



# Gender inclusivity of engineering students' experiences of workplace learning

Final report 2015

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Project website

[www.ecm.uwa.edu.au/staff/learning/research/gender-inclusivity](http://www.ecm.uwa.edu.au/staff/learning/research/gender-inclusivity)

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## List of acronyms used

AAEE	Australasian Association for Engineering Education
OLT	Australian Government Office for Learning and Teaching
UTS	University of Technology, Sydney
UWA	The University of Western Australia
WIE-WA	Women in Engineering–Western Australia

# Executive summary

## Project context

To the detriment of Australian society and people, women in Australia remain under-represented among engineering students, and even more so among engineers. Engineering workplaces have features that are gender non-inclusive (Gill, Sharp, Mills, & Franzway, 2008; Kaspura, 2013). There are efforts to improve engineering education by increasing industry engagement, and all but one of the Australian universities that offer formative engineering degree programs have compulsory workplace learning. However, it was hypothesised that experiences of workplace learning might further discourage female engineering students.

## Aim of the project

This project sought to contribute to ensuring that workplace learning in engineering programs is gender inclusive. The project was designed to investigate gender inclusivity in engineering students' vacation employment and internships, and to develop, test, and model a workshop to help prepare students for successful student and graduate experiences in engineering workplaces. The project provided preliminary investigation into the extent and nature of the need for a full proposal.

## Main findings of the project

The majority of students' workplace experiences were encouraging. However, despite the positive experiences, as many as 53 (33.1%) of 160 engineering students were not aware of any female professional engineers in the workplace, and experiences consistent with gendered workplaces were reported. These included female students experiencing interactions that Hatmaker (2013, p387) identified as marginalising female engineers—namely 'amplifying' gender, 'imposing gendered expectations', 'tuning out' when women speak, and 'doubting technical abilities' of women.

It was found that students were vulnerable due to difficulty finding placements and the need to complete their placements to graduate. Students were discouraged by placements where they were not given engineering work, received insufficient supervision or support, and had little or no interaction with professional engineers.

Student interviews revealed transformative, encouraging workplace experiences, and disheartening experiences. Descriptions of interactions and responses consistent with gendered cultures, and also bullying, were identified.

## Project outputs, deliverables, and resources

This project has described the extent and nature of non-inclusivity of workplace experiences of engineering students at three Australian universities. Manuscripts describing the survey results and interview findings are being prepared.

Resources for educators wishing to hold a workshop to help students prepare for gendered workplaces are available from the project lead. These include workshop slides and facilitator notes, and a handout for students, which contains narrative descriptions and role-play parts for scenarios based on the student interviews.

## **Impact of the project**

Workshops to help students prepare for interactions in gendered workplaces were held at four Australian universities and attended by 110 students and six academics.

A masterclass was attended by 11 participants at the Australasian Association for Engineering Education (AAEE) Conference. The workshop evaluation indicated that five participant academics plan to implement or adapt the workshop.

## **Project approach**

The project was framed within the theory of 'possible selves', in which perceptions of achievable appealing possible future selves are motivating, and feared possible selves are demotivating (Bennett, 2013; Markus & Nurius, 1986). It also focused on personal interactions that marginalise professional engineers, as identified by Hatmaker (2013). Engineering students at the three partner universities were surveyed and interviewed.

Valid and complete survey responses were received from 160 engineering students (25.0% female) who had engineering workplace learning experience. Thirteen engineering students at the three partner universities, including four male students, were interviewed.

## **Recommendations**

Engineering faculties must ensure that engineering students reflect on their workplace experiences to think critically about the cultures they experience and their responses. Engineering faculties should work with employers to improve the quality of placements.

Further research is recommended to describe the prevalence of gender non-inclusivity nationally. Research with employers is recommended to understand how gendered workplace cultures can be improved, and how students can be prepared for working in workplaces where women continue to be in minority.

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# Chapter 1 Introduction

## Rationale

To society's detriment, women continue to be under-represented in engineering in Australia. Engineering workplace cultures are thought to be influential towards the attrition of women from the profession (Gill et al., 2008; Mills, Mehrtens, Smith, & Adams, 2008). At the same time, it has been recognised that there is a gap between the competencies developed by engineering graduates and those required for engineering practice (Male, 2010). To help bridge the gap, most engineering curricula in Australia include a minimum of 12 weeks of practicum, or longer internships. In 2013 and 2014, the Australian Council of Engineering Deans led a national project to improve the quantity and employability of engineering graduates by enhancing industry engagement in engineering degrees (Male & King, 2014). Given women's experiences in engineering workplaces, it is imperative that engineering educators take care to ensure gender inclusivity in any effort to expose engineering students to engineering practice. This project contributed to addressing this issue.

Educators must ensure that industry engagement is designed to be gender inclusive. In the context of programs to recruit female students to engineering, engineering workplaces that are not gender inclusive, and efforts to improve engineering education by increasing industry engagement, it is important that engineering educators understand any differences between how male and female engineering students experience their exposure to engineering practice. Without this understanding, engineering educators risk undermining efforts to recruit female engineering students by discouraging these students in an attempt to expose them to engineering practice.

In addressing the above issue, this project fills a gap. Much research has been undertaken on designing gender-inclusive engineering curricula (Godfrey, 2003; Godfrey & King, 2011; Mills, Ayre, & Gill, 2010b). None of these specifically focused on the gender inclusivity of vacation employment and internships in Australia, and yet in combination they point to the need for this.

Regarding engineering workplaces, there is a vast literature on the gendered nature of engineering organisations and initiatives to improve the status of women in engineering (Barnard, Powell, Bagilhole, & Dainty, 2010; Lewis, Harris, & Cox, 2007), without due attention on the employment of students. Regarding engineering curricula, Mills, Ayre, and Gill (2010a, pp.62-67) raised the significance of identity development as part of designing gender-inclusive engineering education. In an apprenticeship engineering program in France, Blandin (2012) found that respect from colleagues was influential for students in their development of professional engineering identities. Godfrey (2003) investigated the culture of an engineering faculty in New Zealand, finding features consistent with a gendered culture. Studies of engineering workplace cultures in Australia concluded with recommendations that engineering curricula should include education about workplace

cultures, in addition to technical education (Gill et al., 2008). Godfrey and King (2011) investigated students' attrition and success in Australian engineering programs. They reported the need for improved gender inclusivity in engineering curricula, but did not comment specifically on the gender inclusivity of vacation employment or internships.

The most relevant studies were in the USA and UK. Tonso (2007) in her study of project-based learning in an engineering school in the USA, included investigation of gender and identity in workplace experiences of students. She found differences in power and recognition experienced by female and male students. Most importantly, Powell, Bagilhole, and Dainty (2009) in the UK, interviewed 26 female engineering students before, during, and after industry placements. They identified the students' responses to the masculine culture as 'acting like one of the boys', 'accepting gender discrimination' and 'achieving a reputation', seeing 'advantages over disadvantages', or adopting an 'anti-woman approach' (pp.418–21). They explain the gender conflict that can arise, but a detailed account of the range of gendered experiences of the students in the workplace is beyond the scope of the paper. Hatmaker (2013, p386), in her study of 52 female engineers in the USA, found ways that interactions marginalised professional identity: '(a) by amplifying gender, (b) by imposing gendered expectations, (c) by tuning out and (d) by doubting technical abilities'. In a similar manner to Powell et al. (2009), Hatmaker (2013) identifies engineers' responses and consequent outcomes.

In Australia in 2013, Male and MacNish (under review) interviewed six final-year engineering students (two male) in three groups. The male and female students spoke about how their experiences had influenced their perceptions of future possible selves and attitudes towards their programs. Both male and female students had experienced interactions with tradespeople who demonstrated little respect for engineers. However, this was not as disconcerting for the male students as the female students. Female students' reflections included examples of awareness of disconcerting possible future selves. In addition, the female students spoke of gendered interactions similar to those experienced by engineers in Hatmaker's (2013) study. For example, they reported their credibility being doubted, being talked over in meetings, a lack of female toilets, and contractors on site making a joke about gang rape. In just three small focus groups, Male and MacNish (under review) unearthed evidence that further investigation and action was needed.

The studies by Powell et al. (2009); Hatmaker (2013); and Male and MacNish (under review), informed both the research design in this study, and the design of the workshops to help prepare students for gendered engineering workplaces.

## **Aim**

This seed project was designed to investigate and improve gender inclusivity in engineering students' vacation employment and internships, and to develop, test, and model a workshop to help prepare students for successful student and graduate experiences in engineering workplaces. The project was to provide preliminary investigation into the extent and nature of the need for a full proposal.

## Context

The data collection for this project was undertaken in 2014. The mining boom in Australia, which had thrived in Western Australia where two partner universities—Curtin University, and The University of Western Australia (UWA)—are based, had slowed in 2013. Students had reported that vacation employment had become difficult to secure (Male & King, 2014).

The partner universities include a research-intensive university, UWA, and two universities in the Australian Technology Network, these being Curtin University, and University of Technology, Sydney (UTS). Curtin University and UWA have 12 weeks' compulsory workplace learning for Bachelor of Engineering and Master of Professional Engineering students. For UWA students, all 12 weeks must be engineering related. For Curtin University students, some of these weeks may be generic workplace experience and an accumulation of exposure to engineering practice, such as site visits and interviewing engineers.

The majority of Bachelor of Engineering students at UTS undertook a Diploma of Engineering Practice in which they completed two semester-long internships after three and five semesters of coursework. Each internship was preceded and followed by a pre- and post-practicum unit and the Faculty of Engineering and Information Technology assisted students with finding and managing placements, as well as providing additional support. UTS also has the longest running women in engineering program in Australia, UTS Women in Engineering and IT (WiE&IT).

## Chapter 2 Project approach

The project focused on how workplace experiences, especially personal interactions, influence perceptions of appealing or disconcerting possible future selves, and also how these experiences influence engineering students' self-efficacy and identity as future engineers. This is based on a theory of 'possible selves' (Bennett, 2013; Markus & Nurius, 1986), and is informed by Hatmaker's (2013) and Blandin's (2012) studies which, as discussed, found that personal workplace interactions influenced engineers and engineering students' identities.

The research design involved an online survey followed by interviews. Workshops for students were developed to help students prepare for interactions as students and graduates in gendered workplaces. These were tested at the partner universities and at Murdoch University.

### Survey

The survey is reported in a manuscript available from the project lead (Male, Khan, et al., working paper).

### Research questions

The survey addressed research questions about the extent to which Australian engineering students' workplace experiences were consistent with gendered workplaces and were gender non-inclusive. It also explored the extent to which Australian engineering students' workplace experiences influence their motivation to become an engineer, and their confidence in their ability to become an engineer in a gender non-inclusive way.

### Questionnaire

Engineering students at the three partner universities were surveyed online using Qualtrics™. The survey included closed questions with complementary open questions seeking explanations for the responses. After demographic questions about the student, their degree program and their workplace experience, students selected their most influential placement. The remaining questions were about the following aspects of the experience of this placement:

- Overall consequences of this experience in terms of motivation to become an engineer, confidence in ability to become an engineer, and enrolment intentions.
- The influence of the placement in terms of how the student felt with respect to aspects known to be important to persistence of female engineers and feeling confident during the placement.
- Development of awareness of appealing and disconcerting possible future roles, and of encouraging and disconcerting personal interaction or encounters.

- Incidence of experiences consistent with gendered workplaces and known to support persistence of female engineers, based on literature noted in the introduction.

The questionnaire was reviewed and tested by the project team and reference group, before being tested by 40 students from the three universities (Appendix B).

## **Participant recruitment**

Final-year students were invited by email. These were difficult to identify due to the flexibility of degree programs, and students in other years also received invitations and participated.

## **Analysis**

Test responses and later responses were combined, accommodating for minor modification made after the test. Identifying data were removed. Twenty-five responses that answered no questions about the workplace learning were removed. Of the remaining 197 valid responses, 174 (88.3%) had engineering workplace learning experience. Of these, 160 had no missing responses. These included 30 (18.8%) from Curtin University, 49 (30.6%) from UWA and 81 (50.7%) from UTS.

Descriptive data were generated and qualitative responses relevant to non-inclusivity were analysed to identify responses that indicated perceptions of disconcerting possible selves, comments consistent with a gendered workplace, and comments about features that could decrease motivation to become an engineer. Eccles' (2009, pp.80-82) model of task motivation was used. In this model, people are motivated by 'expectancy' of success, 'attainment', 'intrinsic' and 'utility' value, and 'relative cost'. For simplification, the ratings of the eight items on how the student felt and 24 items on the incidence of interactions were factor analysed. All variables were tested for significant differences between responses from men and women at the  $p < 0.05$  level.

## **Interviews**

A manuscript on the interviews is available from the project lead (Male, Figueroa, et al., working paper).

## **Interview protocol**

Interviews were semi-structured. Students who had not participated in the survey completed a short version of the questionnaire. Students were asked to describe their work during their most influential placement. They were asked about responses they had made on the survey: experiences that influenced their responses; how they felt and reacted to the experience; what then happened; and how they now felt about it. Students were then asked about appealing and unappealing possible future roles they discovered, and the influence of the experiences on their confidence that they could become an engineer, and their enrolment intentions. Students were debriefed after their interviews, which lasted up to 45 minutes.

## Participant recruitment

A purposive sample of students was recruited for maximum diversity based on survey responses, using email addresses provided by students in the survey for this purpose. Participants included male and female students with positive and negative experiences.

Students who had left engineering following an internship and enrolled in a different program at the same university were invited to participate. Only five of such students were identified and none replied. Three students who were not identified through the survey but had reported critical incidents during placements were invited to participate.

## Analysis

Identifying details were removed from transcripts before analysis within the framework of possible selves, to identify descriptions of interactions that were not inclusive and features of placements that motivated students.

## Workshops

A workshop was developed to help engineering students prepare for workplace interactions as students and graduates. The workshops are listed in Table 1.

**Table 1 Student workshops**

<i>Workshop location</i>	<i>Date</i>	<i>Participants</i>	<i>N</i>	<i>Universities among participants</i>
Murdoch University	2 October 2014	Students, Engineer	69, 1	4
Curtin University	3 October 2014	Students	9	1
UWA	21 October 2014	Students	19	1
UTS	24 October 2014	Student, Staff	17, 6	2

The workshops were offered as extra-curricular workshops with light morning tea or lunch. The first three workshops were 60 to 90 minutes in duration, led by the project lead with team members from Curtin University and UWA assisting at their respective universities. Students were introduced to the tremendous potential benefits of workplace learning, based on findings from the study by Male and King (2014). They discussed the importance of culture in workplaces and were introduced to the findings of Hatmaker (2013) and Powell et al. (2009). They were introduced to ideas around how to reflect on experiences individually and with trusted others, including cultural factors, in order to maximise learning during placements.

The students then worked in groups of three or four students. Each group acted one allocated scenario from a handout containing four scenarios. The scenarios are adapted from the actual descriptions given by students in the interviews, with identifying material removed. They include examples of bullying, amplifying gender, making requests based on gender, making assumptions based on gender, and doubted technical credibility. The groups discussed the provided questions for their scenario.

Each scenario was then performed by one group for all participants and the facilitator led a discussion, drawing students' attention to the influence of gendered culture on the scenario occurring and the responses of students, and how students might plan for such a scenario. The workshops ended with a workshop summary before students completed evaluation questionnaires, which were collected by a student and posted in a pre-stamped and addressed envelope to a team member at another university.

The first workshop was held at Murdoch University. Because it was advertised as an Engineers Australia event, students attended from Murdoch University, Curtin University and UWA, including undergraduate and postgraduate engineering students. One engineer also attended. The workshop was held in a non-teaching study week for Curtin University students, and in one of their units they are required to attend an Engineers Australia event and write a brief report on it. It is suspected that many of the students who attended were taking this unit.

The second workshop, at Curtin University, was attended by undergraduate and postgraduate students. Numbers were low because many had attended the workshop at Murdoch University. The third workshop, at UWA, was attended by undergraduate engineering students.

The UTS project team members adapted the fourth workshop to two hours in duration. They included pre-work and in-class activities using SPARK<sup>PLUS</sup>, the Self and Peer Assessment Resource Kit, which was developed by project team member Willey and others, and is used widely by universities. Students indicated whether they had experienced discrimination, bullying or inappropriate behaviour (Figure 1). They also identified the person in charge in photographs of people in workplaces and nominated the factors that influenced their decisions. This activity was designed to draw attention to assumptions and subconscious bias. Students also reported whether they had experienced or observed gender-based or general discrimination, bullying, or inappropriate behaviour.

This UTS workshop was attended by students and staff. The staff members were influential in the faculty and included two members of the project reference group. The workshop was also attended by staff and students from Macquarie University. They had heard about the workshops in Western Australia through Engineers Australia and hoped to hold something similar at Macquarie University.

In regard to work place gender discrimination, bullying or inappropriate behaviour.

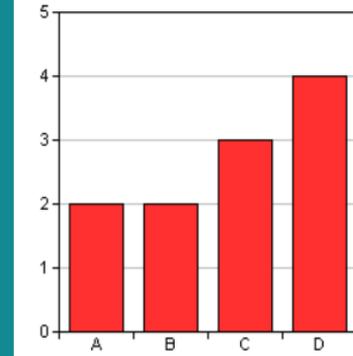
A) I have experienced this personally (it has happened to me)

B) I have not experienced it personally, but witnessed it happen to others

C) I have not experienced it personally, but talked about it with others

D) I have no personal experience of any specific instances nor talked about it with others

Number of students



In regard to other forms of (non-gender) work place discrimination, bullying or inappropriate behaviour.

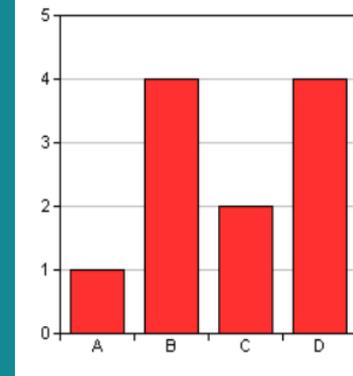
A) I have experienced this personally (it has happened to me)

B) I have not experienced it personally, but witnessed it happen to others

C) I have not experienced it personally, but talked about it with others

D) I have no personal experience of any specific instances nor talked about it with others

Number of students



**Figure 1 Pre-work results from UTS workshop**

## Chapter 3 Project outputs and findings

### Results and findings

This project has found that while the majority of engineering students at the three partner universities felt positive about their engineering workplace learning experiences, some had unacceptable experiences, and both male and female students had experienced gendered workplaces. Female students experienced gendered marginalisation at a higher rate than male students, some of whom also experienced gendered marginalisation, and male students suffered frustration at finding that technical competence was not as central to engineering practice as they expected.

### Survey results

Valid complete survey responses were received from 160 engineering students (25.0% female) who had engineering workplace learning experience. Of these, 53 (33.1%) were not aware of any female professional engineers in the workplace (meaning the building or site where the student was based), and 28 (17.5%) were aware of only one female professional engineer in the workplace.

For the majority of students, the most influential placement was a positive experience. However, four (10.0%) of the 40 female students and 15 (12.5%) of the 120 male students reported that overall as a consequence of their experience, their motivation to become an engineer had decreased, and two (5.0%) of the female students and 12 (10.0%) of the male students reported that their confidence in their ability to become an engineer had decreased. Among qualitative responses were accounts of discouraging workplace experiences in which students were not given engineering work, were given insufficient supervision or support, had minimal interaction with professional engineers, or found their engineering work to be boring.

Descriptions of experiences consistent with gendered workplaces were reported. These included female students experiencing interactions that Hatmaker (2013, p.387) identified as those which marginalise female engineers—namely ‘amplifying’ gender, ‘imposing gendered expectations’, ‘tuning out’ when women speak, and ‘doubting technical abilities’ of women. Male students also suffered experiences consistent with masculine gendered workplaces. Male students expressed frustration at discovering that technical competence was not as important as expected in engineering practice. This is consistent with identity conflict arising from the low status of stereotypically feminine aspects of engineering practice such as communication, within engineering faculties, and misperceptions about the nature of engineering practice. Additionally, a male student noted that rough workers on site were not his ‘scene’ and a male student reported being chastised for using ‘figurative language’, consistent with a culture in which a stereotypically feminine communication style is belittled.

Students indicated the number of times they had experienced each of 24 critical experiences during their most influential engineering learning placement (*never, once, twice or more*). To perform a factor analysis, the three scale points were coded 0, 1, 2. This means that the top end of the scale was under-valued in the coding process and the coded values were only conservative estimates of incidence. These coded incidence ratings for 24 experiences were reduced to eight factors. Consistent with the majority of students reporting overall increased motivation and confidence, the two experience factors conceptually named 'support' and 'opportunity to help others' received the highest ratings of incidence. Support and opportunities to help others were found by Ayre, Mills, and Gill (2013) to be important to female engineers' persistence in the profession. Conservative estimates of the average incidence of items reflecting these factors during a student's placement were 1.24 and 1.09 respectively for the female students, and 1.28 and 1.13 for the male students. Other factors were reflected by items known to discourage persistence of female engineers in the profession.

The 'doubted credibility' factor included doubted technical engineering knowledge, doubted practical skills, and doubted commitment to being an engineer. The 'gendered marginalisation' factor included requests based on gender, assumptions based on gender, comments that drew attention to gender, sexual discrimination, and sexist jokes. The 'isolation' factor included difficulty asking for help, being ignored, and exclusion from the team. The factor 'lack of concern for people' included lack of safety gear, lack of respect, experience of humiliation, and lack of adequate bathrooms.

For female students, among the discouraging experiences, it was doubted credibility, gendered marginalisation, and isolation that were rated as the experience factors with the highest incidence. Conservative estimates of the average incidence of these factors in the student's placement were 0.58, 0.53 and 0.48 respectively. For male students, among the discouraging experiences, it was isolation, doubted credibility and lack of concern for people that were the most prevalent. Conservative estimates of the average incidence during the placement were 0.48, 0.44 and 0.26 respectively. Fisher's Exact Test comparing male and female responses at the item level (comparing responses for items rather than groups of items reflecting a factor) revealed that female students were more likely to experience assumptions based on their gender, comments that drew attention to their gender, and requests based on their gender ( $p \leq 0.001$ ).

Students were vulnerable due to difficulty finding placements and the need to complete their placements to graduate. Twenty-five (20.8%) of the male students and six (15.0%) of the female students reported that they were not paid during their first engineering workplace experience. One female student reported paying thousands of dollars to a recruitment agent to secure an unpaid internship where she had no engineering work in the engineering discipline she was studying, had minimal interaction with professional engineers, and received no guidance from professional engineers. She completed the internship because she needed it to complete her five-year degree program on time.

## **Interview findings**

Thirteen engineering students at the three partner universities, including four male students, were interviewed. The interviews revealed transformative, supportive workplace

experiences, and disconcerting to unacceptable experiences. Some of these experiences the students did not recognise as gendered, although they were consistent with marginalising women. Students who reported motivating experiences either had personal advantage such as having grown up in a family business in the industry, or had worked in an organisation where they were supported.

Female students and one male student described interactions consistent with gendered workplaces. These included interactions that marginalise women as described by Hatmaker (2013), a hierarchy with low respect for stereotypically feminine interests, such as Engineers Without Borders, and an assumed high importance for stereotypically masculine interests, such as cricket. Responses by female students varied. Some reported overall positive responses to their experiences and did not mind the marginalising practices that they experienced. Other female students and one male student reported feeling frustrated, depressed, discouraged and confused by their experiences. Even when unhappy, students remained in their placements because they needed them to complete their degree programs.

Bullying was described, and the responses of male and female students were limited by their assumptions about how they should respond, and about what is 'normal' engineering workplace culture—both based on an assumption that engineers should be tough, which is consistent with a masculine culture. For these students, when they eventually sought assistance from their university they were able to cope better. An outcome of this process was that they improved circumstances for future students, even if this was achieved by the university's decision to approve no further internships with the employer.

A theme among reports was a strong contrast between city office culture, and rough language on site among engineers who work on site. This ranged from swearing, to bragging about using prostitutes on an overseas work trip. Students assumed that rough language was normal engineering site culture and reported that it was not their style, but they tolerated it.

One female student reported that since her placement she planned not to work as an engineer, despite completing her degree. Among other reasons, she disliked the lack of interaction with others that she experienced during her placement. This experience was inconsistent with the socio-technical nature of most engineering practice. Her experience and reaction contrasted with the reports by male students in the survey—that they were frustrated to discover how insignificant technical competence was to the engineering practice that they experienced.

One female student reported that she disliked part of the culture of a consulting firm at which she had two placements, because the firm dismissed many engineers once the workload dropped during her second placement. She had seen how intensely these people had worked for the firm when the workload had been high, and she recalled the stress she felt when her father had been made redundant when she was young. This suggests that she is already judging the 'family friendliness' of possible future roles, which have been found to be important to female engineers' persistence in the profession (Ayre et al., 2013), and which was also raised by students in the study by Male and MacNish (under review).

One student completed his placement in Singapore. He experienced colleagues ignoring requests from him when there was no expected benefit to them in responding, and verbal abuse from clients as experienced by others in the company. However, a difference between the experience of this student and others was the respect given to engineers, including him, by the technicians. He explained that in Singapore the engineers are paid more than technicians and are always respected by them.

## Recommendations

The project points to the importance of employers and universities working together to ensure that during workplace learning placements students do undertake engineering-related work, interact with professional engineers, receive supervision and guidance from professional engineers, and have opportunities to learn in a safe environment.

Students must be supported to prepare for their workplace learning placements, and reflect during and after the placements to ensure that they optimise their learning, and to put their experiences into perspective against others. Before workplace learning, students must be informed about where they can seek support at the university, should they be concerned by experiences during the placement.

Further research is needed to explore the national extent and nature of gender inclusivity of engineering students' workplace experiences, how universities and employers can ensure a supportive experience for all students, and how to prepare male and female students for working in male-dominated workplaces—both to thrive individually, and to improve gender inclusivity for others and for optimal engineering practice for society's benefit.

## Resources

The following resources are available electronically from the project lead. These were supplied electronically to the masterclass participants:

- workshops slides
- facilitator notes
- handouts for students containing extracts of de-identified interview transcripts, scripts for role-play of scenarios, and discussion questions for each scenario.

Additionally, papers on the survey (described at Chapter 2, page 13) and on the interviews (page 14) are available from the project lead (respectively, Male, Khan, et al., working paper; and Male, Figueroa, et al., working paper). These papers will be submitted to journals in the first quarter of 2015 and their details will be posted on the project webpage ([www.ecm.uwa.edu.au/staff/learning/research/gender-inclusivity](http://www.ecm.uwa.edu.au/staff/learning/research/gender-inclusivity)) once they are published.

## Disciplinary links

The first student workshop was hosted and supported with generous catering by Murdoch University. The Dean, School of Engineering and Information Technology, Professor Parisa Bahri, invited the project lead to hold a workshop at Murdoch University, following a workshop for engineers facilitated by the project lead, Male and project team member MacNish at Engineers Australia Western Australia Division. The Engineers Australia Women

in Engineering–Western Australia (WIE-WA) group promoted the workshop (Appendix C). Professor Bahri introduced and attended the workshop. The Immediate Past Chair of WIE-WA, Ms Jolanta Szymakowski also supported the workshop by attending.

## **Factors that affected the success of the project**

The quality of the reference group was invaluable. Members helped to ensure that the project took account of the most current literature by alerting the team to very recent and forthcoming literature. Members were also working ‘at the coalface’ in the field and were therefore able to provide important pragmatic advice for the project.

The project lead’s association with professional bodies led to a well-attended workshop being held at a non-partner university. It also led to people from a non-partner university attending the UTS workshop.

Although there was no funding for a face-to-face project team meeting in the budget for this project, five members of the team met at the AAEE Conference in December 2013, and seven of the eight members of the project team attended the same conference in December 2014 and co-facilitated the masterclass. These opportunities were important to team cohesion and made it easier to rely on skype and telephone, and email at other times.

## **Relevance of resources to a variety of institutions and locations**

The workshop resources will be relevant to all universities that teach engineering and other non-traditional disciplines for women, such as geology. Masterclass participants from Australia and New Zealand plan to use them with students at various stages in their degree programs and also with staff.

Robogals is an international initiative, started in Melbourne, whereby students inspire school girls by leading activities that involve building robots. The Robogals Asia Pacific SINE Conference to induct executive committee members was held at UWA in 2014. On 29 September 2014 at this conference, Ms Helen Pedersen, Engineers Australia Western Australian Division President, and Ms Jag Strachan, Engineers Australia WIE-WA Chair, together with the project lead, facilitated a workshop called ‘Active Advocacy’, for which the slides and scenarios from the student workshops developed in this project were adapted.

The findings are of interest to professional bodies as demonstrated by the speaking invitations listed below (Chapter 4) under dissemination.

## **Links to other OLT projects and fellowships**

This project contributes additional understanding that directly complements two valuable past Office for Learning and Teaching (OLT) projects, and one current project. First, the guidelines on improving gender inclusivity of engineering education by Mills et al. (2010b) did not previously consider engineering students’ workplace learning experiences.

Second, the resources by Goldfinch (2013) to teach engineering students about cultural diversity included limited material about gender. Third, the 2013 project ‘Integrating

Indigenous student support through Indigenous perspectives embedded in engineering curricula' also led by Goldfinch, will benefit from this project.

A masterclass participant on Goldfinch's current project reported by email:

*...given my current role I don't think I'll be using the materials as such but intend to draw on their structure and ideas for some resources for the Indigenous Engineering project at Wollongong, as we proceed. (masterclass participant)*

With respect to the literature, this is the first Australian study on gender inclusivity of workplace learning experiences of engineering students. This is also the first to use possible selves theory, and the depth of qualitative data collected to support and understand the quantitative data is invaluable because it provides powerful stories demonstrating real experiences for use in student workshops.

## Chapter 4 Project impact, dissemination and evaluation

### Impact

One hundred and ten students and six academics in total attended the student workshops. Eleven educators attended the masterclass. Approximately 60 people in the mining industry attended the diversity luncheon noted under dissemination below. One hundred and nineteen students attended the Robogals workshops. Being the first research on gender inclusivity of engineering students' workplace experiences in Australia, the findings were new to all of these people. The scenarios are real and shocking, even to the researchers. The workshop evaluation reports below provide evidence of the learning by students.

Several dissemination activities have led to further opportunities to share the findings and generate impact. After the Robogals workshop, students asked for a similar workshop at their university. Workshop participants asked for more workshops, and masterclass participants have plans for adapting the resources at their own universities for students and staff. Evidence for this is reported in the masterclass evaluation report below. Additionally, the two emails below were received from participants following the masterclass.

*I am keen to implement this in second year group work unit as it is applicable to any gendered environment even when at uni I believe. (senior lecturer in engineering)*

*Thanks very much for the workshop - it was really interesting. Would you mind if I adapted your materials to use in a teaching program that I run with the [course name] post graduate students here? The program includes stuff on teaching and learning, marking, managing difficult behaviour etc... classroom culture, but nothing on gender at the moment. Which is obviously a gap in the program, especially given that most of my students are male engineers teaching male and female students. I think your material could be really useful in getting them to think about how they consciously or otherwise interact with students of different genders, and what underlying assumptions they may hold. (lecturer in engineering)*

This project is snowballing. Strong interest in the project by engineering lecturers augers well for curriculum improvements in 2015. Workshop materials produced by the project will support important changes for hundreds of students. Interest from industry leaders including human resource managers is promising for future collaboration on a project building on this seed project.

### Dissemination

A poster presentation was made at the West Australian Network for Dissemination Sharing Day at Curtin University on 6 October 2014. It is estimated that approximately 30 higher education practitioners and researchers attended.

A masterclass on conducting the student workshop was held at the ASEE Conference on 8 December 2014. Eleven participants attended. The evaluations from the student workshops were used in the masterclass to demonstrate how it had been received by students.

This project is relevant to gender equality in male-dominated workplaces. It is listed on the Academic Research Hub of the Workplace Gender Equality Agency at [www.wgea.gov.au/progress-australian-research/gender-inclusivity-engineering-workplaces](http://www.wgea.gov.au/progress-australian-research/gender-inclusivity-engineering-workplaces) (Peach, 2014).

The project lead spoke about this project as a panel member at the Minerals Tertiary Education Council (MTEC) Gender Diversity Luncheon at UWA on 20 August 2014.

The five team members who are based in Western Australia gave an interactive presentation about the project at the Teaching and Learning Forum at UWA on 29 January 2015. This was attended by fifteen people from at least four universities.

The project lead gave an interactive presentation about the project as guest speaker at the National Association of Women in Operations (NAWO) Industry Solutions Breakfast on Strategies for Retaining Female Talent in Operational Roles on 11 February 2015. This event was attended by executive directors, chief executive officers and human resource managers, representing five businesses.

The project lead will give a presentation about the project to members of Graduate Women WA as guest speaker at a Special General Meeting on Thursday 9 April 2015.

## **Evaluation**

The evaluation from the first two workshops informed improvement for the following two workshops. Modifications were made to the role-play scripts used by the students to make them clearer, and changes were also made to the images on the slides. Evaluation data are presented in Tables 2 to 5 and Figures 2 to 5 (Appendix D and Appendix E below).

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# Appendix A

## *Certification by Deputy Vice-Chancellor*

I certify that all parts of the final report for this OLT grant provide an accurate representation of the implementation, impact and findings of the project, and that the report is of publishable quality.

Name: A.J. Cameron

Date: 2 February 2015

# Appendix B Questionnaire



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## Gender Inclusivity of Engineering Students' Experiences of Workplace Learning Survey and Interview Participant Information Sheet

**Purpose of the project:** This project will contribute to ensuring that engineering students' experiences of internships and vacation employment are beneficial for all students regardless of gender.

**Project team:** The project is funded by the Australian Government Office for Learning & Teaching SD13-3416. The Project is led by Research Associate Professor Sally Male at UWA and undertaken by: Sally and Professor Cara MacNish (UWA); Professor Dawn Bennett and A/Professor Nicoleta Maynard (Curtin University); and Dr Keith Willey, Mrs Anne Gardner, and Ms Eugenia Figueroa (University of Technology Sydney).

**Aim of the project:** The Team will investigate engineering students' experiences of vacation employment and internships, using an online survey and interviews of current engineering students and students who have withdrawn from engineering. We will then develop and test a workshop to help prepare students for the personal interactions they are likely to experience as students and graduates in engineering workplaces.

**Survey and interview participant recruitment: Participation is voluntary.** Current students will be invited to participate in the survey by email using students email lists and through student societies. Emails will be sent by staff with existing authority to access details and details will not be shared with the Project Team. A sample of the survey participants will be invited by the Project Leader to participate in interviews using email addresses provided voluntarily by survey participants, for this purpose. Students who have withdrawn from engineering will be invited to participate in an interview by post or email from a staff member who already has access to student data.

**Consent:** Survey participants indicate consent to participate in the survey by completing the online questionnaire. Interview participants indicate consent to participate by signing a consent form.

**What happens to the data?** Survey data will be collected online. The responses will be allocated identifying codes. Any email addresses provided by participants for later invitation to be interviewed will be stored separately from the survey responses and only the Project Leader will be able to connect the email addresses to the survey responses. Interviews will be conducted by a Project Team member who is not teaching the student in 2014. Interviews will be recorded and transcribed. The interviewers will remove all identifying details from their notes and the transcripts before sharing these with the Project Team for analysis. The survey responses, interview notes and transcripts are the property of the researchers and will be stored securely on the UWA Institutional Research Data Store.

**Is the anonymity of participants protected?** Information that you provide will not be released by the investigators in any form that may identify you. The only exceptions to this principle are if documents are required by law.

**Can you withdraw from the project?** You are free at any time to withdraw consent to further participation without prejudice in any way. You need give no reason or justification for such a decision. In such cases, your records are destroyed, unless otherwise agreed by you.

**What are the risks and inconveniences of the project?** There is no health risk involved and the only inconveniences are volunteering your time. The survey can be completed within 15 minutes. The interviews will be 45 minutes long. Students' enrolments, grades, and relationships with staff members will be in no way affected by their participation or non-participation in this research.

**What are the long term outcomes?** We hope to improve gender inclusivity of engineering students' and graduates' workplace experiences. This is a seed project. The project will provide preliminary investigation into the extent and nature of the need for a full proposal to the same funding body which would also involve employers.

### Questions or concerns:

Approval to conduct this research has been provided by The University of Western Australia RA/4/1/6678, in accordance with its ethics review and approval procedures, Curtin University 100/2014, and University of Technology Sydney 2014000239. Any person considering participation in this research project, or agreeing to participate, may raise any questions or issues with the researchers at any time.

In addition, any person not satisfied with the response of researchers may raise ethics issues or concerns, and may make any complaints about this research project by contacting the Human Research Ethics Office at The University of Western Australia on (08) 6488 3703(08) 6488 3703 or by emailing to [hreo-research@uwa.edu.au](mailto:hreo-research@uwa.edu.au)

All research participants are entitled to retain a copy of any Participant Information Form and/or Participant Consent Form relating to this research project.

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Q58 A small sample of students completed this questionnaire late in May 2014 and in the first week of June 2014. Have you already completed this questionnaire?

- no (1)
- yes (2)

Answer If We can accept only one completed questionnaire from each student. If you have completed the questionnaire but wish to add a comment and/or email address to be invited to be interviewed, please... Choice 2 Is Selected

Q59 We can accept only one completed questionnaire from each student. If you have completed the questionnaire but wish to add a comment and/or email address to be invited to be interviewed, please enter text here. You will then be directed to the end of the questionnaire.

If We can accept only one comp... Is Displayed, Then Skip To Thank you for completing the survey. ...

### Section 1 of 5: Demographics

Q1 At which university are you enrolled in engineering?

- Curtin (8)
- UTS (6)
- UWA (7)

Q2 Which of the following most closely matches your engineering discipline? (*Select one only.*)

- chemical (2)
- civil/structural (1)
- civil and environmental engineering (combined) (11)
- electrical / electronic / computer systems / information and communication technologies (3)
- environmental (6)
- mechanical/mechatronic (7)
- mining (8)
- petroleum / oil & gas (9)
- software (10)
- other (12) \_\_\_\_\_

Q40 Which of the following best describes your engineering degree program? (*Select one only.*)

- 3-year bachelor of engineering technology (4)
- 3-year engineering science major in bachelor of science (2)
- 4-year bachelor of engineering (7)
- 2-year masters of professional engineering (8)
- 5- or 5.5-year combined/double bachelor of engineering and other bachelor (9)
- 5-year bachelor of engineering with diploma of engineering practice (10)
- Other (1) \_\_\_\_\_

Q44 In which year do you expect to complete this degree?

- 2014 (1)
- 2015 (2)
- 2016 (3)
- 2017 (4)
- 2018 (5)
- other (7) \_\_\_\_\_

Q41 What is the main mode of delivery of your degree program?

- on campus (1)
- external (2)
- other (3) \_\_\_\_\_

Q42 Are you a domestic or international student?

- domestic (1)
- international (2)

Q62 Did you complete high school in Australia?

- yes (1)
- no (2)

Answer If Did you complete high school in Australia? yes Is Selected

Q64 In which Australian state or territory did you complete high school?

- ACT (1)
- NSW (2)
- NT (3)
- QLD (4)
- SA (5)
- TAS (6)
- VIC (7)
- WA (8)

Answer If Did you complete high school in Australia? yes Is Selected

Q61 At which school did you complete high school?

Answer If Did you complete high school in Australia? no Is Selected

Q63 In which country did you complete high school?

Q8 What was your age in years at your last birthday?

Q7 What is your sex?

- male (1)
- female (2)

Q66 Why did you choose to study engineering?

Q65 Do you have a family member (e.g. parent, uncle, aunt, cousin, grandparent) who is an engineer?

- no (1)
- yes (2)

Q67 Where does your current engineering course average lie?

- 50%-59% (1)
- 60%-69% (2)
- 70%-79% (3)
- 80%-89% (4)
- 90%-100% (5)

## Section 2 of 5: Your engineering workplace learning

Q59 Have you undertaken any engineering workplace learning (e.g. engineering vacation employment, part-time engineering work, an engineering internship)? *(Comments can be inserted in text boxes.)*

- yes (21) \_\_\_\_\_
- no (20) \_\_\_\_\_
- not yet but I have a confirmed placement (18) \_\_\_\_\_

Answer If Have you completed each of the following forms of engineering workplace learning placements? *(Comments can be inserted in text boxes.)* no Is Selected

Q68 How many applications have you submitted trying to secure an engineering workplace experience?

Answer If Have you undertaken any engineering workplace learning (e.g. engineering vacation employment, part-time engineering work, an engineering internship)? *(Comments can be inserted in text boxes.)* no Is Selected

Q69 What reasons were given for any rejections you have received seeking engineering workplace experience?

Answer If Have you completed each of the following forms of engineering workplace learning placements? *(Comments can be inserted in text boxes.)* yes Is Selected Or Have you completed each of the following forms of engineering workplace learning placements? *(Comments can be inserted in text boxes.)* not yet but I have a confirmed placement Is Selected

Q68 How many applications did you submit to secure your first engineering workplace experience?

Answer If Have you completed each of the following forms of engineering workplace learning placements? *(Comments can be inserted in text boxes.)* yes Is Selected Or Have you completed each of the following forms of engineering workplace learning placements? *(Comments can be inserted in text boxes.)* not yet but I have a confirmed placement Is Selected

Q55 How did you find your first engineering workplace experience? *(Select all that apply.)*

- using a recommendation from someone known to the organisation (1)
- by responding to an advertised position (2)
- through an agency (3)
- by contacting an employer despite no advertised position or contact known to the organisation (4)
- by accepting a position without pay (5)
- other (6) \_\_\_\_\_

Answer If Have you undertaken any engineering workplace learning (e.g. engineering vacation employment, part-time engineering work, an engineering internship)? (Comments can be inserted in text boxes.) yes Is Selected

Q56 Was your first engineering workplace experience paid?

- paid (1)
- not paid (2)
- other (3) \_\_\_\_\_

Answer If Have you undertaken any engineering workplace learning (e.g. engineering vacation employment, part-time engineering work, an engineering internship)? (Comments can be inserted in text boxes.) not yet but I have a confirmed placement Is Selected

Q57 Will your first engineering workplace experience be paid?

- paid (1)
- not paid (2)
- other (3) \_\_\_\_\_

Answer If Have you completed each of the following forms of engineering workplace learning placements? (Comments can be inserted in text boxes.) no Is Selected Or Have you completed each of the following forms of engineering workplace learning placements? (Comments can be inserted in text boxes.) not yet but I have a confirmed placement Is Selected

Q73 Thank you for completing the questionnaire. As you have indicated no workplace learning experience you will now be redirected to the end of the questionnaire where you can enter the draw for a bookshop voucher.

If Thank you for completing th... Is Displayed, Then Skip To Thank you for completing the survey. ...

### **Section 3 of 5: Your most influential workplace learning placement**

For the rest of the questionnaire, please think about your most influential (positive or negative) engineering workplace learning placement.

Q71 What was your most influential engineering workplace learning placement?

- vacation employment (1)
- an internship (2)
- part-time work (3)
- other (4) \_\_\_\_\_

Q74 At what stage of your degree program did you undertake this workplace learning placement?

- Before completing 1 year or of my degree program (1)
- After completing 1 and not 2 years of my degree program (2)
- After completing 2 and not 3 years of my degree program (3)
- After completing 3 and not 4 years of my degree program (4)
- After completing 4 and not 5 years of my degree program (5)
- After completing 5 or more years of my degree program (6)

Q52 In which country did you undertake the workplace learning placement?

- Australia (1)
- other (Please specify.) (2) \_\_\_\_\_

Q63 How many times did you interact with professional engineers during the workplace experience?

- never (1)
- 1 to 5 times (2)
- 6 to 10 times (6)
- 11 to 15 times (7)
- more than 15 times (8)

Q77 Who else did you mainly interact with? (*Select all that apply.*)

- tradespeople (1)
- technicians (2)
- drafters (3)
- operators (5)
- other (4) \_\_\_\_\_

Q81 How many female professional engineers were you aware of in the workplace (meaning the same building or site as where you were based)?

- 0 (1)
- 1 (2)
- 2 (3)
- 3 or more (4)

#### Section 4: How the placement influenced you

*Please continue to think about your most influential workplace learning placement to answer the following questions*

Q47 Overall, as a consequence of this workplace learning placement, how did your motivation to become an engineer change?

- My motivation decreased. (1)
- My motivation did not change. (6)
- My motivation increased. (15)

Q53 Explain your choice.

Q93 Overall, as a consequence of this workplace learning placement, how did your confidence in your ability to become an engineer change?

- My confidence decreased. (1)
- My confidence did not change. (6)
- My confidence increased. (15)

Q54 Explain your choice.

Q94 Overall, as a consequence of this workplace learning placement, did you change your enrolment?

- no (1)
- considered (What change did you consider and why?) (6) \_\_\_\_\_
- yes (What change did you make and why?) (2) \_\_\_\_\_

Q56 Please rate your agreement with the following statements. Overall during this placement, I felt...

	strongly disagree 1 (1)	2 (2)	3 (3)	4 (4)	strongly agree 5 (5)
a sense of belonging with other engineers in the workplace (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
a sense of fit with other engineers in the workplace (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
confident about my technical skills (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
confident about my practical skills (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
confident about my interpersonal skills (15)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I enjoyed the workplace experience (14)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
supported to succeed (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
engineers were respected in this workplace (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q58 Please describe any key experiences that influenced you to select 'strongly agree' above.

Q53 Please describe any key experiences that influenced you to select 'strongly disagree' above.

### Section 5 of 5: Your experience of the placement

*Please continue to think about your most influential workplace learning placement to answer the following questions.*

Q83 During the placement, did you become aware of an engineering role that was appealing as a possible future role for you?

- no (1)
- yes (What role and why was it appealing?) (2) \_\_\_\_\_

Q87 During the placement, did you become aware of an engineering role that you considered undesirable as a future role?

- no (1)
- yes (What role and why was it undesirable?) (2) \_\_\_\_\_

Q89 During the placement, did you experience a personal interaction or encounter that was encouraging?

- no (1)
- yes (Describe the interaction and why it was encouraging.) (2)

\_\_\_\_\_

Q90 During the placement, did you experience a personal interaction or encounter that was disconcerting?

- no (1)
- yes (Describe the interaction and why it was disconcerting or discouraging.) (2)

\_\_\_\_\_

Q84 Please indicate the number of times you experienced each of the following during the workplace learning placement. Explanations are welcome in the text boxes. During the workplace learning placement...

	no (1)	once (2)	twice or more (3)
were you ever ignored? (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
did you ever have difficulty asking for help? (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
were your achievements ever acknowledged? (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
were you ever refused help? (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
did you ever feel you had been set up to be humiliated? (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
did anyone ever doubt your commitment to being an engineer? (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
did anyone ever doubt your technical engineering knowledge? (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
did anyone ever doubt your practical engineering skills? (22)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
did anyone ever question your recruitment by the organisation? (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
did anyone ever show you lack of respect? (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
did you ever have an opportunity to help other(s) in the organisation? (35)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

were you ever excluded from the team? (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
did anyone ever make comments that drew attention to your gender? (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
did anyone ever make requests based on your gender? (14)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
did anyone ever make a joke that you thought was sexist? (15)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
did you ever experience sexual harassment? (16)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
did anyone ever make assumptions about you based on your gender? (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
were you ever supported in planning a career path? (34)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
did you ever miss out on opportunities given to others at the same level? (37)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
were you ever given fewer resources than others at the same level? (17)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
did you ever have an opportunity to help others outside the organisation? (36)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
did you ever experience sexual discrimination? (18)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

did you ever lack suitable safety gear? (19)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
did you ever lack convenient access to adequate bathrooms? (20)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q59 Interviews will help us understand the issues in greater depth. Please provide your email address below if we may invite you to participate in an interview.

Q18 Any other comments.

Q38 Thank you for completing the survey. If you would like to enter the draw for the survey participants to win a \$50 bookshop voucher please enter your email address when redirected. The main survey responses will not be linked to the email addresses, and the email addresses will be used for no other purpose. The winner will be notified by email from Dr S. Male of The University of Western Australia. Please write the name of your university and your email address. If you do not wish to enter please leave the boxes blank.

Note. Qualtrics™ numbers the questions for the participants in the order they appear and the participants do not see the coding numbers for the response options.

# Appendix C Flyer for Workshop at Murdoch University

## Preparing for engineering workplace interactions as a student or graduate

Guest Facilitator: Sally Male BE(Hons) PhD FIEAust

Hosted by: Women in Engineering and Murdoch University



### DATE

Thursday 2 October 2014

### TIME

10.00 am

**Morning Tea Sponsored by Murdoch University**

### VENUE

Murdoch University  
Learning Links Building, 513  
(LL1.002, LL2.002-LL2.004)  
90 South Street  
Murdoch

*The nearest carpark area will be Carpark 4 (for ease of reference this building is located next to the Child Care Centre)*

### TICKETS (incl. GST)

Members & Students: Free  
Non-members: \$30.00

### REGISTRATIONS CLOSE

COB Tuesday 30 September

[REGISTER ONLINE](#)

How do engineers interact in the workplace?

Come and find out. Join Sally Male for a workshop on interactions in engineering workplaces, including how to make informed decisions and how to interpret and respond to situations as they arise. All engineering students are welcome, especially those about to spend time in industry as a student or graduate. The workshop will also be useful to educators and engineers.

The workshop is developed as part of the research project "Gender Inclusivity of Engineering Students' Experiences of Workplace Learning", led by Sally.

Workshop participants will be invited to complete a workshop evaluation questionnaire in the final ten minutes of the workshop. The participant information sheet is available at:

<https://docs.google.com/file/d/0B0Fas1Nd7ZFOZmVySDdZWVhptN2c/e/dit?pli=1>

Support for this project has been provided by the Australian Government Office for Learning and Teaching. The views in this project/activity do not necessarily reflect the views of the Australian Government Office for Learning and Teaching.

### ABOUT THE SPEAKER

**Sally Male** BE(Hons) PhD FIEAust is a Research Associate Professor at UWA. Sally has 17 years' experience improving the status of women in engineering. She leads the study on which this workshop is based, and recently completed a national project to enhance industry engagement in engineering degrees.



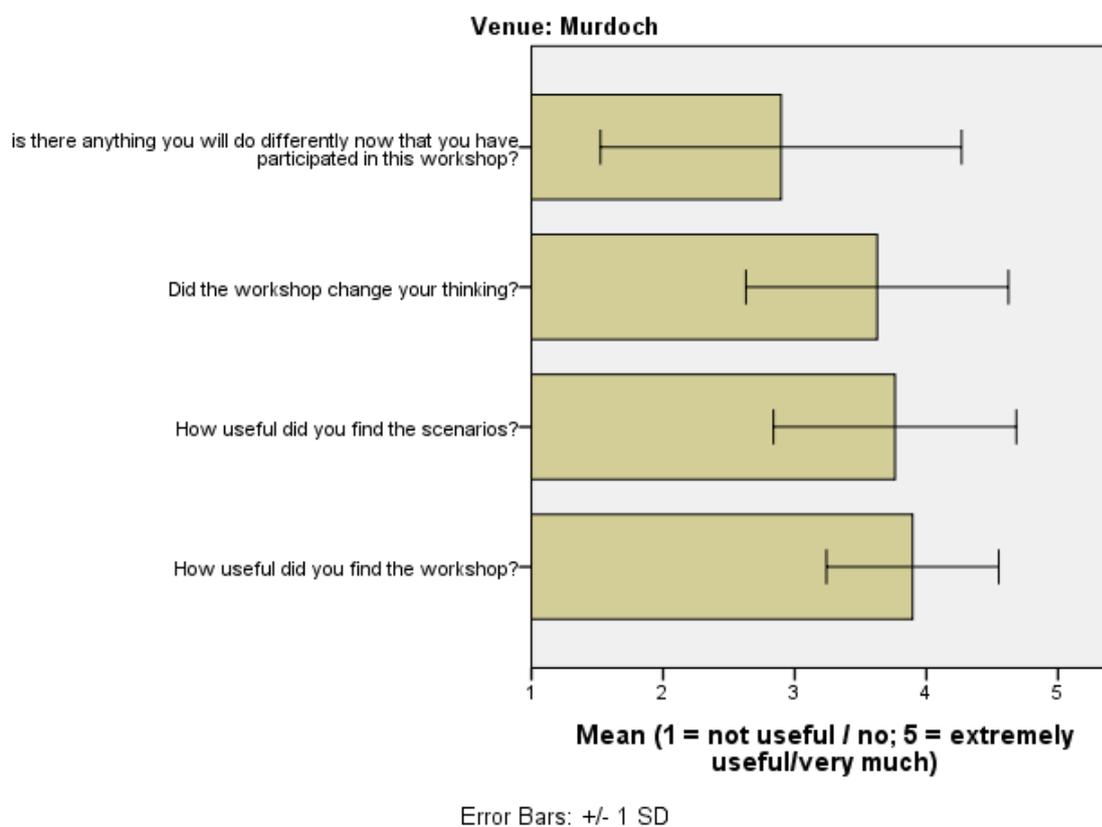
# Appendix D Evaluation data for student workshops

## Murdoch University workshop

Table 2 Murdoch workshop evaluation participants ( $N = 67$ )

Feature	<i>n</i>	%
<i>Sex</i>		
Female	25	37.3
Male	42	62.7
<i>Enrolment (if applicable)</i>		
Domestic	38	56.7
International	29	43.3
<i>Have you undertaken any engineering workplace learning (e.g. engineering vacation employment, part-time engineering employment, an engineering internship)?</i>		
No	57	85.1
Yes	10	14.9
<i>Expected year of completion (if applicable)</i>		
2014	4	6.0
2015	5	7.5
2016	4	6.0
2017	21	31.3
2018	27	40.3
other	5	7.5
<i>Age at last birthday (min, max, M, SD) = (17, 44, 21.1, 5.3)</i>		

Note. Sixty-nine students and one engineer attended the Murdoch workshop.



**Figure 2 Murdoch workshop evaluation ratings (N = 67)**

Below are the Murdoch University workshop participant responses to the question ‘What was the most important thing you learned in the workshop?’

A better understanding of the expectation, culture and gender liaison in the engineering workplace.

As a female student, we should be prepared to face some unfair treatment during future working, as long as prove yourself.

Be yourself in the workplace and build a professional reputation.

Build a reputation through interning.

Don't draw attention to women in the workplace.

Don't have to know everything, all workers are equal.

Don't put emails in the spotlight and recognise them as engineers rather than a female. Always try to take initiative.

Engineering culture is very male dominated, that stereotype of engineering affects perceptions of an individual no matter how skilled.

Equality in the workplace. Don't draw attention to women or treat them differently in the workplace.

Every company has its own culture and it is really significant that adapt it.

Female engineers should be treated as professionals, neither as male nor as female at the workplace.

Female joint the workshop and are scenario of managing director.

Female students or interns or professional female engineers should be treated equally in the workplace as well as society.

Gender discrimination in engineering workplaces exists and we need to try to eliminate it soon.

Gender discrimination is not ok and here are steps hereby to prevent it.

Gender equality, taking female engineers seriously. Reflecting upon incidents that have occurred and improve on them later in the future.

Gender preference, be nice to female engineers in the future. Make myself to be stronger inside.

Golden rule.

How to behave when I get into an engineering workplace, and to make sure not to change my personality and who I am as a person.

How to prepare something.

I don't think my attitude to women will change, but I will definitely be looking at how others treat women in the workplace.

I have learnt that this scenario happens everywhere and I should not take it personally. It is better to discuss it with other trusted people.

I learned that regardless of your standing in the workplace/industry, it's vital that you treat everyone with respect, and be considerate of what you say, do and behave.

I learnt to what extent how much women are separated from men, also how diverse the learning is in the workplace.

I will most likely not like the stereotypes dominant in the workplace.

If men are said to think with their logic, those actions definitely contradict that perception.

I'm an engineering student and as a girl, I do feel like I have that spotlight among my friends which are mostly gutsy. So far they treat me no different between guys and girls, which is good. But I'm not so sure in workplace that's why I need this workshop.

I'm not the only one who had experiences like that.

It is important to ensure you are treated the way you wish to be in the workforce, regardless of gender. Ask for professionals.

It is ok not knowing everything while you were at university. We'll learn new things at workplace.

It is ok to not to remember everything we have learnt in the workplace. The problem that women face in the business is due to stereotyping.

Learning common problems in any situation in the workplace that happens to men and women.

Make an effort to treat everyone equally and professionally.

Men should change their attitude towards women in the workplace, even they dominating the population.

More than being a male or a female it is better to be an engineer.

Networking is the most important thing in seeking a job.

Never discriminate gender. Because knowledge of engineer is not only for men, but women have the right to learn and be an engineer as well. Prove to company that you are competent by your work, not gender.

Never discriminate gender, never underestimate people, respect the students although they are in internship.

Not to worry about forgetting things learnt in uni.

One should behave professionally at workplace whether a male or a female. At workplace everyone should respect others and let it go if something bad happens but learn a lesson from that scenario so it won't happen in future.

Reflection on previous events and how to improve outcomes.

Respect to female engineers.

Sexism exists and we have to try our best to eliminate them.

That it's ok to not to remember everything I learned in uni.

That engineering is a general profession.

That it's ok not to know everything and I'm not the only one feeling unsure, also I know sort of what to expect and maybe think about how to deal with these issues.

That is okay you don't know everything.

That it's ok not to know everything.

That there are plenty of help out there in the workplace. It's ok if you don't remember everything.

That you do not necessarily have to remember all you learned as time in the workshop will help you learn. The faculty of engineering has been until recently lacking emotional intelligence as focus is out mainly in skill and logical intelligence.

The awareness that it is fine if I don't know everything (remember some of the things I did at university).  
There is still a lot to learn/know.

The discrimination about gender is exactly happening in industry.

The extent of gender inequality.

The gendered culture. I was not aware that this gendered culture can be this significant.

There are alternatives to treating women as one of the boys. Professional question colleagues who treat women minorities differently.

To be confident about being a female engineer as they are no lesser than male engineers.

To build a reputation.

To prove yourself to be competent asap.

To seek avenues for discussion (scenario 1) the importance of reporting experiences book.

Treat both female and male similarly at the workplace.

Treat men and women equally.

You are not expected to remember everything you have learnt, you can look it up.

You don't need to know everything, you learn/relearn those things of the workplace again if necessary.

You don't need to remember everything from university.

You need more girlfriends.

---

Below are the Murdoch University workshop participant responses to the question 'What would you do differently now that you have participated in this workshop?'

---

Be more careful and learn how to do in the future.

Be more open-minded and don't be afraid to seek advice or guidance, especially if you are in an uncomfortable situation.

Be more open to ask questions and not expect to know everything. Be aware of enlisting/making wealth of knowledge that people possess regardless of gender.

Be more professional and ask the culture to be more professional.

Definitely think more of how women feel in male-dominated groups.

Didn't have this mindset, however now I'm more aware to catch out.

Focus on networking when I wind up doing my work.

Gain more experience to make the transition to the industry much smoother.

I grew up in a rather male-dominated culture (rural Oz) where women have started to take over from traditionally male-run companies by being more competent and kind of sucking it up. The notion that you should seek mentoring is a good one.

I have realised that gender bias is a subconscious act and so I will put effort to recognise and deal with any bias (in my groups in school, in my case) that appears.

I know very little of engineering but it is ok.

I should undertake engineering workplace experience by taking part in vacation employment in an engineering company.

I will still have to work hard to achieve what I want to achieve. I still believe you have to adapt to your team to be integrated. But I also believe that it is ok to show that you are an intelligent woman.

I would better understand the culture of engineering as well as understand how to better react.

I'd look out for examples of females being treated differently once I experience an engineering workplace.

Learn the machine and workplace...be mindful about the culture. Always try to be awesome, since you may be always watched.

Not doubt engineering women's ability and treat them equally.

Not to change who I am.

Not try and completely be like boys, it will affect how you are treated and also you are not helping the people around you how they should behave—changing the culture makes people think about little things they say, but be tactful.

Panic less (no need to be perfect).

Prepare myself the best way that I can to also reduce that certain things will happen once I'm in the workplace but to not let it bring me down.

Prepare myself to meet people in the workplace that sometimes there might be discrimination.

Reflect on incidents then improve on it.

Reflect personally on critical incidents/happenings and also with others and learn from them.

Remember that it doesn't matter if you don't know everything, you will keep learning on the job.

Stay calm.

Study hard, do the internship, never do the sexism discriminate.

Study more and take more work as engineering to get more experience.

Study more, find more information about engineering.

Take my education seriously.

Take part in vacation internship program and gain actual experience.

Talk with trusted people.

Treat all evenly and professionally.

Treat everyone the same.

Treat women as engineers, equally not doubting their abilities.

Treat women differently (more respectful).

Treat female students as normal.

Trust on my knowledge than gender.

Voice my opinion more...

---

Below are the Murdoch University workshop participant responses to the question 'Any other comments?'

---

It's very useful. Looking forward to joining more.

Keep on doing this workshop regularly.

Scenario 2 was confusing as it wasn't clear if it was referring to an engineering graduate or a student.

Thank you for your time.

This has made me a little nervous, I am doing work this summer and know the site is known for being a very male-dominating site.

This presentation is useful, open up mind, thumbs up.

Very informative, very satisfied, well structured, scenarios gave a great insight.

Very useful presentation, especially for males.

Would like to be exposed to more workplace protocol in addressing issues, particularly with colleagues and supervisors.

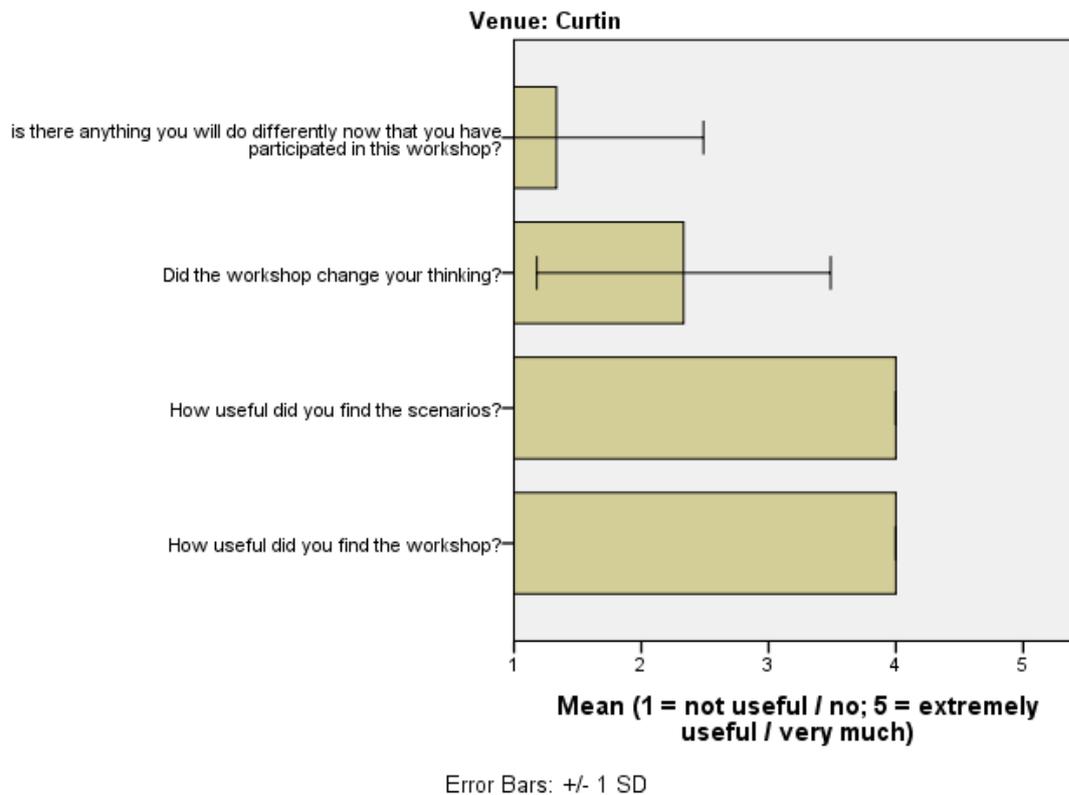
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## Curtin University workshop

Table 3 Curtin workshop evaluation participants ( $N = 4$ )

Feature	<i>n</i>	%
<i>Sex</i>		
Female	0	0.0
Male	4	100.0
<i>Enrolment (if applicable)</i>		
Domestic	4	100.0
International	0	0.0
<i>Have you undertaken any engineering workplace learning (e.g. engineering vacation employment, part-time engineering employment, an engineering internship)?</i>		
No	1	25.0
Yes	3	75.0
<i>Expected year of completion (if applicable)</i>		
2014	1	25.0
2015	0	0.0
2016	2	50.0
2017	1	25.0
2018	0	0.0
<i>Age at last birthday (min, max, M, SD) = (19, 21, 20.0, 1.4)</i>		

Note. Nine participants including one female student attended the Curtin workshop.



**Figure 3 Curtin workshop evaluation ratings (N = 4)**

Below are the Curtin University workshop participant responses to the question ‘What was the most important thing you learned in the workshop?’

---

An effective definition of culture and implications. Methods for reflection.

Gendered culture and its implications.

Mitigating issues by changing approaches to lesson confrontation.

---

Below are the Curtin University workshop participant responses to the question ‘What would you do differently now that you have participated in this workshop?’

---

Align your objectives with your boss.

Further into the culture: what it means.

Get [people? (difficult to read)] involved in solution instead of presenting a solution.

---

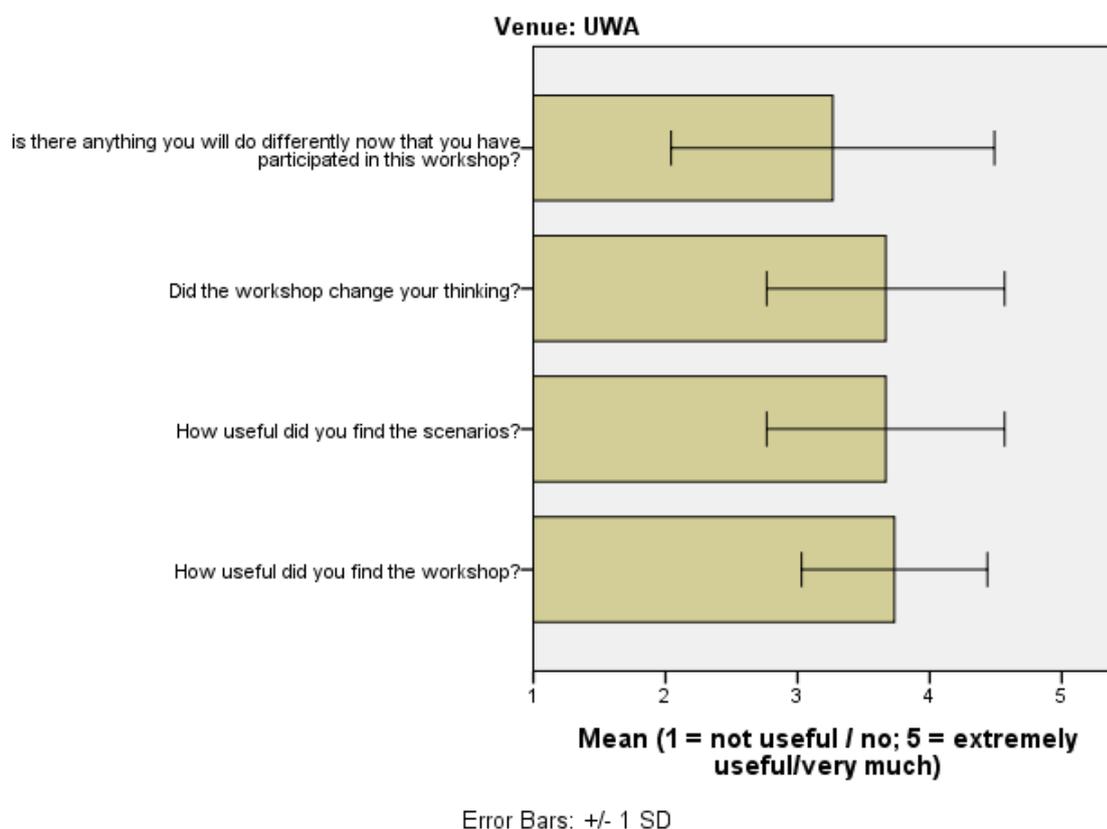
In responses to the question ‘What would you do differently now that you have participated in this workshop?’ one student at the Curtin University workshop wrote, ‘Looks to be a valuable study.’

## UWA workshop

Table 4 UWA workshop evaluation participants (N = 16)

Feature	n	%
<i>Sex</i>		
Female	5	31.3
Male	11	68.8
<i>Enrolment (if applicable)</i>		
Domestic	10	62.5
International	6	37.5
<i>Have you undertaken any engineering workplace learning (e.g. engineering vacation employment, part-time engineering employment, an engineering internship)?</i>		
No	14	87.5
Yes	2	12.5
<i>Expected year of completion (if applicable)</i>		
2014	4	25.0
2015	3	18.8
2016	4	25.0
2017	3	18.8
2018	2	12.5
other	0	0.0
<i>Age at last birthday (min, max, M, SD) = (18, 24, 20.9, 1.9)</i>		

Note. Nineteen students attended the UWA workshop.



**Figure 4 UWA workshop evaluation ratings (N = 16)**

Below are the UWA workshop participant responses to the question ‘What was the most important thing you learned in the workshop?’

---

Be active and take full advantage of your time in the workplace.

Culture is well hidden.

Dealing with bosses/managers as a novice engineer.

Define myself.

Don't need to show what you learn to technicians 'Ask help'.

Gender identity is strong in engineering culture. Hopefully this will improve.

Interactions are important.

Interactions in workplace is important and scary. Unpredictable.

Realise that HR concerns for engineers are common but their solutions are not always obvious. Acting with integrity and respect is always desirable and speaking out when these principles are violated is very important, whether or not gender issues is ...

Speak up if you are treated unfairly.

Talk to people about expectations for the role.

The balance of cultures in explaining actions.

We need to have a clear mind of what we want to be for clear objective. Then we can work hard towards these.

What you don't know is a big part of work and it's ok.

Workplace gender culture and how to react to the situation.

---

Below are the UWA workshop participant responses to the question 'What would you do differently now that you have participated in this workshop?'

---

Be aware that difficult situations can arise, don't say things that encourage the culture.

Be more active than passive.

Be more aware.

Be more forward when presenting myself. Try to gain trust and reputation.

Consider how the culture influences individual actions.

How I approach work will change knowing that I have much to learn on site and the kind of people I may deal with.

I will observe the culture around the engineering workplace and try to understand why people act the way they do. I will speak out when things do not seem ethical. But I feel I will already have done so, so this is a good way to back up. 😊

Interact in a trickier way.

Know how to behave in the work place. How to deal with the abuse words.

More aware.

Not much.

Realise the importance of human interactions in workplace.

Speak up for yourself.

Think about what I want to be in the future indeed. Then work hard to achieve that.

Understanding gender culture in the workplace and mitigating it.

---

Below are the UWA workshop participant responses to the question 'Any other comments?'

---

Give some positive scenarios.

Issues around behavioural aspects impact both male and females. We cannot ignore gender differences, but we need to be sensitive.

That is a great workshop. I wish I had attended it last year before my vacation job.

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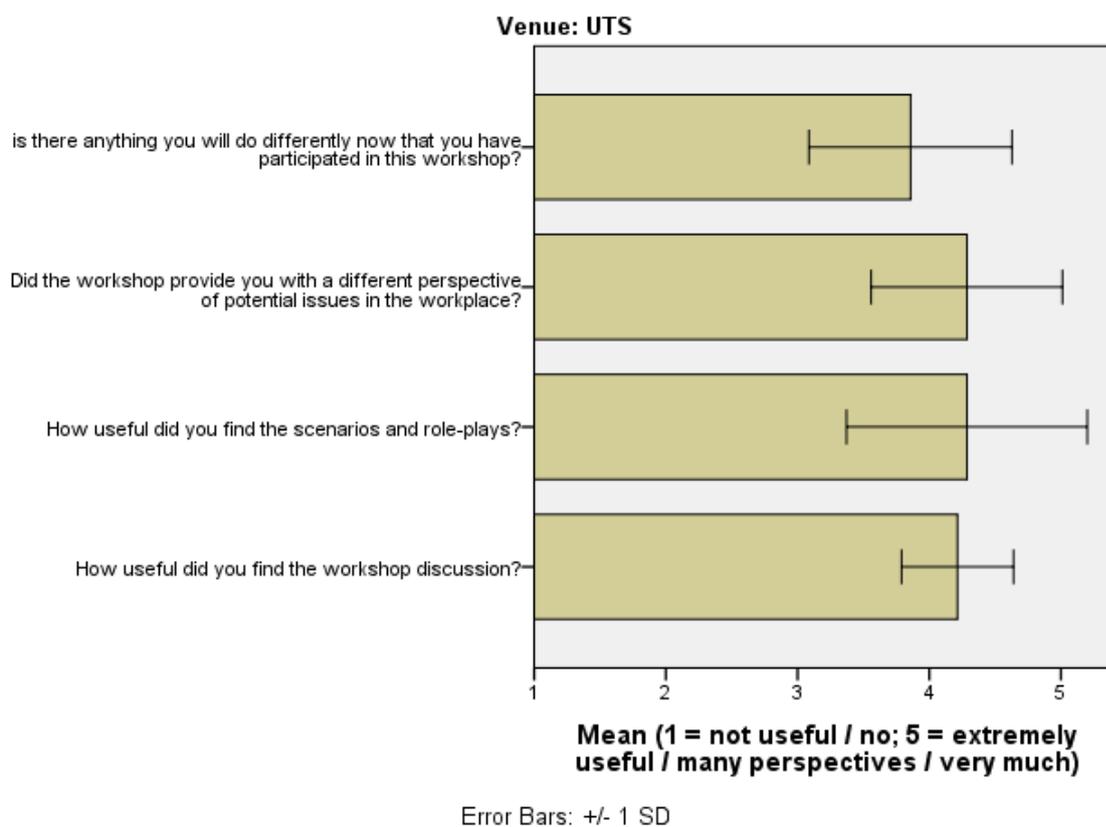
## UTS workshop

While the project lead had led all of the first three workshops which were in Western Australia, the UTS workshop tested the transferability of the resources to different facilitators.

**Table 5 UTS workshop evaluation participants (N = 14)**

Feature	n	%
<i>Sex</i>		
Female	3	21.4
Male	11	78.6
<i>Enrolment (if applicable)</i>		
Domestic	7	50.0
International	6	42.9
<i>Have you undertaken any engineering workplace learning (e.g. engineering vacation employment, part-time engineering employment, an engineering internship)?</i>		
No	11	78.6
Yes	2	14.3
<i>Expected year of completion (if applicable)</i>		
2014	0	0.0
2015	1	7.1
2016	3	21.4
2017	2	14.3
2018	7	50.0
other	0	0.0
<i>Age at last birthday (min, max, M, SD) = (18, 40, 23.2, 7.0)</i>		

Note. Thirteen students and six staff members attended the UTS workshop.



**Figure 5 UTS workshop evaluation ratings (N = 14)**

Note. The questions for the UTS workshop evaluation differ from those for the other workshops.

Below are the responses of UTS workshop participants to the question ‘What was the biggest impact the workshop had on your thinking / perception / awareness of workplace issues?’

---

Always seek help.

Confronting abusive bosses, work around to gain productive.

Different scenarios and how to deal with them.

Facing with different situations which many an intern would face in a working environment.

How to behave with my boss and try to attend more workshops when I finished my degree to be ready to work.

How to interact in the workplace is very much important.

How to react in workplace.

It definitely helped me when thinking how to act after a negative confrontation.

Realising we had perceptions before we speak to people.

Respect for co-workers. Awareness of how commonly harassment in the workplace can occur.

The scenarios.

Tolerance is key.

---

Below are the UTS evaluation participants' responses to 'Is there anything you would do differently now that you have participated in this workshop?'

---

Approach the boss in a different way.

Because we learned how to interact in engineering workplace.

Disregard for titles in the workplace; respect co-workers equally.

Focus on the teamwork better than individual work to avoid problems with the managers.

I may try to understand and reason more when dealing with higher authorities in a negative way.

I will approach the scenarios bit differently.

I would find alternate solutions to my work issues and also promote a healthy workplace environment.

I'll make sure to work according to the advice given during the workshop. Tolerance, Acceptance. New ways of thought.

If something happened I would deal with it differently.

Sharing more about the experiences.

Think of different scenarios from a lot of different perspectives. Ex. Ways of approaching people in higher positions.

Will always come to a win-win conclusion.

---

Below are the UTS workshop participant responses to the question 'Any other comments?'

---

All good.

More workshops would be more useful.

Presentations were very helpful and the academics' table made very good comments.

Why were the pictures of birds and water?

---

## Appendix E Evaluation data for masterclass

### Masterclass evaluation

Seven of the 11 masterclass participants completed the online evaluation questionnaire. Responses are reported below. In addition an email, noted above, indicated that the resources would be used to contribute to a guide.

1. I gained new understanding in the masterclass.

#	Response option		n	%
1	Strongly disagree		0	0
2			1	14
3			1	14
4			4	57
5	Strongly agree		1	14
	Total		7	100

2. I gained new skills in the masterclass.

#	Response option		n	%
1	Strongly disagree		0	0
2			1	14
3			3	43
4			3	43
5	Strongly agree		0	0
	Total		7	100

3. I would like to apply learning from the masterclass at my university.

#	Response option		n	%
1	Strongly disagree		0	0
2			0	0
3			0	0
4			2	33
5	Strongly agree		4	67
	Total		6	100

4. I plan to apply learning from the masterclass at my university.

#	Answer		n	%
1	Strongly disagree		0	0
2			1	17
3			0	0
4			1	17
5	Strongly agree		4	67
	Total		6	100

5. What was the most valuable aspect of the masterclass?

Viewing the scenarios used in the student workshop.

Role playing scenarios made it more easily relatable in what was a very interesting subject.

Opportunity to interact with presenters and participants. Conceptual structure of the work. Clarity of expression about the issues.

Insight into how engineering work placements work, and how blatantly gender-biased some of them are.

Role-play to argue for/against implementing a workshop as part of the curriculum.

Role-plays were valuable way to present info.

6. Please add any other comments here.

My first two answers were 3 because it's an area I'm very familiar with, not a reflection on the workshop content. I look forward to using this work in my courses. Well done.

I would like to use a version of your workshops in a teaching program for postgraduates that I run. I'll email you about it.