Gender issues in the University research environment

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Abstract.
Recruiting and retaining females within science, engineering and technology continues to challenge many European Higher Education Institutions. This study looks at female self-perceptions relating to effective research work and career progression. Focus groups are used to examine the attitudes and experiences of females, and a questionnaire used to explore perceptions in four main skills areas: group work; communication; personal awareness; and project planning and management. The study indicates consistent female concerns on issues pertaining to effective female role models, negative work-role stereotypes and the work-life balance of an academic career. For all four skills areas, the average confidence scores of the female participants fell below that of males, but these differences were only statistically significant for perceptions on group work and communication skills, and prior to an intense skills development course. Based on these findings, a student workshop on gender issues has been developed, an outline of which is presented.

Keywords.
women in engineering; gender issues; skills perceptions

1. Introduction.

Concerns of gender disparities in, for example, student attrition and career progression (Ferreira, 2003), positive college experiences (Jacobs, 1996) and general barriers to participation (Evans, 1995; Ingram and Parker, 2002), have been widely reported. Recruiting and retaining females within science, engineering and technology (SET) continues to challenge many European Higher Education Institutions: compared to males, fewer female undergraduates continue into the postgraduate, postdoctoral and academic levels. This trend is not limited to academic realms, with evidence to suggest that:

> "a continuing disproportionate lack of women in most scientific and engineering disciplines, especially at the upper reaches of the professions" (Etzkowitz et al., 2000)

Several possible reasons for such an occurrence have been postulated in the literature, and include issues pertaining to: a lack of female role models; implicit gender differences in communication and collaboration styles which may disadvantage females in established, male-dominated groups; subtle forms of discrimination; and the real and perceived challenges associated with balancing a work and family life.

A lack of female role models in engineering education is argued to adversely influence the self-esteem of female students (Marx and Roman, 2002) and prevent the formation of a female engineering identity (Byrne, 1993). The lack of visibility of role models at higher performance levels in industry and academia, together with increasing male competitiveness for top positions, may trigger a cautionary *out-of-bounds* expectation for women. They may feel that they have progressed as far as they can and that they are not expected to challenge men for more senior positions. The net effect of perceived gender-based limitations to career advancement confirms not only a negative gender stereotype, but also what Steele (1997) terms *stereotype threat*. This arises, he says "not from internal doubt (i.e. believing the stereotype to be true of one's group) but from the concern of confirming the stereotype through one's actions". As a consequence of their low *visibility* in science departments, female role models are sometimes perceived as being isolated and disconnected. The perception of female scientists occupying a shadowy wasteland on the peripheries of their departments is neither encouraging for potential role models nor their protégées. Low visibility of female scientists may discourage PhD students from consolidating an academic career in their discipline: there may be a perception of departmental promotion as token or compensatory rather than being based on ability or worth to the department.

Ingram and Parker (2002) report on a two-year study examining the role of gender and the existence of different communication styles between men and women in undergraduate engineering projects. The study cautions against assigning women to predominantly male teams, since when a team's social structure is mostly male, traditional gender-linked interactional behaviours are more likely to emerge. However, no significant differences in gender communications styles were observed in effective groups; rather a commitment to team work by individual members was found to be more important than the gender ratio of groups.

More recently, Yentsch and Sindermann (2003) examined the way graduate science and technology students chose faculty advisors. They sampled female and male students in their survey and found the following critical questioning at the core of why some students made decisions based on negative assumptions of female advisors.

- Will the recommendation of a woman scientist have the same weight when the time comes to finding a job?
- Will a woman advisor be able to give me the same contacts and open the necessary doors as compared to a man?
- Will I as a graduate student be subject to the negative effects of any lingering and well-concealed biases of male committee members during qualifying exams and thesis defence?

The authors also note that women graduates are likely to be more critical of women advisors (supervisors) than they are of men; "female graduate students expect women faculty members to be [especially] exceptional". The assumption by female students that female faculty members are 'exceptional' says much about the perception of gender-based inferiority that many female scientists contend with in male-dominated 'labs'. Not only do competent female scientists need to justify their inclusion in higher ranked positions, but they must, in the eyes of observers, continue to justify it by demonstrating outstanding ability. This observation by Yentsch and Sindermann (2003) suggests that there are unconscious value-based mechanisms that differentially judge female scientists' contributions against male peers.

"The path for women in science remains a difficult trek, according to a group of US researchers writing in a recent edition of Science magazine" (BBC News, 20 August 2005[1]; see also see Handelsman, 2007). The lead author, Jo Handelsman, is a Professor at the University of Wisconsin-Madison, US. She claims that balancing family and work is a difficult thing to achieve; "family responsibilities are mostly taken on by women, making it harder for them to progress in academic careers." She also talks about the pressing demands of childcare that occupy the lives of women students at the university she teaches at: "Universities aren't set up to deal with family issues". Moreover, mention is made of the "chilly" climate of the academic environment and the unconscious bias that many women face.

The abovementioned studies exemplify real concerns and barriers by female research students, with a complex set of issues related to cultural expectations, self-beliefs, a poor role-identity and occasional gender-linked (stereotypical) interactional behaviours. Such concerns and beliefs, it is assumed, may influence motivation for research and academic career progression. Accordingly, this study initially investigates female self-perceptions about some key transferable skills related to effective research work and career management. Focus group discussions then examine the attitudes of female students on matters such as 'work in male-dominated research environments', 'effective role models in academic contexts', and the 'compatibility of an academic career with family life'. The focus-group work was undertaken through collaboration between Imperial College London and the Institute of Education (IOE), University of London. This ensured that the Institute of

1 http://news.bbc.co.uk/1/hi/sci/tech/4163248.stm

Education based researcher undertook impartial and independent studies within Imperial College London. Like many other international institutions, the engineering and physical science departments of Imperial College are generally under-represented by both female students and academic staff. The paper is concluded with discussions on how the research findings yield insight into, or give support to, favourable initiatives in undergraduate and postgraduate engineering education. Specifically, some recent initiatives from the Faculty of Engineering are described to exemplify practices which may help alleviate gender-based motivation and career barriers.

2. Methodology.

This study emerged as a consequence of data from a survey undertaken to investigate the skills perceptions of research students; see Alpay and Walsh (2008) for details of the experimental design and methodology. The main focus of survey was to establish the impact of a 3-day residential course on *Research Skills Development* on science and engineering research (PhD) students. Subsequent analysis of the data indicated clear gender differences in the skills perceptions of the students, and so motivation for further investigation in this area. A summary of the skills survey work, i.e. the development and implementation of the Skills Perception Inventory (SKIPI), is presented below. Attention is then given to the research design and procedures of the focus group studies. The overall methodological approach thus involves both a questionnaire based attitudinal study and a semi-structured discussions.

SKIPI was administered to a general cohort of science/engineering research students within Imperial College. SKIPI was administered to students at the very start of a 3-day skills-training course, and again at the very end of the 3-day course. The total survey size consisted of 298 participants, i.e. 187 males and 111 females, attained over 10 training courses over a 12-month period. In terms of cultural diversity the test group consisted of 144 home students (67 females), 52 EU students (14 females) and 102 non-EU students (30 females). The questionnaire consisted of items to gauge confidence levels on four areas: group work, communication, project planning and management and personal awareness. For each skills area, several question items are chosen to cover the key facets of that area and provide an overall perception-score which does not rely on a single response; question items for each of these areas are listed in Table 1. A 5-point scale is used to score student perceptions, with 1 representing very low confidence / comfort and 5 very high confidence / comfort. Further details on questionnaire design and administration can be found in Alpay and Walsh (2008)

As will be presented below, data emerging from SKIPI indicated lower female confidence scores in certain skills areas. As a consequence, focus groups were set-up with female research students to explore these trends, as well as some of the communication barriers and inhibitions which are perceived to exist in a male-dominated learning environment. Specifically, focus group questions were organised under meaningful categories: experiences of group work; perceived gender differences in the research environment; women role models; experiences of overt and subtle forms of discrimination, stereotype threat; and motivations for undertaking research work. The full list of questions is given in Appendix A; where possible questions were chosen to identify positive experiences of being a female researcher. In light of the SKIPI data, a key premise of the focus groups was to establish why female

doctoral students in science and engineering self-assess their skills at lower levels than their male counterparts.

Two main (recorded) focus groups were run, each 3 hours in duration, and involving a total of 15 (7+8) female doctoral students. Prior to these, a pilot session was also carried out involving 9 participants[2]. One-to-one interviews were also carried out with 2 volunteers, and thus discussions with a total of 26 participants. The sample group provided a good representation of the female research community at Imperial College, i.e.: approximately half the participants were single (the others either in a relationship or married); the approximate ethnic background distribution consisted of 55% British White, 15% British Asian, 15% non-European, 7.5% European (non-British), and 7.5% African / Caribbean; and the approximately age distribution consisted of 45% 23-25 years old, 25% 26-30 years old and 30% 30 years and older. Most of the students (~85%) undertook their first degrees in another institution before commencing research studies at Imperial College. It is noted that whilst the total focus-group sample size is relatively small (N=24), the premise of this study was to raise issues on perceived gender differences (as indicated by the quantitative and widespread administration of SKIPI), and is addressing a very select group of people, namely postgraduate women in science and engineering. On this basis, internal validity in the study exists.

In all cases, the volunteers were invited through an email letter giving some basic background to the purpose of the study, e.g. to "gauge any difficulties or inhibitions that our female researchers might be facing". The main focus groups were restricted to a size of 8 participants. Over-subscription for the focus group sessions enabled some participant selection based on background information, i.e. to ensure uniform representation from Departments and Faculties. Nevertheless, there was approximately equal participation from students from the two Graduate Schools of the College, i.e. the Graduate School of Engineering and Physical Sciences and the Graduate School of Life Sciences and Medicine.

Within the focus groups, which were facilitated by the IOE researcher (see details in Hari, 2007), open communication was encouraged through discussions in pairs and sub-groups before reporting to the whole group. The discussions were audio-taped and later transcribed for analysis. Transcribed information was then organised into key themes, based on the level of response and contribution from the participants. Levels of response could be gauged through the colour coding of transcribed text, such as blue text for topics pertaining to discrimination.

3. Results and Discussion.

SKIPI Data.

With reference to Table 2, for all four skills areas and for both pre- and post-course surveys, the average confidence scores of the female participants fell below that of the males. However, independent samples t-test calculations indicated that these differences were only significant for pre-course perceptions on group work ($t = -2.81$, $p<0.01$) and communication ($t = -2.29$, $p<0.03$). Given the small sample size of females within the EU and non-EU categories (N=44), it was not possible to

2 The pilot session was undertaken by an Imperial College researcher, prior to the handover of the study to the independent, Institute of Education, researcher.

ascertain whether or not any cultural influences contributed further to the gender differences. An analysis of the items relating to the group work and communication domains suggested that the following questions were particularly discerning in male-female differences: (i) group work: working with others on an interdisciplinary group project ($p<0.02$); having my ideas listened to by other group members ($p<0.001$); coordinating a group project ($p<0.02$); (ii) communication: being able to give constructive feedback to peers and other students ($p<0.02$); dealing with conflict with my supervisor ($p<0.01$). There was nevertheless parity in the post-course perceptions of male and female participants. The results support the notion that women in male-dominated educational environments may be more likely to adopt interactional behaviours which are accommodating of and tentative towards male peers and staff (Ingram and Parker, 2002). Inevitably, such behaviours may lead to a loss in the motivations of women researchers, as well as a reinforcement of feelings of low confidence.

With reference to Table 2(b), there was greater gender parity in the post-course survey data. Even so, for all 4 skills categories average self-perceptions of females were lower than those of males. The data demonstrates that where mixed cohorts of students can engage in experiential skills training, and females given opportunities to critically reflect on there competencies and interactions with male peers, self-perceptions can favourably change. This has led to greater efforts in interventionist type programmes in the support of female research students; see discussions below. Interestingly, such programmes are also deemed relevant in employment contexts, as depicted in a recent publication on the European Code of Best Practices for Women and Information and Communication Technologies[3] in which a recommendation for career development is given as:

> "offer competence development programmes which will provide women with the necessary hard and soft management skills, as well as short training programmes on professional challenges, leadership and networking"

Of course, socio-cultural pressures and habitual modes of thinking can reverse the benefits of such training, and ongoing commitments and measures are required on both the part of the individual and institution to ensure effective personal and career development.

Focus Group Data.

For both focus groups, 3 key themes of discussion emerged: the lack of female role models; work-life balance for the female researcher and discrimination. Of these concerns about discrimination proved to be of central importance. For example, in the first focus group, of the 20 main discussion lines, 11 concerned an aspect of discrimination. Even when a new topic was introduced (see Appendix A), participants would frequently refer back to issues pertaining to discrimination as a means of intensifying or illustrating the new topic. Some notable comments from the participants (which were supported by other participants) include:

> "I would ask him [*participant's supervisor*] a question: he would give basic answers 'yes, no', but I observed when another colleague of mine asked him

3 Published by the The European Centre for Women and Technology (ECWT); see www.womenandtechnology.eu

the same question, he really delved into the answer. I was shocked and had to eavesdrop to get the answer. I just thought that was so unfair."

"There are only two women and the rest are guys and depending on your tone of voice it can affect and tell how people listen to you, tell whether you're going to be interrupted by the guys… I think carefully before I speak because I feel like I am going to be criticised."

"I would meet male physics students who would quite happily tell you how they were stronger physically but they were also, uh, intellectually and how they have brains that work differently."

"I have had men tell me to be quiet when I was making a point".

"One thing that bothers me is that I may fight to make a point and then ten minutes later a man will make the same point I made and everyone is like WOW!"

"Women who are confident and accomplished are considered hard-nosed and driven whereas men are seen as successful"

"Society teaches women to work in non-technical careers and makes them believe they are less capable than men".

Analysis of data collected from the Focus Group indicated that negative gender stereotyping (Steel et al., 2002) is at the root of many of the discriminatory practices that participants have experienced. Participants expressed their dismay at the degree of gender stereotyping that they had encountered in their departments. Nevertheless, it was surprising how some students did not recognise differential treatment such as condescension, invisibility or exclusion as subtle forms of discrimination. The received wisdom was that female scientists were second-rate and that those that were notably successful in their fields had in some way compromised their femininity and their roles as wife and mother in order to compete with men; c.f. the notion that: "Fitting the stereotype of wife and mother leads to perceptions of lack of commitment to science" (Yentsch and Sindermann, 2003, p. 212). Female scientists are subsequently encumbered by stereotype threat, and are therefore faced with the stress of either confirming the stereotype by underachieving in relation to male peers; or not confirming the stereotype by the extra need to excel in relation to male peers. There were differing views in establishing a consensus of what constitutes discrimination and discriminatory practices: participants would relate an account of something that a man said or did or didn't do and follow with the caveat that it might be "my perception" or simply "his personality". It was found that this was a common reaction in both Focus Group sessions. What this study shows though is that even within an elite European institution, women are encountering obstacles of a socio-cultural nature, and on occasion receiving less support than their male peers. Perhaps this is not surprising in that some evidence exists to show that gender disparity is greatest in top institutions and companies due to high competitiveness; see, e.g., the review undertaken by Simard et al., 2008. Our findings support the notion that: "There is no doubt, a host of societal and psychological factors that may help to explain why many undergraduate women switch out of math, science or engineering

programs. We believe there are two factors that are particularly important sexual discrimination and stereotypical threat" (Steel et al., 2002). The net effect of this may be to drive promising female scientists away from science and engineering careers.

With regards to role models, the student perception of female role models was particularly negative. Many participants remarked on the relative absence of supervisory roles and responsibilities for female scientists in their departments. Some notable comments include:

> "I have not had that much contact with female role models like to look at and think I feel like you and I can see myself progressing in the way you have and I think other women…I find they (females in the department, supervisors at a high level) are really inaccessible to talk to, they are quite closed off."
>
> "There are some women in my department but they don't do any of the supervising or research, all of the research and all of the publications are all run by men, they don't do any."
>
> "I find that every step doing my PhD, every step of the way, I find myself thinking, I don't feel like a Scientist. I don't know whether that is some weird perception of what a Scientist is and that I don't fit into that mould."

Imperial College London has a significant number of world-leading female researchers, but there is much variation on their visibility from one department to the next, and indeed within discipline areas which have traditionally been male dominated. Since the date of collection of the data, there have been a number of appointments of senior academics, who happen to be women, to high profile leadership positions in the College, including 2 Pro-Rectors and a Faculty Principal. Role models have a valuable part to play in confirming what is achievable in any field. They set the limits of possibilities whilst affirming that "I was once where you are". Peer review studies confirm the positive effects that women role models have on female students (see, e.g., Marx and Roman, 2002). The indications are that more female role models will have a beneficial effect on both female scientists' aspirations in the field, and in the retention rate of promising students at post-graduate level.

When participants were asked about future career ambitions, they did not respond in positive ways. Most seemed unconvinced that the time and effort required to reach a senior position would be justified in terms of their expectations of personal fulfilment and job satisfaction. When asked: "How many people here would want to pursue a career as an academic?", participants responded spontaneously with comments such as: "no way!", "definitely not", "it is so long, it's too long to be a senior lecturer", "it seems like such a lot of hard work". Participants commented on the fact that being married or having children confirmed a negative gender stereotype in the eyes of male peers. Seen as less committed and serious, participants felt that departments were less supportive and encouraging of career-development opportunities for female scientists who often felt that they had to prove themselves in ways beyond that expected of their male peers. A further consideration is that many female scientists are being forced to weigh-up how far they can take a demanding career in academia when considering their future desires to have children. These are not easy choices to make. What this study suggests is that these choices need to be

understood by departments, institutions, and male partners, as choices being made by women-as-scientists, rather than women-as-housewives. Pattatucci (1998) suggests women "are likely to feel guilty if chores are not attended to". Perhaps in this way, by valuing the commitment and personal sacrifices being made by career-oriented female scientists, the prevailing attitudes of departments and institutions can be changed.

The focus group data gives some insight as to why some women may be feeling less confident in skills areas pertaining to group work and communication within a male-dominated research environment. Clearly, some women feel ongoing discrimination and stereotyping, and pressures of cultural socialisation, societal expectations as well as a subliminal threat in defending themselves against stereotypes. Confidence levels may also be subconsciously influenced by a relatively poor female role identity within some engineering and science departments. However, as the pre- and post-course SKIPI data indicate (Table 2), such confidence levels are readily amenable to change, often through experience (as in the case of the experiential skills training courses), and also through greater awareness of the wider issues and psychology of gender difference.

Interestingly, a parallel study at Imperial College has identified gender differences in the aspirations and motivations of undergraduate engineering students; see Alpay et al. (2008). Specifically, data surveying 2330 students, across 7 departments of engineering, indicates that male aspirations for engineering study and work are dominated by "inventing something new" (29.3% male response rate) and "making a difference to the world" (21.9%), whereas for females the latter aspiration dominates (33.5%) followed by invention (18.5%). Where connections can be made to a *meaningful* and *high-impact* career in engineering, student motivations are likely to be enhanced, perhaps especially with many female students. Here, particular efforts are needed at both the undergraduate and postgraduate levels to exemplify meaningful careers through role models, male and female. At the undergraduate level, the Faculty of Engineering at Imperial College has recently introduced an Engineering Impact lecture series for all first-year (freshmen) students. Themes such as sustainability, energy, health and food feature strongly in the lecture series, and provide speakers with an opportunity to share their personal rewards of an engineering career. Female speakers may help to exemplify how the perceived barriers to a rewarding career can be overcome. In academic contexts, the sharing of personal rewards may help to balance the negative beliefs of a competitive, male-biased environment. In other words, efforts to stimulate the values-driven motivations of many female students through pertinent female role-models, combined with open discussion on gender issues, may help to strengthen the resolve for a career in engineering, academic or otherwise.

Based on the outcomes of this work, the College has in the recent past developed workshops to raise awareness of gender issues in the research / academic environment, and run for mixed cohorts of male and female students. The basis of the workshop involved discussion on: gender stereotype and forms of differential treatment; perceived difference in male and female work-life priorities; dealing with acts of discrimination; dealing with feelings of insecurity; applying techniques in assertiveness and communication to overcome feelings of marginalisation or invisibility. The workshop was originally presented to research students but currently plans are underway to introduce this into an earlier (undergraduate) level of skills and

personal development support; likewise, there is interest in introducing elements if gender awareness into the initial training of new academic staff. Raising the visibility of females in Science, Engineering and Technology (SET) is especially being achieved through the Women in SET Society, established at Imperial College London in 2005. For example, in recent times, the society has organised Open Days for schoolgirls, a photographic exhibition of female staff and students, and motivation and retention events for female postgraduate students and postdoctoral staff.

At the undergraduate level, the Faculty of Engineering is also giving much support to student-led projects which have a specific real-world, humanitarian and / or application premise. Several such projects are seeing a strong female lead, such as the El Salvador Project (e.g. earthquake proof housing) and the Altiplano Expedition (feasibility studies on small-scale engineering projects in the Bolivian Altiplano). Similarly, a disproportionate number of female engineering students are involved in local volunteer and community-support projects. In all cases, personal anecdotes suggest a greater motivation for the engineering profession through such experiences. Efforts by academic staff to increase the visibility of such students, e.g. through the organisation of faculty-wide presentations on their experiences, is helping to challenge stereotypes and providing peer role-models. Interestingly, although the benefits of project-centred and real-life learning have been documented in engineering education, the additional benefit of motivating female students is perhaps less documented.

Attitudes and perceptions of gender transfer from one context to the next, and the findings of this work suggest engrained views of *one's place* and societal expectations. However, the male-dominated industrial culture of the Western world is being transformed by globalisation and the vital need for sustainable engineering. In the Faculty of Engineering, we are seeing a favourable attitudinal shift in some female students towards this new engineering ethos. Nevertheless, institutional changes are still required to address the work-life balance of the *academic mother*, whilst respecting equally the same ambitions and concerns of many male researchers and teachers. In future work, the male perspective on the above issues will be explored. Anecdotal evidence suggests that many acts of differential treatment are carried out without bad intent but are a form of neglect. For example, consider a male supervisor who conducts research discussions with his male students in informal, social settings (such as the local pub), but is reluctant to do so with a female student lest it be misconstrued as a sexual advance. The male supervisor neglects to consider other ways to run the research discussions when simple solutions (such as group meetings instead of one-on-one; or agreeing "ground rules" to avoid misunderstanding) are available. Of course, gender differences in the research environment are not a *female problem*, but rather a male-female communication and awareness issue.

4. Conclusions.

This study indicates the persistence of negative female perspectives on their roles and contributions to science and engineering within academic environments. A college-wide and randomized skills perception inventory demonstrated that female doctoral students consistently underrate themselves in certain skills areas, especially relating to group work and communication within the research area. In depth focus group discussions suggest ongoing female concerns in role identity (and the lack of female role models), the perceived negative work-life balance of a female academic and

widespread concerns of overt and subtle differential treatment. Nevertheless, skills perceptions have been found to be highly changeable through experiential training. The study has led to the development of a workshop to raise gender awareness amongst both male and female student populations. This is also intended to raise self-awareness in any habitual responses to differential treatment, as well as skills to effectively respond to or avert such situations.

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Table 1 – Question items for the 4 transferable skill areas relevant to research work.

Group work:
Working with others on an interdisciplinary group project
Being able to appraise the strengths of other group members
Having my ideas listened to by other group members
Being aware of the different roles within a good team
Coordinating a group project
Being able to describe the facets of good team development

Communication Skills:
Being able to communicate with people of different cultures
Being able to give constructive feedback to peers and other students
Dealing with conflict with my supervisor
Having to communicate with people I don't know very well
Making use of feedback opportunities in the planning of my work
Networking with academics and senior scientists / engineers
Being able to enthuse a non-expert about my work
Receiving feedback and dealing with criticism of my work
Being able to develop cooperative relationships

Project Planning and Management:
Effectively prioritising my work to minimise distractions
Using effective strategies to plan my work over the course of a term
Being aware of the level of accomplishment needed to successfully transfer from MPhil to PhD registration
Keeping up-to-date with the research literature throughout my project
Being able to set realistic research goals
Being able to realistically monitor the progress of my research

Personal Awareness:
Recognising excessive stress in myself
Being aware of strategies for dealing with stress
Having a realistic awareness of how I am perceived
Understanding how my and others' personality-types influence work interactions
Understanding and maintaining my motivation for work and study
Having an awareness of my strengths and weaknesses
Being aware of my specific areas for further development

Table 2 – Descriptive statistics for the skills perceptions / attitudes of male and female students for (a) the pre-course and (b) post-course surveys; * denotes $p < 0.01$, ** denotes $p < 0.03$. (187 male participants; 111 female participants).

(a)

		mean score	standard deviation
group work*	female	3.48	.50
	male	3.66	.54
communication**	female	3.43	.50
	male	3.58	.55
project planning & management	female	3.28	.60
	male	3.37	.60
personal awareness	female	3.41	.55
	male	3.43	.54
benefit / value of skills training	female	2.91	.41
	male	2.93	.48

(b)

		mean score	standard deviation
group work	female	4.03	.49
	male	4.09	.54
communication	female	3.89	.49
	male	3.97	.54
project planning & management	female	3.66	.50
	male	3.76	.56
personal awareness	female	3.87	.53
	male	3.90	.55
benefit / value of skills training	female	3.11	.49
	male	3.06	.59

Appendix A –Focus Group Questions (Prompts by Facilitator)

Group Dynamics
Can you think of a time or an instance when you worked with others in an interdisciplinary group?
Did you feel comfortable contributing to the group?
How did you do this?
Were you taken seriously?
Were your ideas listened to by others? Why or why not?
Do you think all members contributed equally?
In any of these or other experiences, do you see differences between men and women and the way they work in groups? What are these differences? What are the similarities? Why do you think such differences exist?
Any comments on voice in group-work, assertiveness, aggression ie. men or women more aggressive
Comments on women's self-perceptions
Do you think women have lower confidence as compared to men?

Gender Differences
What is it like being a female in your field?
What experiences do women have or factors in women's lives that differ them from men studying in the same area? Why do you think these differences exist?
In your opinion, does this contribute to the low rate of women in doctoral studies? Are there other reasons?
Do women researchers get the same opportunities as men in regards to receiving resources, partners, children, being a researcher, pay and research postings and/or opportunities?
In a qualitative evaluation, where women self-assess they found that women consistently report lower levels of confidence than their males colleagues, specifically in the areas of group work and communication skills. Why do you think this pattern exists?
Do you think that you are harder on yourselves then men are on themselves i.e. academically
What fears for the future do you have?
Do you have any fears for the future, e.g. salary?

Advantage/Disadvantage/No Difference in being a female research student
Prompts:

- PhD enrolment: finding a supervisor and project
- working in a lab
- participating in conferences / symposiums
- networking (including social events)
- perceived expectations from: friends; family; academic staff
- working in a group/team

Discrimination
Have you experienced any overt forms of discrimination?
What subtle ("non-actionable") forms of discrimination are you aware of?
Have you experienced any of these within the College?
What are some of the ways you have dealt / can deal with subtle discrimination?

Stereotype Threat
Did you ever receive a negative stereotype of you being in the math and science field? How does that make you feel? Did you ever have doubts that you could have a career in science because of it?
If you ever do badly in a test, do you ever think that has to do with your gender?

Motivations
Your motivations for doing a PhD?
Do men have different motivations in your opinion?

Closing Questions
Are there any things that you would change in the College to help support woman researchers?
Would you want to include anyone else?
Is there anything else in terms of gender issues in the research environment that you'd like to raise?