

# **Women in STEM**

VCUG2002 Group Project

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Women are underrepresented in STEM (science, technology, engineering, mathematics) subjects at ANU and other universities. The gender culture in STEM subjects is unacceptable and needs to change in order for ANU to achieve the goals of the 2020 Vision and to show leadership in the face of this challenge.

Our investigation gathered quantitative and qualitative data to illustrate the current gender culture in STEM subjects. The quantitative data showed that there are more males than females enrolled in STEM subjects at ANU, demonstrating the unequal gender distribution (Appendix 1).

The qualitative results illustrated perceptions and experiences of students regarding STEM subjects. The experiences of some students are shocking and present an obligation to the leaders at ANU to end this discrimination. (Appendix 2).

Our research shows that the STEM gender culture negatively affects the ANU student experience. Women are underrepresented in STEM at both ANU and in society and there is large potential for improvement on this issue.

Addressing this issue directly aligns with the goals of ANU's 2020 Vision. The access and equity component of the Vision states that

‘Opportunities for people to demonstrate their excellence must not be limited by... gender.’

Our recommendations align with this goal and the Vision's overarching aim to ‘enhance the distinctive excellence of ANU’. Leading the way in addressing the gender culture issues in STEM will enhance the distinctive excellence of ANU on both a national and global scale. Improvements in the student experience at ANU will not only benefit students but also the university. Students who enjoy their university experience are more likely to be active alumni and give back to the university in financial and other ways.

We purport that the unbalanced gender culture in STEM results from a longstanding culture and problems with recruitment and retention of women in STEM.

The ANU has an opportunity to lead the much-needed shift in the STEM culture. We recommend that the ANU targets a gender balance of staff in STEM subjects. This would provide an example of gender equality for both female and male students and would be a significant step towards shifting the current culture.

Leading this cultural change is also likely to assist with the recruitment of female STEM students at ANU. Being renowned for gender equality in STEM will assist ANU in attracting the best students, both domestically and internationally.

Retention of female STEM students can also be achieved through the development of a support network to provide students with the opportunity to interact with role models and mentors in their area of study. This is currently being developed by the ANUSA Women's Department in collaboration with STEM colleges and we recommend that the leaders of ANU support this initiative.

We urge the university to actively address the issues we have raised in this report. It is the obligation of ANU to end the discrimination and isolation experienced by select students in STEM.

## Appendices

### Appendix 1: Quantitative results of the percentage of females and males in STEM

Figure 1: The percentage (%) of male and female students in science courses (i.e. chemistry, environmental science, science communication and earth and marine science) that have an overall gender balance. There is one anomaly in the percentage of male students enrolled in SCOM in 2014.

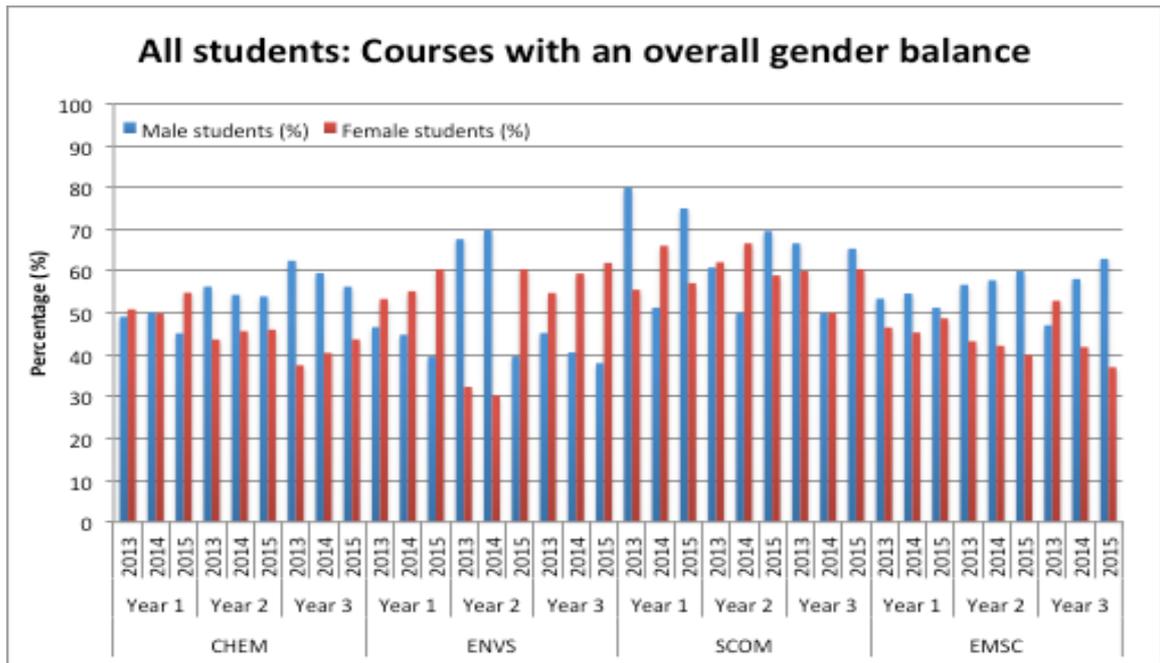


Figure 2: The percentage (%) of male and female students in science courses that have more females than males (i.e. biology and psychology).

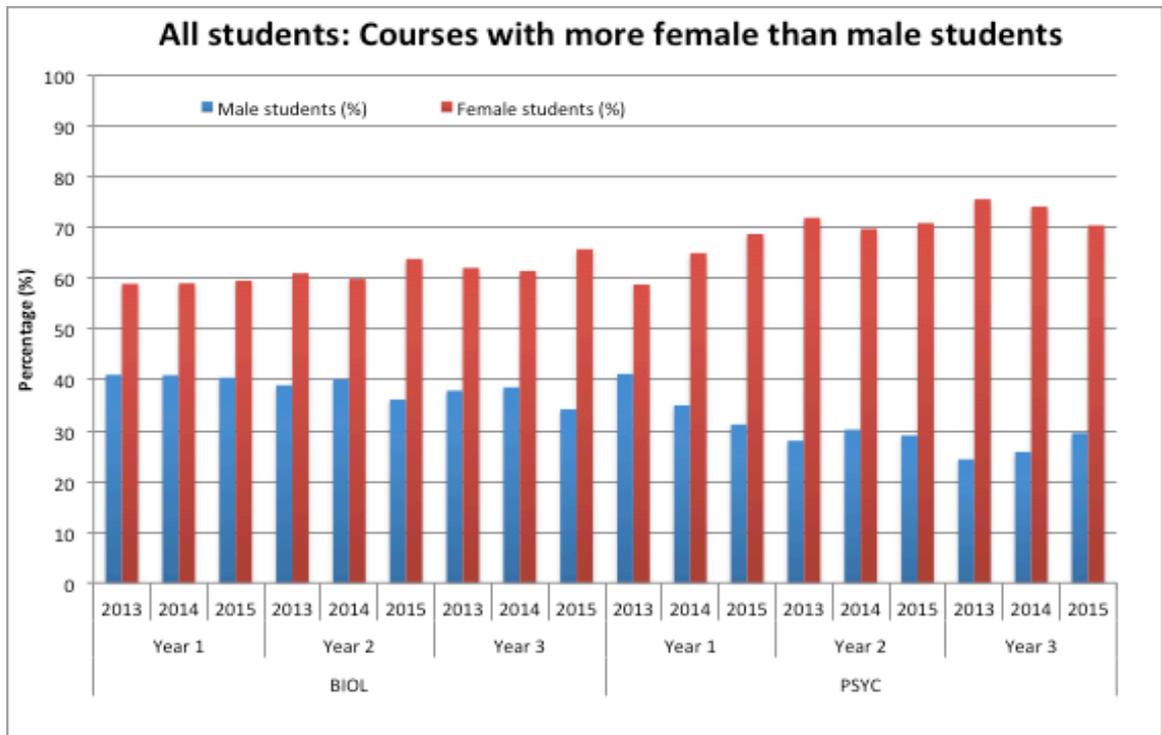


Figure 3: The percentage (%) of male and female students in science courses that have more females than males (i.e. mathematics and physics).

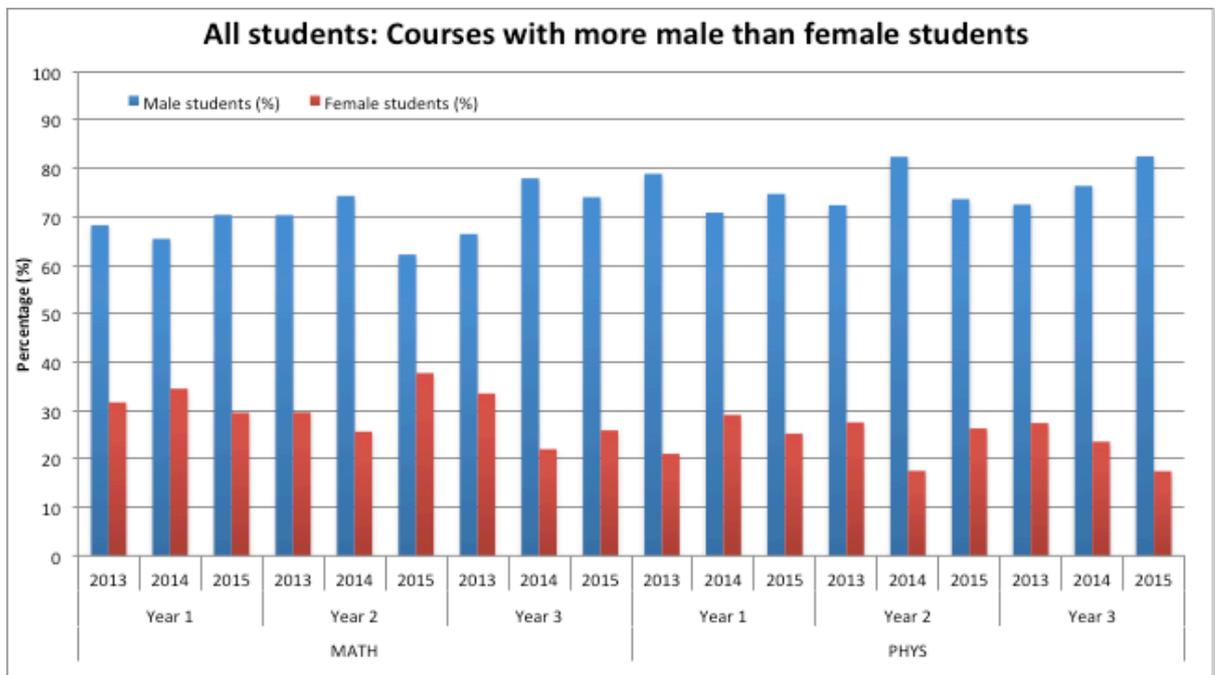


Figure 4: The percentage (%) of male and female students in computing/IT courses. It shows that the approximate enrolment rates for males and females from 2013-2015 are approximately 80% to 20%, respectively.

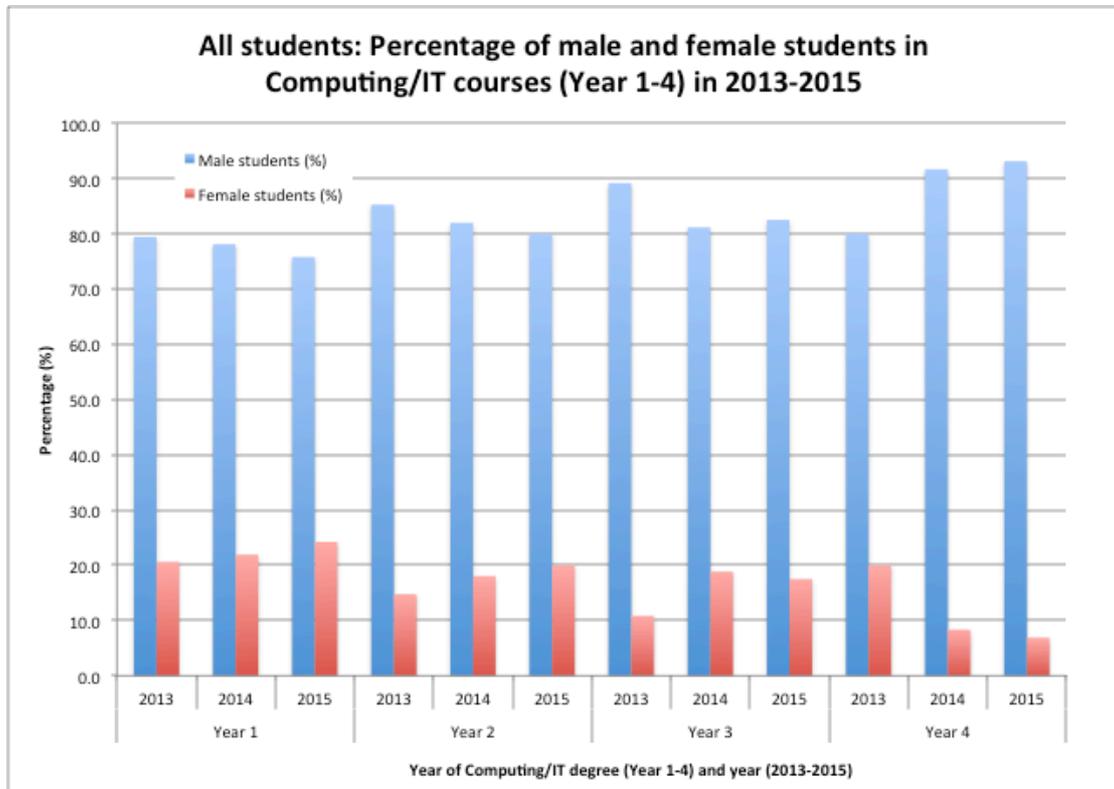
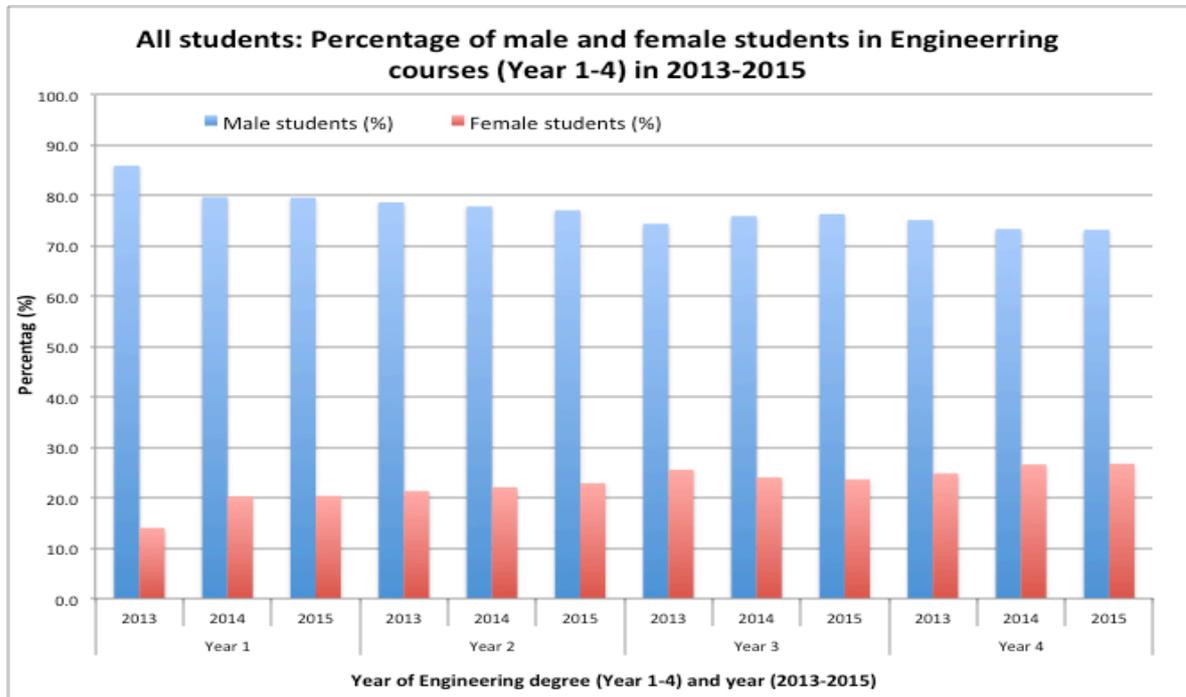


Figure 5: The percentage (%) of male and female students in computing/IT courses. It shows that the approximate enrolment rates for males and females from 2013-2015 are approximately 75% to 15%, respectively.



## Appendix 2:

**Qualitative analysis of the perception of the gender culture in STEM conducted on a sample size of 1014 students (95% from the ANU and 5% from other universities).**

Figure 6: The percentage of male and female students who stated that they have felt uncomfortable or isolated in their respective study environments. In areas that have typically more males, almost 50% of females stated that they have felt uncomfortable or isolated.

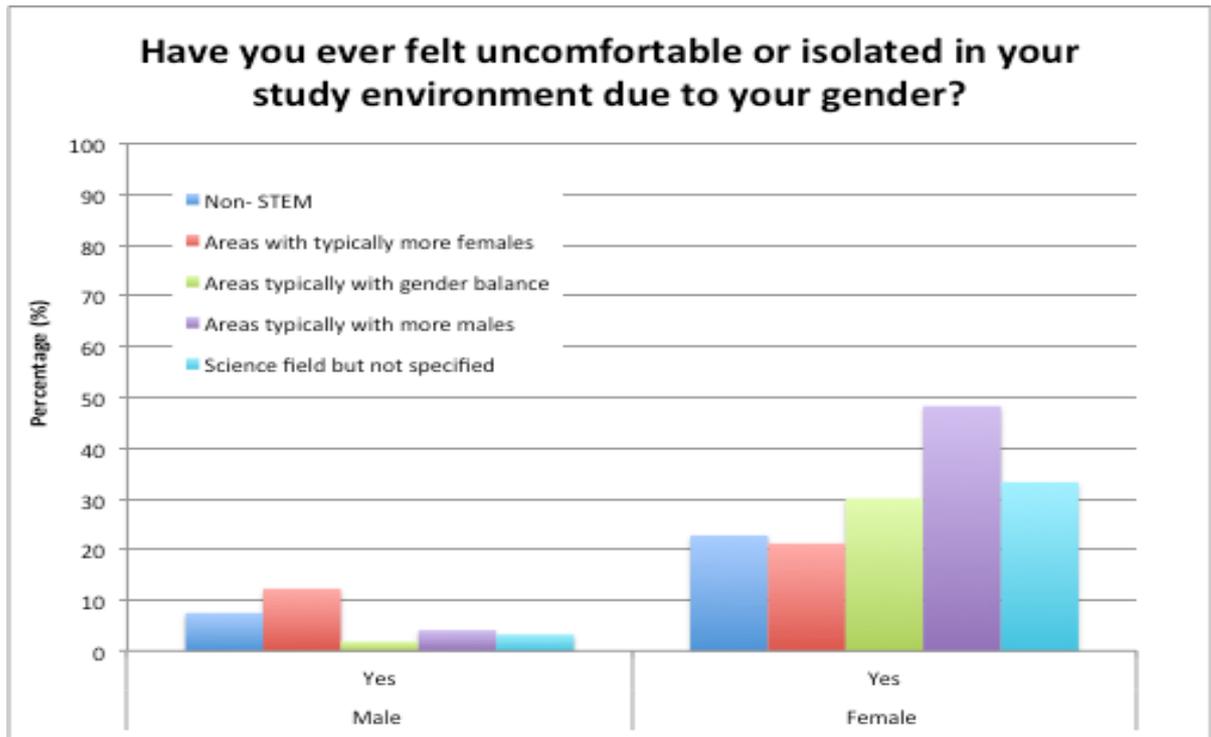


Figure 7: It is evident that in areas typically with more males, 30% of females have felt that their opinion has been disrespected because of their gender compared to 10% of males who have felt that their opinion has been disrespected in areas with typically more females.

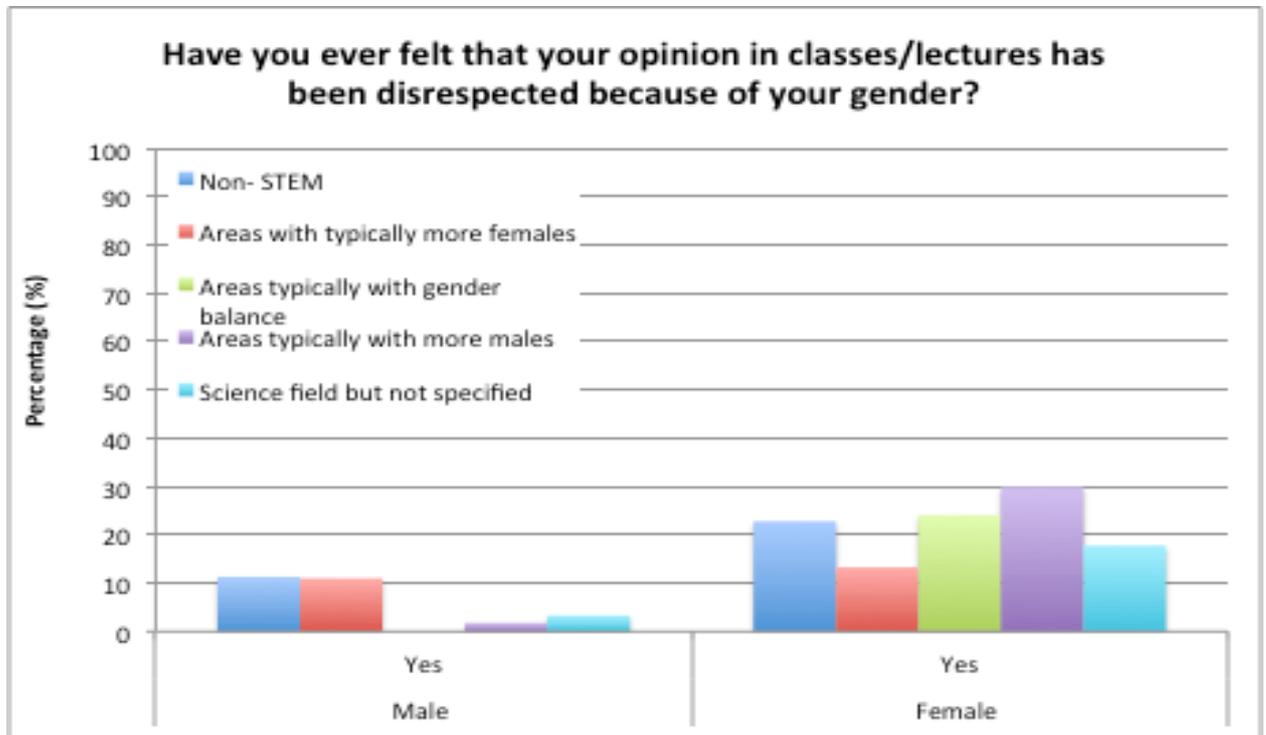


Figure 8: It is apparent that 25% of females changed their major in areas with more males as opposed to 19% of males who changed their majors in areas typically with more females.

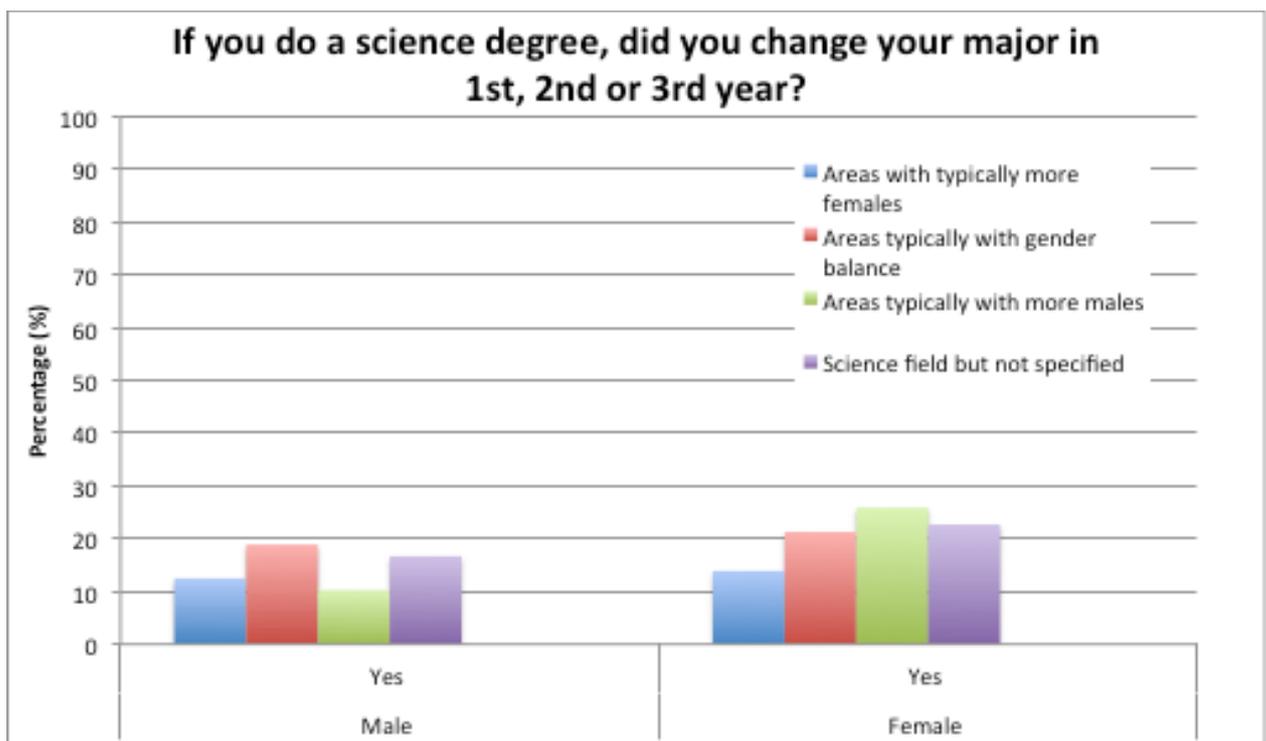


Figure 9: In an organisation where there is a severe lack of female representation, more than 50% of males disagreed that a female candidate should be prioritized if the merits of a male and female candidate are identical, whereas over 50% of females participants believed that a female candidate should be prioritized.

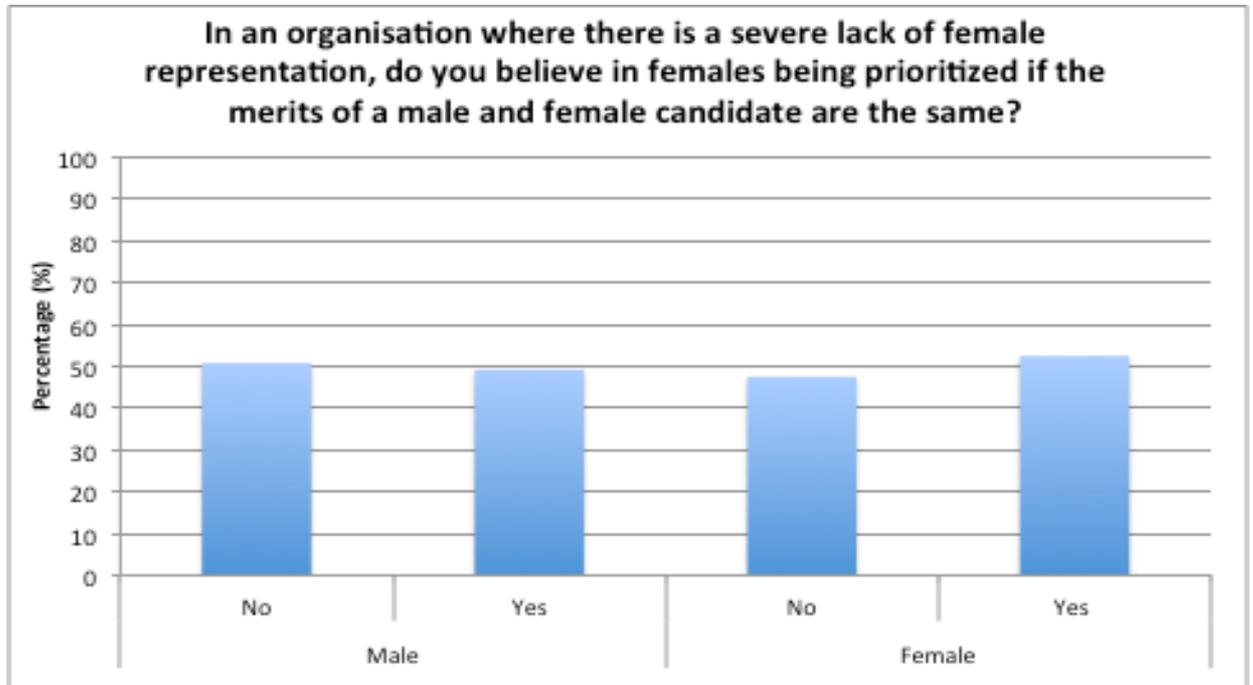
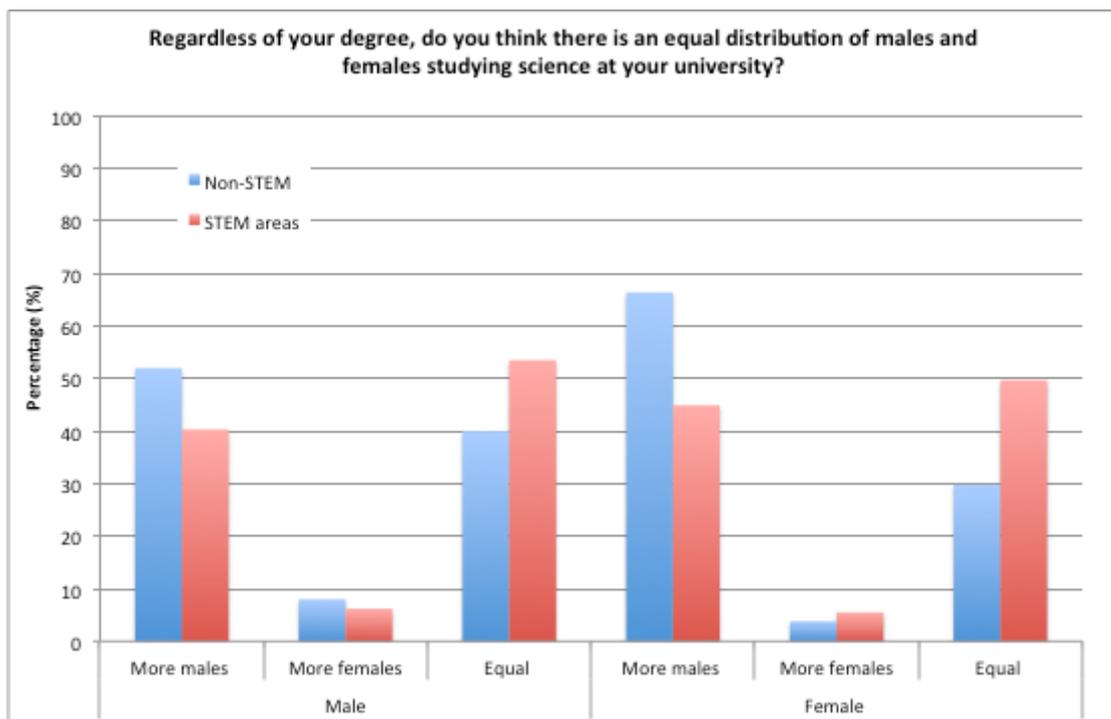


Figure 10: Both non-STEM and STEM students believe that the percentage of students studying science at university have approximately equal numbers of males and females or more males.



**Appendix 3:  
Raw data for qualitative analysis presented in Appendix 2.**

Table 1. Data accompanying Figure 6. The percentage of male and female students who stated that they have felt uncomfortable or isolated in their respective study environments.

% within Course

			Course					Total
			Non-STEM	Areas typically with more females (Biol, Psych)	Areas typically with gender balance (Chem, ENVS, SCOM, EMSC)	Areas typically with more males (Math, Phys, Comp, Engn)	Science field but not specified	
Male	Have you ever felt uncomfortable or isolated in your study environment due to your gender?	No	92.5%	87.7%	98.1%	95.9%	96.7%	94.2%
		Yes	7.5%	12.3%	1.9%	4.1%	3.3%	5.8%
	Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Female	Have you ever felt uncomfortable or isolated in your study environment due to your gender?	No	77.2%	78.8%	69.9%	51.7%	66.7%	71.3%
		Yes	22.8%	21.2%	30.1%	48.3%	33.3%	28.7%
	Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total	Have you ever felt uncomfortable or isolated in your study environment due to your gender?	No	81.5%	80.9%	81.0%	77.7%	78.7%	79.9%
		Yes	18.5%	19.1%	19.0%	22.3%	21.3%	20.1%
	Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 2. Data accompanying Figure 7. The percentage of male and female students who stated that they have felt that their opinion in classes/lectures has been disrespected because of their gender.

% within Course

			Course					Total
			Non-STEM	Areas typically with more females (Biol, Psych)	Areas typically with gender balance (Chem, ENVS, SCOM, EMSC)	Areas typically with more males (Math, Phys, Comp, Engr)	Science field but not specified	
Gender								
Male	Have you ever felt that your opinion in classes/lectures has been disrespected because of your gender?	No	88.7%	89.0%	100.0%	98.2%	96.7%	95.2%
		Yes	11.3%	11.0%		1.8%	3.3%	4.8%
	Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Female	Have you ever felt that your opinion in classes/lectures has been disrespected because of your gender?	No	77.2%	86.7%	75.9%	70.1%	82.2%	79.7%
		Yes	22.8%	13.3%	24.1%	29.9%	17.8%	20.3%
	Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total	Have you ever felt that your opinion in classes/lectures has been disrespected because of your gender?	No	80.4%	87.2%	85.3%	86.7%	88.0%	85.6%
		Yes	19.6%	12.8%	14.7%	13.3%	12.0%	14.4%
	Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 3. Data accompanying Figure 8. The percentage of male and female students who did and did not change their major in 1<sup>st</sup>, 2<sup>nd</sup> or 3<sup>rd</sup> year.

Gender			Course				
			Non-STEM	Areas typically with more females (Biol, Psych)	Areas typically with gender balance (Chem, ENVS, SCOM, EMSC)	Areas typically with more males (Math, Phys, Comp, Engn)	Science field but not specified
Male	If you do a science degree, did you change your major in 1st, 2nd or 3rd year?	No	5 9.6%	56 77.8%	41 77.4%	116 70.3%	24 80.0%
		Yes	2 3.8%	9 12.5%	10 18.9%	17 10.3%	5 16.7%
		Not applicable	45 86.5%	7 9.7%	2 3.8%	32 19.4%	1 3.3%
	Total	52 100.0%	72 100.0%	53 100.0%	165 100.0%	30 100.0%	
Female	If you do a science degree, did you change your major in 1st, 2nd or 3rd year?	No	7 5.3%	195 81.9%	61 76.3%	60 51.7%	30 68.2%
		Yes	3 2.3%	33 13.9%	17 21.3%	30 25.9%	10 22.7%
		Not applicable	123 92.5%	10 4.2%	2 2.5%	26 22.4%	4 9.1%
	Total	133 100.0%	238 100.0%	80 100.0%	116 100.0%	44 100.0%	

Total	If you do a science degree, did you change your major in 1st, 2nd or 3rd year?	No	12	251	102	176	54
			6.5%	81.0%	76.7%	62.6%	73.0%
		Yes	5	42	27	47	15
			2.7%	13.5%	20.3%	16.7%	20.3%
		Not applicable	168	17	4	58	5
			90.8%	5.5%	3.0%	20.6%	6.8%
Total			185	310	133	281	74
			100.0%	100.0%	100.0%	100.0%	100.0%

Table 4. Data accompanying Figure 9. The percentage of male and female students who responded 'no' or 'yes' to whether an organisation should prioritise hiring females in the event of the merits of a male and female candidate being the same.

		Gender		Total
		Male	Female	
In an organisation where there is a severe lack of female representation, do you believe in females being prioritised if the merits of a male and female candidate are the same?	No	50.8%	47.5%	48.7%
	Yes	185	324	509
		49.2%	52.5%	51.3%
Total		376	617	993
		100.0%	100.0%	100.0%

Table 5. Data accompanying Figure 10. The percentage of male and female students who perceive there to be more males, females or an equal distribution of genders studying science at their university.

Gender			STEM or non-STEM degree		Total
			Non-STEM	STEM	
Male	Regardless of your degree, do you think there is an equal distribution of males and females studying science at your university?	More males	26 52.0%	131 40.3%	157 41.8%
		More females	4 8.0%	20 6.2%	24 6.4%
		Equal	20 40.0%	174 53.5%	195 51.9%
	Total	50 100.0%	325 100.0%	376 100.0%	
Female	Regardless of your degree, do you think there is an equal distribution of males and females studying science at your university?	More males	87 66.4%	214 44.9%	305 49.6%
		More females	5 3.8%	26 5.5%	31 5.0%
		Equal	39 29.8%	237 49.7%	279 45.4%
	Total	131 100.0%	477 100.0%	615 100.0%	
Total	Regardless of your degree, do you think there is an equal distribution of males and females studying science at your university?	More males	113 62.4%	345 43.0%	462 46.6%
		More females	9 5.0%	46 5.7%	55 5.5%
		Equal	59 32.6%	411 51.2%	474 47.8%
	Total	181 100.0%	802 100.0%	991 100.0%	

## Appendix 4:

### A selection of survey responses to the question 'Please explain why or tell us about a particular incident [of feeling uncomfortable or isolated in an academic setting]'

*Microaggressions. Also rape jokes.*

– Female, 3<sup>rd</sup> year Engineering/Science at the ANU

*I have experienced sexual harassment and sexism by male scientists in labs I have undertaken undergraduate research projects in. This has ranged from comments about my appearance not showing enough cleavage (while wearing a lab coat) or too much (wearing a tank top while doing fieldwork in a hot glasshouse, accompanied by a sleazy grin) to being told I need to get my tits out to get ahead in science*

– Female, 4<sup>th</sup> year Bachelor of Philosophy (Science, honours) student at the ANU

*[In Maths and Physics] Many students assumed I was dumb or shallow because I was female, whereas I am actually a HD average on an academic scholarship. I experienced snarky comments such as 'you're such a stereotypical girl' when studying. I felt very uncomfortable asking any questions for fear of mocking, as I did not want to perpetuate the idea that I was dumb. One time when working on a difficult question in a maths study group, I solved the question, and everyone spent an hour checking my answer because they couldn't believe I got it correct*

– Female, 3<sup>rd</sup> year Commerce/Science student at the ANU

*Men look down upon women in STEM. Constantly.*

– Female, 1<sup>st</sup> year Bachelor of Science student at the ANU

*I expressed interest in going in the area of Criminal Psychology, and was told by my (male) tutor that as a girl no one would take me on in that field to supervise for postgrad etc. or for later research/employment.*

– Female, 2<sup>nd</sup> year Bachelor of Psychology (Honors) student at the ANU

*I'm a confident white male. My privilege doesn't allow me to get in such a situation.*

– Male, 3<sup>rd</sup> year Bachelor of Science (Adv) (hons) student at the ANU

*Never in the slightest, but I'm male.*

– Male, PhD (Chemistry) student at the ANU

*I once went to a logic summer school at the ANU, run by the computer science department. There were around 15 students, only 3 (including myself) were female. The lecturers were also all male. While I expected this, I did not*

*expect to feel so socially excluded from the group. None of the male students would talk to me. The course coordinator was very chatty and friendly with male students, but made jokes at my expense multiple times in front of the rest of the class. I ended up leaving the course halfway through as any social situations (morning tea, lunch) made me feel very anxious.*

– Female, Master of Neuroscience student at the ANU

*At divisional morning teas, people are asked to contribute something to eat. My supervisor only ever asks the female students to bake. He has also spoken about not hiring women "of a certain age" because they will get pregnant and not be able to work in the lab, something he considers downright despicable and dishonest. He thinks that there is no gender imbalance in science, but that because there are things like a minimum requirement of 30% female keynote speakers at a meeting this is unfair because good male speakers are missing out to make room for females who have just been given a free ride and aren't very intelligent. I could go on.*

– Female, PhD (Biochemistry and molecular biology) student the ANU

*Once I indicated to a lecturer that I might pursue an academic career. He told me it would be harder than I thought it would, and that it might not be compatible with a good family life.*

– Female, 4<sup>th</sup> year Bachelor Science (Adv) (Hon) student at the ANU

*It's a boys club - even the lecturers say inappropriate things or skew conversations to the males.*

- Female, 4<sup>th</sup> year Bachelor of Science student at the ANU