Levels of Science Identity, Belonging and Experiences of Discrimination for Commencing Science Students at an Australian University

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Abstract

A key step in achieving gender equality in the science, technology, engineering, and mathematics (STEM) workforce is recruiting more women into undergraduate STEM degrees. Some disciplines, such as biology, have been more successful at this than others. Yet, gender issues at university still exist in these science disciplines, which may be deterring women from remaining in this career pathway. This case study at an Australian university explored known risk factors for attrition by surveying 215 first-year undergraduate science students. It also investigated how these factors differ for students in the 'gender-balanced' and 'gender-unbalanced' science fields. Findings showed that female students in both the 'gender-balanced' and 'gender-unbalanced' science fields begin university with low levels of belonging, and encounter experiences of discrimination early on. These findings highlight potential risk factors for attrition for incoming Australian science undergraduates, and some potential challenges tertiary educators need to be aware of within their first-year classrooms.

Introduction

Addressing gender inequality in science, technology, engineering, and mathematics (STEM) is a top priority in Australia (Australian Academy of Science, 2019). One way to rectify the gender imbalance in STEM is to increase the number of enrolling female students in undergraduate science degrees. Studying the first year of university has been a focus in higher education research (Reid, Smith, Iamsuk, & Miller, 2016), as introductory STEM courses often act as 'gatekeepers' for these career pathways (Gasiewski, Eagan, Garcia, Hurtado, & Chang, 2012). This is particularly relevant for female STEM students. For example, Fink, Frey, and Solomon (2020) demonstrated that female students in introductory chemistry courses have decreased levels of belonging and increased uncertainty when compared to male students. This lack of belonging and feelings of uncertainty were then associated with decreased performance and increased attrition for female students.

Women are more likely to switch out of a science major at university than male students, regardless of their academic performance (Astorne-Figari & Speer, 2018; Bettinger, 2010). This raises the question as to why women are deciding to leave the sciences at university. Recent focus has been placed on the affective domains, which acknowledges the impact that emotions can have on the student learning experience (Trujillo & Tanner, 2014). This current study will specifically focus on the affective domains of belonging and science identity due

to the limited research of these constructs on Australian university cohorts (Fisher, Thompson, & Brookes, 2020b).

The first affective domain investigated was belonging. The definition of belonging used within this study follows from the work of Good, Rattan, and Dweck (2012). When defining 'academic' belonging, Good et al. (2012) emphasised the importance of membership and acceptance in these fields. Additional compounding factors were also highlighted, such as how positive feelings (i.e., affect) and willingness to engage also reflect on one's belonging. A sense of belonging has proven to be critical for students' interest and persistence in university majors where their gender is not the majority (Tellhed, Bäckström, & Björklund, 2017), with a key example of this being female students pursuing the male-dominated science fields.

An affective domain closely linked to one's sense of belonging is their identity, or specifically their science identity. The theoretical background of science identity is continually evolving, though Carlone and Johnson's (2007) definition includes the three core concepts of recognition, performance and competence. Recognition refers to being recognised by both yourself and peers as a 'science person', performance refers to the act of doing science, and competence refers to one's knowledge in the sciences. Science identity is associated with one's intention to pursue a scientific career path (Stets, Brenner, Burke, & Serpe, 2017). Gender differences have also been found when investigating the science identities of university students, particularly in the more male-dominated science fields (Hazari, Sadler, & Sonnet, 2013).

In addition to these affective measures, the final factor that will be investigated as part of this study is experiences of gender discrimination, due to the impact it can have on students' development of their belonging and science identity. Discrimination can be divided into explicit and implicit forms (Kuchynka et al., 2018). While explicit discrimination is overt, such as sexual harassment, implicit discrimination is subtler and driven by unconscious biases engrained from a young age (Smyth & Nosek, 2015). Students from minoritised groups (e.g., ethnic minorities) have been shown to have decreased belonging, or *belonging uncertainty*, when facing stigma or stereotypes in their academic environment (Walton & Cohen, 2007). Experiences of implicit discrimination may also result in lower levels of science identity for women, which can impact their academic performance (Lane, Goh, & Driver-Linn, 2012; Ramsey & Sekaquaptewa, 2011).

While the literature on gender differences in the STEM university experience is primarily based in an American context (Cheryan, Ziegler, Montoya, & Jiang, 2017; Eddy & Brownell, 2016), some Australian research into gender issues within the first-year STEM university experience has been conducted (Lyons et al., 2012). However, of the Australian research that does exist, studies tend to investigate the more male-dominated, also termed 'gender-unbalanced', STEM fields, such as physics (Lindstrøm & Sharma, 2011; for a more extensive review see: Fisher, Thompson, & Brookes, 2020b). Consequently, research into the more 'gender-balanced' science fields in an Australian context is limited. The present study responds directly to this gap in the literature, by surveying students in both 'gender-balanced' and 'gender-unbalanced' science fields and comparing their experiences.

The aim of this study was to investigate how the previously discussed factors are impacting Australian undergraduate science students at the beginning of their university experience.

Doing so will highlight potential risk factors for attrition within incoming science student cohorts. Therefore, the research questions this study sets out to answer are:

> What are the levels of science identity, belonging, and experiences of discrimination for commencing undergraduate science students?
>
> a. How do these factors differ by gender?
> b. How do these factors differ within the 'gender-balanced' and 'gender-unbalanced' science disciplines?

Methodology

A case study survey research design was used (Mills, Durepos, & Wiebe, 2013). A single Australian university was sampled as a case study to investigate the gendered experience of commencing undergraduate science students, which was part of a broader national research project on the undergraduate student experience. Ethics approval for this project was granted by Monash University's Human Research Ethics Committee (project ID: 16341).

Participants

First-year unit coordinators at a research-intensive university located in Melbourne, Victoria, in the fields of biology, chemistry, mathematics, and physics were recruited to distribute an online questionnaire to their students during class time, or advertise it online through a centralised learning management platform. The questionnaire was accessible to students during the first four weeks of Semester 1, 2019. There was no monetary incentive to complete the questionnaire for students.

In total, 222 complete responses were collected. As first-year science units were targeted in this study, it was assumed that students would be enrolled in undergraduate science degrees. At this university in 2019, 1,655 students enrolled in undergraduate science degrees, therefore these 222 responses reflect approximately 15% of the overall incoming science student cohort. This lower response rate is to be expected with online questionnaires (Nulty, 2008). Due to ethical considerations, analysis was restricted to adult participants only, with seven participants under the age of 18 excluded from analysis. This resulted in a final sample size of 215. The demographics of the final participants are shown in Table 1.

While the exact degree that these students were enrolled in was not recorded, it was assumed most students were enrolled in an undergraduate science degree with the majority declaring a major in a science field. As the Australian university system allows students to determine their major later in their degrees, students self-reported their *planned* major. Only a small portion of students declared not intending to major in the science fields (8.4%). To classify students' planned science majors, science disciplines were separated into 'gender-unbalanced' and 'gender-balanced' fields. The 'gender-unbalanced' science fields were classified as science fields which have relatively low female participation rates (i.e., <33% female enrolments). In Australia, these disciplines are mathematics (32%) and physics (25%) (Department of Education and Training [DET], 2018). In comparison, the 'gender-balanced' science disciplines are defined as ones with relatively higher female participation (i.e., >33% female enrolments), which in Australia are biology (57%) and chemistry (42%) (DET, 2018). Students planning to major in both a 'gender-balanced' and 'gender-unbalanced' science field were classed as a double major.

Table 1. Demographics of study participants (*n*=215).

Variable		Frequency (%)	
Gender	Female	91	(42.3%)
	Male	121	(56.3%)
	Other/Prefer not to say	3	(1.4%)
Ethnicity	White/Caucasian	117	(54.4%)
	Asian	79	(36.7%)
	Black/African American	2	(0.9%)
	Latino/Hispanic	2	(0.9%)
	Aboriginal or Torres Strait Islander	0	(0.0%)
	Mixed or Other	15	(7.1%)
First in family to attend university?	Yes	41	(19.1%)
	No	172	(80.0%)
	Not specified	2	(0.9%)
Mature age?	Yes	20	(9.3%)
(21 years old or over)	No	194	(90.2%)
	Not specified	1	(0.5%)
High achieving student?	Yes	164	(76.3%)
(>80 in Year 12 or equivalent)	No	29	(13.5%)
	Not specified	22	(10.2%)
Previous experience in science?	Yes	207	(96.3%)
	No	8	(3.7%)
Science Major	'Gender-unbalanced'	95	(44.2%)
	'Gender-balanced'	94	(43.7%)
	Double Major	8	(3.7%)
	Other/not specified	18	(8.4%)

Data Collection

Data in this study was collected from an online questionnaire. The purpose of the questionnaire was to establish risk factors for attrition within Australian science undergraduate cohorts, by exploring their levels of science identity, belonging and perceived gender bias in science when commencing these degrees. The questionnaire was constructed from four pre-existing sub-scales; a five-item scale that investigated science identity (Chemers, Zurbriggen, Syed, Goza, & Bearman, 2011), an adapted 26-item belonging scale, reduced for brevity, investigating specific subfactors of belonging in a science classroom (i.e., membership, acceptance, affect, desire to fade) (Good et al., 2012), a 6-item scale on perceived identity compatibility between gender and major (London, Rosenthal, Levy, & Lobel, 2011), and a four-item scale on students' perceptions of gender bias in their science major (Ganley, George, Cimpian, & Makowski, 2018). The final questionnaire can be found in Supplementary Materials Table S1. A five-point Likert scale (strongly disagree to strongly agree) was used for all question items. The internal consistency reliability of the questionnaire was measured using Cronbach's α. The sub-scales' α values were greater or approximately equal to 0.7 (Supplementary Materials Table S2), which is the widely accepted value for reliability (DeVellis, 2003).

In addition, a single open-ended question asking students to provide any experiences of discrimination they had faced while at university was included ('*Gender bias occurs when*

people treat others unfairly due to their gender. Please describe if you have had any experiences with gender bias in your discipline during your degree'; Robnett, 2016). The questionnaire was distributed online using Qualtrics software.

Data analysis

For quantitative analysis, R (version 3.6.3) was used. To assess gender differences in questionnaire responses, the Kruskal-Wallis test was used when there were three gender categories to compare, followed by *post-hoc* Mann-Whitney *U* tests using Bonferroni corrections to adjust for multiple comparisons. When only binary categories (i.e., female, male) for gender were within a subgroup, Mann-Whitney *U* tests were used for gender comparisons. A significance level of $p<0.05$ was used for all tests.

For qualitative data analysis, NVivo software (version 12) was used. A total of 91 responses were collected from the open-ended question in the questionnaire. For qualitative analysis, a combination of deductive and inductive coding was used. A deductive coding approach was used to begin with (Boyatzis, 1998), as the question had been asked on Australian university cohorts in a previously related study (Fisher, Thompson, & Brookes, 2020a). Therefore, themes generated from previous studies (i.e., *a priori*) framed the beginning of the codebook, and codes were added to this codebook as new themes emerged from the text via inductive coding (Thomas, 2006). The final codebook included six codes (Supplementary Materials Table S3). To prevent bias, interrater reliability occurred with two other educational researchers, ensuring percentage agreement was over 70%.

Results

Demographics of respondents

Analysis was restricted to students who identified as planning to major in the 'gender-unbalanced' or 'gender-balanced' science disciplines, comprising 87.9% of the study cohort ($n=189$). To control for confounding variables, demographic information between the genders was tested. A Fisher's exact test was used, to account for the small sample sizes within some of the gender sub-groups. No statistically significant differences ($p<0.05$) were found between the genders and the background variables tested (Supplementary Materials Table S4). Thus, it was assumed no substantial confounding effects would be present in this study cohort.

Gender differences for commencing undergraduate science students

Quantitative results

No gender differences were observed in levels of science identity in the 'gender-balanced' or 'gender-unbalanced' science fields. However, multiple items relating to belonging had statistically significant gender differences in both fields. As there were only two reported genders (i.e., male and female) in the sub-group of the 'gender-balanced' science fields, a Mann-Whitney *U* test was used to compare belonging. Results showed that female students in these science fields self-reported lower levels of belonging when in a science classroom at university. Specifically, female students had lower levels of acceptance and affect with regards to their belonging, with several items on these two belonging sub-scales having statistically significant differences between the genders, all with small effect sizes ($r<0.3$; Table 2).

Table 2. Gender differences in belonging in the 'gender-balanced' science fields.

Question item	Female (mean)	Male (mean)	*U*	*Z*	*p*	Effect size (*r*)
I feel disregarded (-)	2.21	1.81	1363	-2.067	**0.039**	0.214
I feel valued	3.45	3.85	789.5	-2.569	**0.010**	0.265
I feel appreciated	3.32	3.79	788.5	-2.558	**0.011**	0.264
I feel excluded (-)	2.17	1.68	1420	-2.527	**0.012**	0.261
I feel insignificant (-)	2.47	1.96	1379	-2.173	**0.030**	0.225
I feel comfortable	3.47	3.83	847.5	-2.094	**0.036**	0.216
I feel inadequate (-)	2.79	2.28	1387	-2.215	**0.027**	0.229

Note: (-)=reverse-coded items.

To assess gender differences within the 'gender-unbalanced' fields, Kruskal-Wallis tests were used to find significant differences as there were non-binary identified students in these fields (n=2). *Post-hoc* pairwise Mann-Whitney *U* tests were used to determine what sub-groups within the genders differed in their levels of belonging. Overall, female students reported lower levels of belonging in a science classroom at university when compared to male students in regards to their acceptance, affect and desire to fade in these fields, all with medium effect sizes (r>0.3; Table 3). A significant effect was also recorded for one question item ('*I feel calm*') between male participants and those students who identified as non-binary with a medium effect size (U=118.5, Z=-2.005, p=0.045, r=0.312), with the latter sub-group of students feeling less calm. However, the small sample size of this cohort makes the generalisability of these findings limited.

Table 3. Pairwise comparisons between gender differences in belonging in the 'gender-unbalanced' science fields.

Question item	Female (mean)	Male (mean)	Non-binary (mean)	*U*	*Z*	*p* adjusted	Effect size (*r*)
I feel disregarded (-)	2.39	1.88	-	1300	-2.226	**0.026**	0.273
I feel like I fit in	3.42	3.88	-	668	-2.457	**0.014**	0.293
I feel at ease	3.18	3.85	-	591	-3.090	**0.002**	0.351
I feel calm	3.24	3.82	-	634.5	-2.652	**0.008**	0.314
	-	3.82	1.50	118.5	-2.005	**0.045**	0.312
I feel inadequate (-)	3.24	2.50	-	1360.5	-2.697	**0.007**	0.318
I enjoy being an active participant	3.30	3.92	-	698.5	-2.044	**0.041**	0.256

Note: only statistically significant pairwise comparisons are shown. (-)=reverse coded items.

Several items on the gender-focused sub-scales had statistically significant gender differences in both the 'gender-balanced' and 'gender-unbalanced' science fields (Table 4). Overall, female students reported higher levels of perceived gender bias in their science classrooms than male students, and male students often disagreed with the presence of gender bias in their science major. It should also be noted that a significant effect was observed with non-binary students in the 'gender-unbalanced' disciplines, with these students agreeing more that they have faced gender issues in their science major when compared to male students, with a medium effect size (U=5, Z=-2.183, p=0.029, r=0.331).

Table 4. Gender differences in perceived gender bias.

Science major	Question item	Female (mean)	Male (mean)	Non-binary (mean)	*U*	*Z*	*p*-value	Effect size (*r*)
Gender-balanced	I don't think that my gender will affect how others view me in my major.	3.89	4.23	N/A	859	-1.986	**0.047**	0.205
	Women have a hard time succeeding in my major. (-)	2.53	1.87	N/A	1446	-2.702	**0.007**	0.279
	My major is more welcoming to men than it is to women. (-)	2.70	2.19	N/A	1373.5	-2.108	**0.035**	0.218
Gender-unbalanced	I don't think that my gender will affect how others view me in my major.	3.27	4.03	-	641	-2.576	**0.010***	0.304
	I don't think that my gender will affect how well I do in my major.	3.85	4.43	-	717.5	-1.995	**0.046***	0.252
	I think I have experienced difficulties in my major because of my gender. (-)	2.27	1.57	-	1353	-2.968	**0.003***	0.339
		-	1.57	4.00	5	-2.183	**0.029***	0.331
	Women in my major experience discrimination. (-)	2.94	2.25	-	1295.5	-2.108	**0.035***	0.262

Note: Only statistically pairwise comparisons are shown. (-)=reverse-coded items. *=*p*-value adjusted for multiple comparisons using Bonferroni correction.

Qualitative results

The most prominent theme (*n*=76, 83.5%) from qualitative analysis was students believing that there were no gender issues in science (Table 5). However, the second most prominent theme was self-reported experiences of discrimination by both male and female students (*n*=11, 12.1%). While most experiences were reported by female students (*n*=8), male students also discussed experiences of discrimination (*n*=3). One self-identified transgender male also spoke on issues relating to their gender in the science fields. Other minor sub-themes were also discussed by students relating to gender imbalances in the classroom, their confidence, or their parents' impact on their learning.

Table 5. **Qualitative coding from open-ended responses.**

Theme	Freq. (%)	Exemplar Quote
No gender issues in science	76 (83.5%)	*I haven't had any experience with gender bias in my science degree* –Female #1
Discrimination	11 (12.1%)	
a. Against women	8 (8.8%)	*Male peers often disregard my comments when working on problem sets in maths tutorials* –Female #2
b. Against men	3 (3.3%)	*Females often get more attention because of studies such as this and an intentional active approach to including them. Some guys get ignored because everyone is trying to help women* –Male #2
Gender imbalance in STEM	4 (4.4%)	*I have been in classes that are primarily male, however that hasn't made me feel any different about my science degree* –Female #3
Confidence	3 (3.3%)	*…during physics classes majority of the answers are by boys […] I don't feel confident to share my own answers* –Female #5
Parents	1 (1.1%)	*…at home my parents have doubts that I will succeed* –Female #4
Transgender issues	1 (1.1%)	*As a trans guy, I have found it hard to study due to the discomfort and prejudice I face* –Transgender male #1

Note: frequency was calculated from valid responses (n=91).

Discussion

The aim of this study was to determine the extent to which gender differences exist at the beginning of an undergraduate degree in key factors (i.e., belonging, science identity, experiences of discrimination) that are associated with student persistence in the science fields. Findings showed that female students in both the 'gender-balanced' and 'gender-unbalanced' disciplines reported lower levels of belonging than male students. Female students were also more aware of the discrimination they may face in the science fields at the start of their undergraduate degree, regardless of whether they were in a 'gender-balanced' or 'gender-unbalanced' science field. Experiences of discrimination were also self-reported by students within the first few weeks of commencing their undergraduate degree. While these reports were mainly from female students, male students also gave examples of discrimination.

Interestingly, no gender differences in science identity were found at the beginning of the university experience despite previous research showing that female students in introductory male-dominated science courses often have lower science identity than male students (Hazari et al., 2013; Seyranian, Madva, Duong, Abramzon, Tibbetts, & Harackiewicz, 2018). A lack of discipline specific identity questions may explain why science identity was not observed to have a gender effect, as discipline specific questionnaires, such as those looking at the physics identities of students, have shown gender differences previously (Seyranian et al., 2018). Additionally, the majority (96.3%) of students had experience in science at a pre-tertiary level. Therefore, secondary school experiences in STEM may have resulted in

increased science identity of these students, particularly for female students depending on their secondary school science experiences (Prieto-Rodriguez, Sincock, & Blackmore 2020).

Female students reported lower levels of belonging than male students in the first few weeks of their university experience, particularly with regards to their feelings of acceptance and affect in a university science classroom. This is supported by international findings, with female students reporting lower levels of belonging in university 'gender-unbalanced' introductory science courses (Lewis et al., 2017; Stout, Ito, Finkelstein, & Pollock 2013). This is of concern as low levels of belonging are associated with decreased persistence in these fields (Lewis et al., 2017), putting these female students at risk for attrition from this career pathway. These lower levels of belonging and acceptance seen in the quantitative results align with the examples of feeling disregarded and unvalued in a science classroom, which arose in the qualitative examples of experiences of discrimination for female students.

Implicit discrimination has been previously identified as an issue for women in science degrees and is commonly experienced by female students in these fields (Smith & Gayles, 2018). While over 80% of students in this study believed that there were no issues of gender in science upon commencing their science undergraduate degrees, 12.1% (n=11) of students reported experiences of discrimination within the first few weeks, primarily by female students in the 'gender-unbalanced' science disciplines. Some examples of discrimination given by female students involved their peers in the classroom not taking them seriously or disregarding their opinion:

> *I will be the last person on the table people turn to for the answer to a question or advice, and often my contributions to the discussion are treated patronisingly*. – Female #6

> *In conversations with all other males, I've been ignored or my opinions have been set aside discreetly. Other than that, people are usually surprised when I get things correct or I seem 'smart', as if they assumed the opposite*. – Female #7

Continued exposure to such discriminatory experiences has been shown to affect STEM engagement and lower academic performance in students (Lane et al., 2012; Ramsey & Sekaquaptwea, 2011). Therefore, it is concerning that these experiences were occurring within the first few weeks of a university degree for women in this study, as it may be impacting their attitudes and performance in these science fields later.

In this study cohort, women from the 'gender-unbalanced' science fields predominantly discussed experiences of discrimination. However, it has been shown that women in the 'gender-balanced' fields also experience forms of implicit discrimination by their peers (Grunspan, Eddy, Brownell, Wiggins, Crowe, & Goodreau, 2016). Preliminary research with Australian undergraduate science students in these disciplines suggest that such experiences of discrimination may occur later in their degrees (Fisher, Thompson, & Brookes, 2020a). Therefore, there is a need for longitudinal studies that investigate the experiences of women in these 'gender-balanced' fields as they progress through their degree to explore how these experiences manifest.

An interesting result emerged in the opinions of male students on the topic of discrimination towards women in science in this study. Instead of being aware of these issues, some male students reported feeling discriminated against themselves. In these experiences, these men linked the initiatives to help women in science as discrimination against men:

> *I believe that gender bias has reverted. It is now my opinion that there are so many programs, scholarships, extra support, extra resources and pathways to get young girls involved in science at school and at university that men do not [get] the same opportunities that women now receive; and I believe that this is gender bias*. – Male #4

> *There should not be quotas for how many men or women are in a particular discipline […] For example, where there is a quota that 50% of the workforce must be female, if a male is better qualified for a job than a female colleague yet misses out because there are already 50% of males, he has been denied that job not because of her ability but because of the gender he was born into. THIS IS NOT EQUALITY OF OPPORTUNITY*. – Male #5

This opinion towards the topic of gender equality in science held by these male students was also reflected in one female students' opinion:

> *I feel like I'm not allowed to talk about gender inequality within my degree without being a 'feminazi'*. – Female #8

Limitations

While this study provided some insight into the experiences of commencing undergraduate science students in Australia, there were several limitations. First, as it was a case study, the generalisability of these findings is limited. Sampling students across several Australian institutions would provide a more accurate national sample to act as a comparison for international studies. In addition, while transgender and non-binary students were included in this analysis, the generalisability of this statistical analysis is limited due to the small sample sizes. Further research on the issues faced by non-binary and transgender science students would aid in answering this question in future studies.

Second, data collection was at a single time-point, which occurred several weeks into the students' undergraduate degree. However, studies have shown the fluctuation of the factors tested during the first three weeks of university (London et al., 2011). Sampling students at multiple time points, or following a sub-sample of students, would help overcome this limitation in future studies. Additionally, while some students self-reported issues of discrimination, the majority did not. This may have been due to sampling students within the first few weeks of their degree, as experiences of discrimination in the STEM fields appears to be reported more by final-year students compared to first-year students (Hall et al., 2020). Therefore, future studies should look at sampling students further along in their undergraduate degrees to truly capture these experiences.

Implications

Findings from this research present gender differences in commencing undergraduate science student cohorts in an Australian context. The issues present for female students in both the 'gender-balanced' and 'gender-unbalanced' science fields, such as experiences of discrimination and lack of belonging, suggest a need for awareness of these issues by university educators to ensure the most gender equitable classroom environment as possible. Specifically, quantitative and qualitative findings highlighted lower feelings of acceptance in a university science classroom for female students. These decreased feelings of belonging within female students in this cohort appear to be driven by the discriminatory experiences, which were often caused by their peers. Female students associated these experiences with feeling less respected and valued in these environments, which are core concepts of belonging (Good et al., 2012). Educators need to be aware of the potential gender

discrimination occurring in small groupwork in their classroom to foster gender equitable environments for all students.

Implications for future research have already been highlighted. Studying these factors across diverse Australian institutions and at multiple timepoints of the university experience are needed to explore how these levels of belonging and science identity, and experiences of discrimination change throughout an undergraduate degree. These current findings provide a baseline for future studies to determine exactly how the affective domains are impacted during the undergraduate experience, and subsequently impact potential student attrition in these science fields. This will help inform educators and institutions on how to best address these issues and help retain more students, particularly women, in the science fields.

Conclusion

Determining which factors are contributing to the gendered experience of undergraduate science students will help determine what issues may be causing female students to leave their science majors at university. Female science students in this study cohort in both the 'gender-balanced' and 'gender-unbalanced' fields commenced their degrees with lower levels of belonging, particularly in regards to, feeling accepted in a science university classroom, putting them at risk for attrition. Female science students in this study also had higher levels of perceived gender bias in science and some female students encountered experiences of discrimination within the first four weeks of university. While it appears that most commencing science students did not believe gender was an issue within these fields, experiences of discrimination were still reported by students. These findings provide a comparison to the international literature and will alert science educators at universities of the potential issues of gender occurring in their classrooms. Doing so will help ensure that Australian female university students are not potentially being deterred from a science career at this critical time point within this career pathway.

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