

## **Gender Differences in Construction Management Students' Sense of Belonging**

**Dr. Luciana Debs, Purdue University Programs**

Luciana Debs, is an Assistant Professor of Construction Management in the School Construction Management Technology at Purdue University. She received her PhD from Purdue University Main Campus, her MS from the Technical Research Institute of Sao Paulo (IPT-SP), and BArch from the University of São Paulo (USP), in Sao Paulo, Brazil. Prior to her current position she worked in design coordination in construction and real estate development companies in Brazil. Her research is mainly focused on integrating design and construction and she is currently coordinating the Design and Construction Integration (DCI) major at Purdue University.

**Ms. Bhavya Rathna Kota, Purdue University at West Lafayette (PPI)**

An enthusiastic Construction Management professional with an Architectural background. My research interests range from collaboration- communication to sustainability and BIM.

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Despite significant efforts being made to recruit and retain women, construction is still a male-dominated industry. Though there have been numerous studies on understanding the barriers and retention strategies of females in the industry and academic programs, very few of those analyzed the issue using a sense of belonging framework. The present paper adds to previous studies with the objective to evaluate gender differences in sense of belonging of undergraduate construction management students, as well as common gender stereotypes of women in construction using a survey approach. This research is a pilot inquiry taking place at the authors' institution. Our findings show that female students' sense of belonging is significantly lower than that of male students'. Additionally, our results indicate that both male and female students perceive that there is gender discrimination in the construction industry, though females perceive it at a higher agreement level. Female students also indicate they perceive that recruiters prefer to hire males for jobsite positions, though both female and male students indicated they think women are just as capable in construction and the jobsite. Our findings concur with previous studies on gender differences in construction, yet they provide an interesting benchmark to the sense of belonging of construction students and an updated view of what students' think about women in construction. Results from this pilot study can be used to help academic institutions and industry to create policies to attract and retain more women in construction domains, and provide construction instructors with recent findings to discuss the role of women in construction nowadays.

## **Introduction**

The construction sector is one of the largest contributors to the United States' gross domestic product (GDP), with 4.2% of the total GDP [1]. Though the construction industry employs close to 11 million people [2], it still faces a shortage of workers due to increased demand for new projects and a reduced number of skilled workers [3]. Despite employing millions of workers, it remains a male-dominated industry, with women accounting for roughly 10.9% of workers in construction [2]. And in the case of construction managers, that number is even lower, at 8.4% [4]. Though economic and societal changes have helped to increase women's participation in the workforce [5], the impending shortage of construction labor still indicates women remain an untapped resource [6].

Numerous studies have been undertaken to understand the reason for the underrepresentation of women in male-dominant fields or STEM fields [7], [8], [9]. The conclusions drawn from those previous research suggest that feeling of membership or lack of it is an instrumental factor that influences one's decision to continue their current job [7], [8], [9]. For example, Good, Rattan and Dweck [7] argue that the presence of stereotype attitude and gender bias can greatly affect women's sense of belonging in mathematics. Some key factors affecting the sense of belonging in academic settings are negative stereotypes towards certain groups and the notion that ability is fixed and cannot be acquired through learning [7]. Specific to the construction industry, gender stereotyping has been identified as one of the biggest obstacles that prevent women from pursuing construction education [8].

Despite the fact that significant research was performed to understand women's participation in the construction industry and female construction students' motivations, our study adds to the body of knowledge in providing the investigation of gender differences through a lens of sense of belonging of construction students. We are greatly inspired by the work of Good, Rattan and Dweck [7] in studying the sense of belonging of students in mathematics. To this point, we provide results from a pilot study conducted at the authors' institution and are guided by the following research questions (RQ):

RQ<sub>1</sub>: Is there a difference in the sense of belonging of construction students based on gender?

RQ<sub>2</sub>: What are the current views of women in construction by construction students?

## **Literature Review**

To help with the understanding of the current body of knowledge on the topic explored in the present study, we provide a brief overview of (1) the concept of sense of belonging; (2) factors affecting women's participation in construction, (3) recruitment and retention of female construction students.

### *Sense of belonging*

There are many definitions of belongingness. In this paper, sense of belonging refers to the feeling of fitting in and having a connectedness with peers, and being valued by others [10]. The reverse belongingness is alienation, social isolation, or rejection, leading to depression in the long term [11]. Among factors that influence the sense of belonging of women to a major are identity or being valued [12]; stereotype-free educational environment [13]; formal and informal student organizations supporting female students [12]; family, faculty and peer support [7]. On the other hand, and specific to the construction industry, many prior studies indicate that presence of gender stereotyping, low sense of belonging, lack of support system, and lack of female role models factor to women opting out of construction-related studies and careers [14], [15], [16].

Previous research on sense of belonging found that only when an individual is emotionally satisfied and believes that they are valued and accepted by members of a community will they be motivated to excel in that path [7]. Studies have also found empirical evidence that in an academic setting, having a sense of belonging with peers, faculty, college community can influence students' academic achievement [17] or influence their persistence/withdrawn behavior [7], [8], [11]. Thus, the sense of belonging becomes a key factor that drives or motivates students' intent to pursue or leave a specific program or career.

Additionally, other factors that influence the sense of belonging are classroom engagement, faculty-student engagement, social engagement, and peer engagement. Settles, et al. [18] argue that sexist attitude, hostile environment, can negatively affect women's sense of belonging. Research has also shown that in the face of setbacks, isolation, and undermining of the students' ability can greatly impair their motivation and performance [7]. Thus, increasing the feeling of membership in construction is vital to retain women in construction-related studies and careers.

In seminal work specific to the mathematics field, Good, Rattan and Dweck [7] have explored the differences in sense of belonging of female and male students. In their conclusion from a series of three studies on the topic, they found two significant issues related to female students' sense of belonging – a fixed view of their abilities in mathematics and stereotype views of women in mathematics. More specifically, the greater their belief on fixed abilities and the belief that women are less capable than men in mathematics, the lower their sense of belonging. In addition, researchers found in the same study that a lesser sense of belonging to the mathematics discipline over time resulted in students' lower interest in pursuing future careers in mathematics [7]. Therefore, understanding students and professionals' sense of belonging can provide a better understanding of their career decisions.

### *Factors affecting women's participation in construction*

Previous research has indicated that a woman's choice of career depends on learned interests, skills, values, beliefs and occupational satisfaction [19]. Dabke et al. [20] argue that women's job satisfaction in construction trades is important for them to continue in the same line of work. In the same study, the researchers found that tradeswomen, most of who work on jobsites, often face the lack of adequate facilities, harassment on-site, and the feeling of isolation, which may demotivate them to continue a career in construction [20].

Additionally, previous studies have provided information on other factors that help retain or force women to opt-in or out of construction professions and both are important to discuss here. Some factors that encourage women to remain in the construction industry are related to individual or psychological factors like job satisfaction, having work-life balance, opportunities for self-development, self-efficacy and environmental or sociological factors like women role models, working environment, support from family and friends and feeling of inclusion [16], [19], [20]. For example, the vast majority of 24 women participants in Moore and Gloeckner [16] study, reported having a strong sense of self-confidence. And, among significant findings from Bennett, Davidson and Gaeland [21], women were found to be “the most optimistic in terms of their own abilities and career development”. The same study found that recognition of efforts was also perceived to be more important for women than for male counterparts and that female construction professionals were more inclined to recognize the importance of the construction industry efforts towards equal opportunities.

Environmental or sociological factors like work environment and having role models and mentors also often influence an individual's career choice [16]. In fact, many women share that having a family member in the construction industry attracted them to a similar field in a study conducted on women in construction trades [20].

However, not all factors have a positive influence. On the issues faced by women in construction, 14 of 24 married study participants in Moore's study [19] raised concerns regarding work-life balance and having challenges to satisfy the job demand and family responsibilities. With construction industry acknowledging that women workers are the untapped resources, Fielden, Davidson, Gale and Davey [13] conducted focus groups with construction stakeholders in the United Kingdom to evaluate what could be done to increase women's participation in the industry. They found that enforcing inclusive workplace policies, providing flexible hours, and

having support groups create an equal platform for employees irrespective of socio-ethnic and gender differences can help attract and retain women in construction. This is similar to Moore's [19] findings indicating that flexibility in schedule and proper supportive program with less travel can help in creating work-life balance and retain women in their position.

Post 1990, many attempts were made to study this underrepresentation of women in the construction industry [6], [7], [14]. Factors contributing to this issue were the industry's masculine image, stereotype attitude, organizational culture, working environment, and job recruitment issues [6], [22]. Not only that, some studies on the women working in construction show that the majority of them work in secretarial or office positions than in the field [6], [13].

Expanding further on issues of underrepresentation, in the study conducted by Fielden, et. al [13], it is reported that the construction industry has a poor image and the workers are considered as 'cowboys' creating a macho stereotype. Sadly, the view of construction as a "man's world" is still reflected even in recent studies of women participation in construction [23]. Coupled with that, women's social image as being delicate and sensitive deters girls from considering pursuing a career in the construction industry [9]. And even when women pursue a career in construction, many end up leaving [23].

Other issues faced by women in the construction industry include women being questioned about their competency [24], having experienced someone making suggestive comments or passed sexist jokes on them [25], women feeling penalized for wanting to take-off time for families [6]. These issues can ultimately result in women resenting to work in this industry [8].

Additionally, recruitment to construction jobs also seems to also be a barrier. Previous research found that many employers are reluctant to recruit women for jobs in the construction industry [6], [13]. Fielden et al. [6], argue that the construction job postings have a masculine image like requiring workers to have reasonable strength deterring women from applying and that companies are worried about the impact of family's responsibilities women may have. Professional recruitment was also found to rely heavily on word of mouth and male networks, which may not reach women as effectively [13]. Women are made aware of construction as a career opportunity later in life than men [23]. Fielden et al. [6], suggests that the way forward for women in construction is for companies to have more female recruiters at panel interviews, emphasize on management skills over technical skills in their job postings and have support sites for networking and mentoring for women.

### *Recruitment and retention of female construction students*

As mentioned previously, several studies have identified the lack of awareness about careers in construction to young women as an important factor that influences women's participation in construction [8], [13], [16]. Moore & Gloeckner [16] suggest that to recruit more females in construction-related degree programs, it is important to educate and partner with career counselors and college advisors and hold information sessions about the construction industry and careers in construction the high-school level. This could diminish the construction industry's stereotype image and help attract and retain more female students to construction programs.

This lack of awareness can be offset by having a family member (especially fathers) who works in the construction industry [26]. Having peer and family support can also greatly impact the female student's decision to pursue a career in construction. Moore and Gloeckner [16] indicated that a common trend for female interviewees to have parental support in their decision to pursue a degree in construction. And significant others were also often described in previous research as influential to females' decision to pursue a construction degree [16].

Previous research has also suggested that having identity-building activities, small sessions with practicing female professionals, access to women role models in the staff and faculty and job shadowing programs can greatly assist women retention in a construction program [12]. Apart from that, having an inclusive environment, classroom involvement and faculty interaction was also found to greatly boost women's retention in construction management programs [16], [26]. In fact, many of the women in the construction industry recognized that their experiences of being a minority in the academic program and their early career shaped their choice of opting in or out of their construction career path [16], [21].

Though many positive and negative factors to female participation in construction-related degrees, the underlying theory that motivates the students to continue the program seems to include their sense of belonging [12], [16], [27]. Some of the attributes that positively impact the 'sense of belonging' of female students in construction are recognition of their ability, acceptance, by their peers and faculty; support from family; having support groups, role models and inclusive academic climate [12], [16]. In addition, previous research has identified communities of students and involvement in student organizations as a positive influence in the retention of female students in construction majors [26].

Simultaneously, a lack of sense of belonging or isolation can discourage students from continuing their education in the construction field [8]. This stems from a negative environment linked to the masculine image of construction or having low-esteem due to others constantly questioning one's competence and negative stereotype environment [8], [12], [16]. Besides, the stigma of not fitting in due to the feeling of being invisible or being isolated from peers and sexual discrimination, even verbal discrimination, lack of supportive environment can cause withdrawal effect leading to dropping of the program [7], [8], [28].

Therefore, several aspects that have been identified in other male-dominated fields, such as stereotypes [7] can be seen playing a major role in female construction students and professionals career decisions. And, in addition to industry stereotypes and through our review of literature, we have selected three main factors to be further explored to understand in the sense of belonging of construction students, namely (1) family and friends, (2) peers and (3) instructors. Students' perceptions of their future careers in construction was also included, as previous research indicates issues in the long-term retention of women in construction industry [23].

## **Methodology**

In this pilot study, we have used a survey approach to collect data from construction students at a large, midwestern university. The department in which this research took place offers two

construction-related majors and one construction related minor. Currently, the department currently has 464 students, 15.5% of which are females.

The survey was distributed during the last months of 2020 and the initial months of 2021. The survey invitation was distributed electronically, either by the authors requesting instructors of the School of Construction Management Technology (SCMT) at Purdue University to forward an anonymous link to their students, by posting posters with the survey link in laboratories frequented by construction students when they are not in class, and by announcing the study (and showing the poster invitation) at the end or break of construction related courses. Survey participation was anonymous, voluntary and participants did not receive any incentives.

The survey instrument contained 11 questions divided into three main blocks: demographics, sense of belonging, and views of women in construction. The first block contained six demographic questions, including gender, if they belong to a minority group, age, program, academic standing and if they have had an internship. The second block focused on factors that affect their sense of belonging to the major: family and friends, faculty-student interaction and student-student interaction. Perceptions of long-term industry participation and sense of belonging was also included as a separate block named 'construction-related feelings'. And, the last block specifically asks for students views of women in construction. Both the second and third block used similar rating statements based on a 5-point Likert type scale (1 – strongly agree to 5 – strongly disagree). Negatively worded items scoring were reversed prior to analysis. As this was a pilot study, we will also report Cronbach's  $\alpha$  reliability measure for the instrument and for the second and third blocks. This will help refine the instrument for future iterations and provide useful information for others wanting to use the instrument.

The results were analyzed using descriptive and inferential statistics. For the inferential statistics, a Mann-Whitney U test was used (testing for significance at the  $\alpha = 0.05$  level) using the following hypothesis:

H<sub>1o</sub>: There is no significant difference in the sense of belonging of male and female construction students.

H<sub>1a</sub>: *There is a significant difference in the sense of belonging of male and female construction students.*

H<sub>2o</sub>: There is no significant differences in students' views of women in construction based on gender.

H<sub>2a</sub>: *There is a significant difference in students' views of women in construction based on gender.*

In hypothesis 2, we have evaluated gender differences over five questions of the third block, and we follow Armstrong's [29] recommendation to not perform statistical adjustments in the results when a small number of planned comparisons are performed. The items included in the second hypothesis were:

- Women are not fit to be in a jobsite
- There is gender discrimination in the construction field
- Men are more capable than women in the construction domain

- Women in construction are a better fit for office jobs rather than being on the field
- I feel recruiters for construction companies prefer hiring males over females for jobsite-related positions

## Results

We have obtained 68 responses to our survey, with 67 respondents being in a construction related major and one being in a construction related minor. Considering the total major students in the department, we have obtained a 14.4% response rate.

### *Instrument reliability*

The Cronbach's alpha for all the Likert-type items and for the second part (sense of belonging) of the questionnaire was found to be  $\alpha=0.828$ , which is considered to be acceptable [30], while the third portion, on views about women in construction was found to be less reliable ( $\alpha=0.575$ ). The number is considerably higher ( $\alpha=0.694$ ) when removing the items related to women's clubs in construction, the effectiveness of female instructors and construction students, and comfort level of respondents to receiving orders from a woman supervisor, which might not relate to the construct of 'views of women in construction'. The removal of those four questions did not significantly change the whole questionnaire's reliability measure ( $\alpha = 0.830$ ). We recommend the exclusion of these items for a future iteration of the research or anyone wanting to use this instrument in the future and have included the proposed revised questionnaire in the appendix.

### *Descriptive statistics*

Of the 68 respondents, 47 were males and 21 females. Therefore, we had an overrepresentation of female students in the sample compared to female students enrolled in SCMT majors. This is expected given that the topic might have been more attractive to female students. 53 students indicated there were not part of a minority group, while 14 did indicate they belonged to a minority group and one student preferred not to disclose that information. The overwhelming majority of respondents ( $n=66$ ) were in the 18 to 24 years old age group, with one respondent being in the 25 to 30 years old and one more than 31 years old.

Most respondents were upper classmen (seniors  $n=35$ , junior  $n=24$ ), six were sophomore, one freshman and two indicated they were unclassified or does not apply. And, for industry experience, only two indicated they had no previous internship experience in construction. The rest ( $n=66$ ) indicated they had internships for summer(s) or a combination of summer internships and full time jobs.

Now we provide descriptive statistics for items in each of the subparts of the second block of questions (friends and family, instructors, peers, major-related feelings and views of women in construction). For the first subpart, we noted that female responses had much more variation than male students, with the mean for male students being closer strongly agree than female students'. However, both groups displayed a median of "strongly agree" in all items in this subpart. Table 1 summarizes the findings for subpart 1.



Table 1 – Descriptive Statistics – Subpart Family and Friends (n=68)

Item	Gender	N	Mean	Median	Standard Deviation
Family Support	Male	47	1.19	Strongly Agree	0.495
	Female	21	1.43	Strongly Agree	0.811
Family Approval	Male	47	1.15	Strongly Agree	0.416
	Female	21	1.43	Strongly Agree	0.811
Friends Support	Male	47	1.38	Strongly Agree	0.677
	Female	21	1.67	Strongly Agree	0.856

The second subpart included questions about instructors in a series of six items. Most of the answers indicate students either agree or somewhat agree with the items. This time, the standard deviation on male students' responses seemed to match or in some items exceed that of female students. For the most part, students seem to display a positive image of instructors in the program. Table 2 provides a summary for subpart 2.

Table 2 – Descriptive Statistics – Subpart Instructors (n=67)

Item	Gender	N	Mean	Median	Standard Deviation
Instructor concern about student	Male	46	1.85	Somewhat agree	0.988
	Female	21	1.90	Somewhat agree	0.700
Instructors motivate students to become better professional	Male	46	1.63	Strongly agree	0.951
	Female	21	1.62	Somewhat agree	0.590
Instructor knows by name	Male	46	1.85	Somewhat agree	0.842
	Female	21	1.62	Strongly agree	0.805
Instructor's value student	Male	46	1.80	Somewhat agree	0.885
	Female	21	2.05	Somewhat agree	0.865
Instructors' approachability	Male	46	1.76	Somewhat agree	0.970
	Female	21	1.67	Somewhat agree	0.483
Comfortable to interact with instructors	Male	46	1.57	Strongly agree	0.910
	Female	21	1.81	Somewhat agree	0.680

The following subpart assesses students' perceptions of their peers. In this subpart, we had two questions that were negatively worded (reluctance of classmates to team up and prove self for peer recognition). The answers for those two questions had higher standard deviations than others in this subpart. Interestingly, many female students felt they need to constantly prove themselves for peer recognition, while most male students neither agreed nor disagreed with this statement. Table 3 summarizes the descriptive statistics for this subpart.

Table 3 – Descriptive Statistics – Subpart Peers (n=65)

Item	Gender	N	Mean	Median	Standard Deviation
Comfortable to interact with other students	Male	45	1.44	Strongly agree	0.624
	Female	20	1.65	Strongly agree/ Somewhat agree	0.813
Active participation in class	Male	45	1.51	Strongly agree	0.695
	Female	20	1.65	Somewhat agree	0.671
Valued by peers	Male	44	1.77	Somewhat agree	0.677
	Female	20	2.15	Somewhat agree	0.745

<b>Item (cont.)</b>	<b>Gender (cont.)</b>	<b>N (cont.)</b>	<b>Mean (cont.)</b>	<b>Median (cont.)</b>	<b>Standard Deviation (cont.)</b>
Reluctance of peers to team-up <sup>a</sup>	Male	45	2.49	Somewhat disagree	1.308
	Female	20	2.20	Somewhat disagree	1.105
Constantly prove self for peer recognition <sup>a</sup>	Male	45	2.67	Neither agree nor disagree	1.108
	Female	20	3.70	Somewhat agree	0.923
Friends with other students in program	Male	45	1.56	Strongly agree	0.841
	Female	20	1.30	Strongly agree	0.571

<sup>a</sup>Negatively worded items scoring reversed for analysis (1 – strongly disagree, 2 – somewhat disagree, 3 – neither agree nor disagree, 4 – somewhat agree, 5 strongly agree)

Additionally, in students’ answers we see that female students tend to be more engaged in participating in construction-related student organizations on campus than male students. And, interestingly, for both male and female students, there is a decrease in perception that they will be working in the construction industry from the two timeframes measured (‘5 years from now’ and ‘rest of their lives’). Table 4 summarizes the results.

Table 4 – Descriptive Statistics – Subpart major and field related feelings (varies from n=61 to n=64)

<b>Item</b>	<b>Gender</b>	<b>N</b>	<b>Mean</b>	<b>Median</b>	<b>Standard Deviation</b>
Active participation in construction related student organizations	Male	44	2.77	Neither agree nor disagree	1.292
	Female	20	2.55	Somewhat agree	1.146
Feel as a member of construction community	Male	42	1.60	Strongly agree	0.734
	Female	20	2.20	Somewhat agree	1.105
Work in construction 5 years from now	Male	42	1.29	Strongly agree	0.835
	Female	20	1.65	Strongly agree	1.040
Work in construction rest of life	Male	42	1.81	Strongly agree/ Somewhat agree	1.018
	Female	20	2.10	Strongly agree/ Somewhat agree	1.410
Construction is a diverse industry	Male	41	2.20	Somewhat agree	1.400
	Female	20	2.90	Somewhat agree / Neither agree nor disagree	1.518
Starting family may be barrier for working in construction <sup>a</sup>	Male	42	3.07	Neither agree nor disagree	1.135
	Female	20	3.95	Somewhat agree	0.826

<sup>a</sup>Negatively worded items scoring reversed for analysis (1 – strongly disagree, 2 – somewhat disagree, 3 – neither agree nor disagree, 4 – somewhat agree, 5 strongly agree)

In this subpart we also ask students specifically for their sense of belonging to construction industry. We can see in Table 3 already that there is a difference in the answers of male and female students, but this difference is even clearer when analyzing the breakdown of answers provided in figure 1.

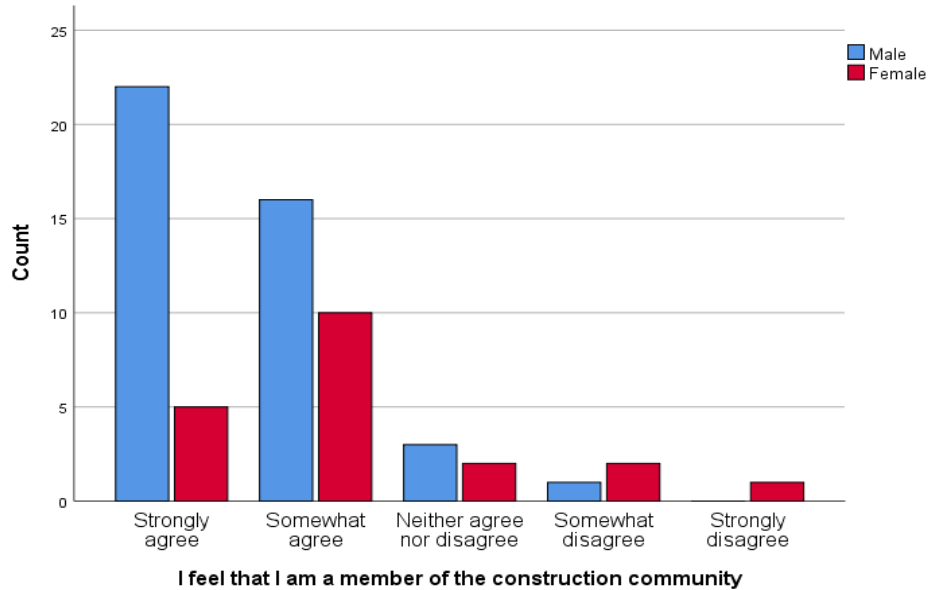


Figure 1 – Female and Male students’ feeling of belonging to construction community (n=62)

Finally, in the third block of questions, respondents answered questions related to their views of women in construction. The five questions analyzed in this block were negatively worded, so a lower mean would represent more disagreement with the statement than a higher mean.

Interestingly, both males and females agree that there is gender discrimination in construction, though how much they agree seem to differ. And while most male and female students strongly disagree with the statement that ‘women are not fit for the jobsite,’ females had a higher standard deviation for this item. In fact, standard deviation was close to one for many of the items for both male and female respondents for many of the items. Another item that seemed to cause disagreement between female and male students was views of recruiters preferring males for jobsite related positions. Table 5 summarizes the findings for the block specific to views of women in construction.

Table 5 – Descriptive Statistics – Views of women in construction (varies from n=60 to n=61)

Item	Gender	N	Mean	Median	Standard Deviation
Women not fit for jobsite <sup>a</sup>	Male	41	1.39	Strongly disagree	0.703
	Female	20	1.45	Strongly disagree	1.099
There is gender discrimination in construction <sup>a</sup>	Male	40	3.63	Somewhat agree	1.148
	Female	20	4.40	Somewhat agree / Strongly agree	0.754
Men are more capable than women in construction <sup>a</sup>	Male	41	2.00	Somewhat disagree	0.949
	Female	20	1.75	Strongly disagree	1.164
Women are better fit for office jobs <sup>a</sup>	Male	41	2.15	Somewhat disagree	1.014
	Female	20	1.80	Strongly disagree / somewhat disagree	1.105
Recruiters prefer males for jobsite related positions <sup>a</sup>	Male	41	2.54	Somewhat disagree	1.267
	Female	20	3.45	Somewhat agree	1.331

<sup>a</sup>Negatively worded items scoring reversed for analysis (1 – strongly disagree, 2 – somewhat disagree, 3 – neither agree nor disagree, 4 – somewhat agree, 5 strongly agree)

## Inferential statistics

To answer our two research questions, we have utilized the Mann-Whitney U-test on the two hypotheses indicated in the methodology section.

For our first hypothesis, we have tested differences in the sense of belonging to the construction community by gender. Our results indicate that there is a significant difference in the mean ranks of female and male students' sense of belonging to the construction community ( $U=281$ ,  $\rho=0.023$ ). Therefore, we can reject the null hypothesis ( $H_{10}$ ) for our first research question. Table 6 provides the test statistics. Male students have a higher sense of belonging to the construction community than female students. This was not surprising after the analysis of the descriptive statistics for this question.

Table 6 – Hypothesis 1 – Summary of Test Statistics

<b>I feel I am a member of the construction community</b>	
Mann-Whitney U	281.000
Z	-2.279
Asymp. Sig (2-tailed)	0.023*

\* test statistics significant at the  $\alpha=0.05$

For our second hypothesis, we have analyzed students' answers to items in the third block of the questionnaire. A total of five items were included in this analysis and we tested the items again using a Mann-Whitney U-test also at the  $\alpha=0.05$  confidence level. Our results are given by item and show a significant difference between male and female views of women in construction only for two items: gender discrimination in construction and views of recruiters preferring males for jobsite related positions. For the first item, female students indicate they perceive discrimination in construction at a higher agreement level than male students. And for the second item, female students agree more than males that recruiters prefer males for jobsite-related positions. Table 7 summarizes the test statistics. Items related to women's capability to work on jobsite, better fit for office jobs and women's fit for construction in general were not found to be statistically different by gender.

Table 7 – Hypothesis 2 – Summary Test Statistics

	<b>Women not fit for jobsite</b>	<b>Gender discrimination in construction</b>	<b>Man more capable than women in construction</b>	<b>Women better fit for office jobs</b>	<b>Recruiters prefer males for jobsite related positions</b>
Mann-Whitney U	380.500	233.500	325.500	317.500	250.500
Z	-0.589	-2.764	-1.383	-1.495	-2.542
Asymp. Sig (2-tailed)	0.556	0.006*	0.167	0.135	0.011*

\* test statistics significant at the  $\alpha=0.05$

## Discussion

Our results concur with previous research in that females are concerned about establishing a life-work balance in construction after starting a family [19], [21], [27], more so than for male students. Our findings also indicate an interesting trend that female and male students overall indicate a lesser likelihood of working in construction for the rest of their lives when compared to five years from now, which warrants further exploration. Much of the previous research is focused on the retention of females and minorities in construction, so there is a lack of research to understand if this is a new trend and the reasons behind the results.

In terms of the sense of belonging, our studies concur with Good, Rattan and Dweck [7] in the mathematics field in that females displayed a lower sense of belonging than male students and establishes an initial baseline for other similar studies on the sense of belonging of construction students, despite its exploratory nature. In a study of professionals' sense of belonging in male-dominated industries, researchers found that sense of belonging, interpersonal sexism, mental health and job satisfaction are interrelated [31], indicating the importance of evaluating the sense of belonging, and the factors that can contribute to its rise and fall.

Though not explicitly measured in previous quantitative studies in construction, sense of belonging is linked to several other factors, such as classroom environment, self-efficacy, peer recognition, family and friends support and others [7], [12]. One result obtained in the present study that stands out due to its difference between male and female students is the question about students' perceptions of having to constantly prove themselves for peer recognition, with women indicating a higher agreement than male students. This echoes some of the participants from Moore and Gloeckner [16], which mentioned having to prove themselves especially for male students.

Our findings related to females perceiving gender discrimination in construction at higher levels than male students seem vaguely resemble those of Bennet, Davidson and Gaeland [21], who found that females perceive industry commitment to equal opportunities as more important than males. This can also be a signal that male students have more difficulty empathizing with women's struggles in the construction industry and perceiving discrimination, given that it is still a male-dominated industry. However, it was still encouraging to see that both female and male students perceive that gender discrimination exists in the industry at some level.

On a positive note, both male and female students seem to agree that women are just as able to work on a jobsite or in the construction industry as a whole. This is similar to research conducted by Bennet, Davidson and Gaeland [21] in that male students recognized women as just as capable to work in construction.

Finally, our results still indicate females' perception that recruitment for jobsite positions is skewed towards males. This finding provides an interesting insight to the construction industry, in that female students seem to perceive recruitment preferences for jobsite related positions. Previous research by Fielden et al. [13] indicated male construction professionals as perceiving jobsite positions not as attractive to women due to weather conditions or that women's lack of strength would be a barrier for women in construction trades. In the same study, it was also noted that some of the biases against women in construction might come from women as well [13]. In sum, our results suggest that the construction industry still has a long way to improve its image

of inclusion. More efforts are still needed to reduce gender bias perceptions and allow for more females to participate in the construction industry now and in the long term.

## **Limitations**

This study was performed in only one university, with two construction related majors at the undergraduate level. More data from other universities can help establish more robust results for construction students as a population. Another potential limitation is that we cannot measure if participants have displayed respondent biases in that they could have answered in a socially accepted manner, regardless of how they felt.

## **Conclusions and recommendations for further research**

Our research has explored the sense of belonging of female and male construction students at a large, midwestern university in the United States. Our findings are novel in that we have specifically measured students sense of belonging to the construction community, showing that female students' sense of belonging is significantly lower than male students'. Additionally, our findings concur with much of the previous research on the retention of female students in construction. And, despite encouraging findings in that male and female students perceive that female students are just as capable to work in the construction industry than males, construction is still perceived as having gender discrimination – by both male and female students, though female students at a more agreement rate.

More interestingly, female students indicated they perceived that recruiters tend to favor males for jobsite positions than females. This finding shows that despite the construction industry's efforts since the turn of the millennium to recruit more women, it is still far from breaking with gender stereotypes that prevent a broader inclusion of women in construction industry as a whole. In addition to providing interesting insight for construction industry improvement, our findings can provide interesting points of discussion to be raised at the undergraduate level and engage all students in a debate about gender inclusion in the construction industry.

Our findings are exploratory in nature and we recommend that further studies be conducted in using the survey to collect data from construction related programs in other institutions, to provide a more robust view of construction students' sense of belonging. Additionally, we recommend follow up interviews to provide more clarification on some items, such as a lower perception of students that they will work in construction in the long run versus immediately after graduation, and assessing young female graduates' actual experience in the construction industry.

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## Appendix – Proposed Revised Questionnaire

### *Block 1 – Demographics*

- 1) What is your gender?
  - a. Male
  - b. Female
  - c. Prefer not to say
  - d. Prefer to self-describe
- 2) Do you consider yourself to belong to a racial/ethnic minority group?
  - a. Yes
  - b. No
  - c. Prefer not to say
- 3) What is your age group?
  - a. 18-24
  - b. 25-30
  - c. 31+
  - d. Prefer not to say
- 4) What is your program?
  - a. **\*\*removed for blind review\***
  - b. Construction management minor
  - c. Other. Please Specify:
- 5) What is your classification in college for your current major? If you are enrolled in two or more majors, choose the highest classification.
  - a. Freshman / First Year
  - b. Sophomore
  - c. Junior
  - d. Senior
  - e. Unclassified or does not apply
- 6) Have you had previous experience in construction (including internships)?
  - a. No
  - b. Yes, internships – for one summer or less
  - c. Yes, internships – for two or three summers
  - d. Yes, a mix of internships and full-time job (with full time position less than 1 year)
  - e. Yes, full time position for 1 year or more (with or without previous internships)

### *Block 2 – Sense of Belonging*

#### Block 2.1 – Family and friends

- 7) For the items below, rate how much you agree with what is stated (1 strongly agree; 2 somewhat agree; 3 neither agree nor disagree; 4 somewhat disagree; 5 strongly disagree).
  - a. My family supports my decision to pursue a degree in construction
  - b. My family approves my choice of career
  - c. My friends support my decision to pursue a degree in construction

### Block 2.2 – Instructors

- 8) For the items below, rate how much you agree with what is stated (1 strongly agree; 2 somewhat agree; 3 neither agree nor disagree; 4 somewhat disagree; 5 strongly disagree).
- a. Instructors in my program are truly concerned about me
  - b. Instructors in my program motivate me to become a better construction professional
  - c. Instructors in my program know me by name
  - d. Instructors in my program value me
  - e. Instructors in my program are approachable for one-on-one discussions on subjects and issues that are important to me
  - f. I am comfortable to interact with instructors in my program

### Block 2.3 – Peers

- 9) For the items below, rate how much you agree with what is stated (1 strongly agree; 2 somewhat agree; 3 neither agree nor disagree; 4 somewhat disagree; 5 strongly disagree).
- a. I feel comfortable interacting with other students in my program
  - b. I am an active participant in my class
  - c. I am valued by my classmates
  - d. My classmates are reluctant to team up with me on group projects
  - e. I need to constantly prove myself to be acknowledged by other students in my program
  - f. I am friends with other students in my program

### Block 2.4 – Construction-related feelings

- 10) For the items below, rate how much you agree with what is stated (1 strongly agree; 2 somewhat agree; 3 neither agree nor disagree; 4 somewhat disagree; 5 strongly disagree).
- a. I actively participate in construction-related student organizations on campus
  - b. I feel that I am a member of the construction community
  - c. I see myself working in construction 5 years from now
  - d. I see myself working in construction for the rest of my life
  - e. Construction is a diverse industry
  - f. Starting my own family may pose a barrier working in the construction industry long term

### Block 3 – Views of women in construction

- 11) For the items below, rate how much you agree with what is stated (1 strongly agree; 2 somewhat agree; 3 neither agree nor disagree; 4 somewhat disagree; 5 strongly disagree).
- a. Women are not fit to be in a jobsite
  - b. There is gender discrimination in the construction field
  - c. Men are more capable than women in the construction domain
  - d. Women are better fit for office jobs rather than being on the field
  - e. I feel recruiters for construction companies prefer hiring males over females for jobsite-related positions