



Self-Efficacy, Motivation, and Locus of Control, Among Male and Female Construction Management Students

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Abstract

Increasing female participation in construction education programs, and ultimately the construction industry, necessitates an understanding of gender-based differences among construction management students. The psychological constructs of self-efficacy, locus of control, and motivation have been shown to influence human behavior and performance in occupational and educational settings. These constructs were adapted to the domain of construction education in a survey instrument that was administered to 178 construction management students at two universities. The mean levels of construction training self-efficacy was significantly lower ($p = 0.033$) for females than males. Females also reported a more internal locus of control and lower level of motivation towards construction education than male students; however, the differences were not statistically significant ($\alpha = 0.05$).

Results suggest that female students were less confident in their abilities regarding construction education and were more likely to express an internal locus of control. A low levels of self-efficacy has been linked in previous research to poor performance and low retention among female students in Science, Technology, Engineering and Math (STEM) programs. Results underscore the need for strategies that boost construction education-specific self-efficacy among female construction management students. Interventions for increasing self-efficacy as well as study limitation and opportunities for further research are discussed.

Introduction

A U.S. Bureau of Labor Statistics study released in March 2013 found that by age 25, 30% of women had earned a bachelor's degree, compared with 22% of men³⁹. Additionally, degrees earned by women constitute more than half of all the undergraduate degrees awarded annually in the US. However, female students are overrepresented in some fields and underrepresented in others³⁸. Undergraduate construction education programs are heavily male dominated, as is the construction industry as a whole. Efforts to increase enrollment and reduce attrition among female students in underrepresented fields have had limited success³¹.

Overall, the construction industry has a poor reputation regarding female inclusion, while simultaneously suffering from a lack of skilled labor^{6, 21}. Researchers posit that women represent the largest untapped source of trainable labor available to the field³³. It is clear that greater inclusion of females would benefit the construction industry. While various approaches can be taken to address this issue, increasing female enrollment and retention in construction education programs plays a key role in enhancing female participation in the construction workforce.

According the Lopez del Puerto, Guggemos, and Shane,¹⁸ women in male-dominated fields often feel the need to “undo their gender”. They devalue and reject their femaleness to gain acceptance in the dominating culture. This leads to identity conflicts and contributes to maintaining a negative environment that discourages women to pursue male-dominated careers³¹. In order to

change the culture to be more accepting of women, a critical mass of females in construction needs to be built.

In recent years there has been increased interest in attracting women to construction and recruitment and retention methods used in construction management programs have been investigated. Lopez del Puerto et al.¹⁸ note that recruitment efforts need to be specifically tailored for women and should involve working with high school advisers and establishing summer camp experiences for prospective female students. They also conclude that once women are enrolled in construction management programs, mentoring by female faculty and establishment of Women in Construction clubs will enhance retention. Finally, construction management education programs need intentional efforts to promote positive images and role models to counter the negative perceptions of female participation in construction. The effectiveness of recruitment and retention strategies hinges on understanding the psychological factors underlying gender disparity in construction management programs.

The main objective of this study was, therefore, to investigate psychological factors responsible for gender disparity in construction management programs at the undergraduate level. A survey instrument was developed to assess student personality characteristics linked to performance in, and completion of, educational programs. The survey response data from 178 construction management students at two universities was analyzed. Based on survey results, strategies are discussed for increasing female representation in construction management programs.

Literature Review

Understanding and explaining human conduct has been an objective of the behavioral sciences for almost 100 years⁵. While many constructs exist that inform human behavior, the initial step in this study was identification of the most pertinent constructs related to pursuit of, and performance in, educational programs. This study relied on the framework of the integrated theory of training behavior developed by Colquitt, LePine, and Noe⁹. In the current study, the theory's salient and interconnected constructs of self-efficacy, locus of control, and motivation were adapted to the domain of construction management education and training.

Self-efficacy is defined by Albert Bandura as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performance"³. Self-efficacy beliefs comprise the foundation for individuals' motivation and level of personal accomplishment because the degree to which they can accomplish tasks is directly related to their incentive to act and obtain the desired outcome²⁸. According to Bandura,⁴ an individual's level of motivation and actions are grounded more in what individuals believe they can accomplish (i.e., their self-efficacy) than what is objectively true about their capabilities. In turn, Pajares²⁹ and Bandura⁴ contend a person's self-efficacy beliefs are often a better predictor of behavior than what they are actually capable of accomplishing. Individuals with the same skill level may achieve much different outcomes in the same task based on their efficacy beliefs and "insidious self-doubt can easily overrule the best of skills"⁴. Highly efficacious people will likely persist in the face of obstacles and persevere in difficult situations to attain the expected outcome (success), whereas people who doubt their capabilities often quit, which confirms their expected outcome (failure)².

Locus of control (LOC) is defined as the extent to which people believe they have control over their own fates²³. Originating in Rotter's social learning theory, LOC refers to the extent to which individuals display an internal or external perception of control over the outcome of varied situations. According to Rotter³², internal versus external control refers to the degree to which persons expect an outcome of their behavior is contingent on their own behavior or personal characteristics versus a function of chance, luck, or fate, and is under the control of powerful others, or is simply unpredictable. Occupational research has shown that internal LOC orientation has been associated with high levels of motivation, problem-solving ability, confidence, effort, and performance in work settings^{17, 23, 35}. Noe²⁴ also identified that LOC was related to training performance outcomes through the expectancy theory of motivation⁹. Those and rewards, whereas those with external LOC orientations (externals) may disregard good or poor performance outcomes as a consequence or condition outside their influence such as fate or good fortune. In occupational settings, pay increases are considered rewards³⁵ and female internals were paid higher wages than externals^{15, 34}.

Self-beliefs are a critical component of modern theories of motivation⁴⁰. Within the realm of human behavior there are numerous theories of motivation. According to Eagle¹⁰ all psychoanalytic theory is, at its core, a theory of motivation and all meaningful human behavior is motivated by one's wishes and desires. Thus, motivation is especially pertinent to understanding a person's pursuit of educational programs. The work of Noe and colleagues^{13, 26, 27} was seminal in distilling motivational theory to the pertinent components that influence educational outcomes within the occupational training domain. In occupational and educational settings, one's motivation to learn and motivation to transfer learned skills to outcomes are intertwined with LOC and self-efficacy^{9, 24, 26, 37}. Colquitt et al.⁹ and Tracey et al.³⁷ found that an individual's self-efficacy and LOC were significant factors influencing motivation to learn and motivation to transfer learned skills to performance.

Methodology

In this study the terms "construction training" and "construction education" were used synonymously. Study participants were informed both verbally and in the written survey that, when responding to the survey, "construction training" should be interpreted to mean the program coursework comprising a four-year degree in construction management. The instrument was comprised of items that were adapted from the Training Attitudes and Intentions Scale²⁵ and Work Locus of Control Scale³⁶. The instrument contained 14 self-efficacy items (i.e., "If I participate in construction training in an unfamiliar area, I expect to be able to do well."), 9 motivation items (i.e., "I would like to improved my construction-related skills."), and 7 LOC items (i.e., "Having the opportunity to attend a construction-related training program is mostly a matter of luck."). Survey respondents provided their level of agreement with each statement on a 5-point Likert scale (1 = Strongly Disagree through 5 = Strongly Agree). High levels of agreement with statements in the instrument indicated higher levels of perceived self-efficacy, higher motivation toward construction education, and an external LOC orientation.

Administration, Data Collection, and Analysis

During the spring semester of 2013, 330 students enrolled in construction management classes at Colorado State University and the University of Nebraska Kearny were invited to respond to the survey. Of the students invited to participate 247 responded with usable surveys, yielding a response rate of 74.8%. It was noted that not all students enrolled in the construction management classes were construction management majors. In fact, several of the female participants were interior design majors. Therefore the survey responses were stratified by major and data analysis focused on 178 students majoring in Construction Management.

Results

The profile of the 178 Construction Management respondents was 92.1% (164) male, which mirrors the gender distribution in construction education. Respondent grade level was distributed as follows: freshmen 19.7% (35), sophomores 19.7% (35), juniors 25.8% (46), seniors 33.7% (60), and graduate students 1.1% (2). Overall the 30-item instrument exhibited internal consistency reliability (Cronbach's α) of 0.90. The self-efficacy ($n=14$), motivation ($n=9$), and LOC ($n = 7$) subscales had internal consistency reliabilities of 0.94, 0.94, and 0.89, respectively.

Significant differences in mean self-efficacy ($p = 0.033$) were observed by gender (Table 1). The mean self-efficacy of males was 0.39 point higher than females of the 5-point scale. Medium effect sizes ($d = 0.57$) was observed for self-efficacy²². It was noted that the mean level of motivation and LOC was lower for females; however, the differences were not statistically significant at the 0.05 level.

Table 1. Mean Self-Efficacy, Locus of Control, Motivation by Gender

Variable	N	M	SD	t	df	p
Self-Efficacy				2.15	176	0.033
Female	14	3.77[3.37, 4.21] ^a	0.76			
Male	164	4.16[4.04, 4.22] ^a	0.59			
Locus of Control				1.42	176	0.158
Female	14	1.91	0.64			
Male	164	2.15	0.61			
Motivation				0.36	176	0.716
Female	14	4.16	0.78			
Male	164	4.23	0.68			

^a 95% confidence intervals provided when mean difference was significant at ≤ 0.05 level

It has been widely documented in occupational and training research that high self-efficacy and motivation are positively correlated with each other while negatively correlated with an external LOC^{8, 9, 30}. It can be seen that the correlations between the psychological constructs in this study (Table 2) are directionally consistent with previous research, providing evidence of convergent construct validity.

Table 2. Correlation Matrix, N = 178

Construct	1	2	3	M	SD
1. Self-Efficacy	1			4.11	0.61
2. Motivation	0.79	1		4.22	0.64

3. Locus of Control	-0.40	-0.44	1	2.13	0.62
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Note: All correlations are significant at $p < 0.001$ level (2-tailed).

Discussion

Results suggest that female students were significantly less efficacious ($p = 0.033$) than their male counterparts regarding their abilities in construction education. With regard to self-efficacy within social cognitive theory, Bussey and Bandura⁷ contend that environmental factors, other than gender, are at work in creating motivational and self-regulatory differences between individuals. However, according to Pajares,²⁸ in male-dominated fields “a masculine orientation is associated with confidence and achievement because masculine self-perceptions are imbued with the notion that success in these areas is a masculine imperative”. In other the male-dominated educational fields, like engineering, female student’s intentions to persist were significantly and positively related to their level of self-efficacy¹⁹. Construction education and the construction management are male-dominated^{11, 12, 14} and the findings of this study warrant further investigation of self-efficacy and persistence among construction management students.

While not significant at the 0.05 level, female students were, on average, slightly less motivated and expressed a more internal locus of control orientation than did male participants. While the difference between male and female student motivation was small, it should be noted that the correlation between self-efficacy and motivation was significantly high ($r = 0.79, p < 0.001$). Additionally, high levels of self-efficacy and motivation were negatively correlated with an external LOC ($r = -0.40, p \leq 0.001$ and $r = -0.44, p \leq 0.001$, respectively). Low levels of self-efficacy as well as an external locus of control have been linked in previous research to poor performance in occupational training and education settings^{1, 9, 16}. This indicates that an understanding of construction management student’s self-efficacy, motivation, and LOC orientation may provide valuable insight into the likelihood for success in construction management education. Results underscore the need for strategies that affirm or boost construction training self-efficacy among female construction management students.

These findings must be interpreted within the context of the methodological framework. First, the study was conducted at only two universities and the results may be different based on a broader selection of students. In addition, since female students are underrepresented in construction education programs, the female students sampled was small. In addition, the sample was not random but surveyed a pre-existing group of students enrolled in construction management courses. The authors also recognize that self-report surveys have an inherent potential for recall and reporting bias. Respondents may provide truthful or spurious answers, and responses can be biased by poor recall or a negative state of health at the time of the survey. Therefore, the results of this study should be interpreted with caution and generalization of the findings requires further investigation. However, despite these limitations, this study provides initial insights into the roles of self-efficacy, motivation, and LOC in gender disparity among students enrolled in construction management programs.

Conclusions and Future Research

In order to increase the enrollment of women in construction education programs, the underlying causes must be addressed. According to Marra, Rodgers, Shen, and Bogue,¹⁹ “a strong sense of

self-efficacy, especially for women students who are under-represented in engineering classrooms, can help them persist and enable them to become practicing engineers". Zeldin, Britner, and Pajares⁴⁰ posit that females Science, Technology, Engineering and Math (STEM) students gain their self-efficacy through social persuasion and vicarious experience, whereas males increase their self-efficacy through mastery experiences. Further, women in STEM fields rely on relationships to create and support their confidence to succeed in male-dominated fields⁴⁰. Both the present study and previous research in STEM education underscore the need for effective interventions to increase self-efficacy among female students and thereby increase recruitment and retention of females in construction management programs.

Several potential interventions, as suggested by Lopez del Puerto, Guggemos and Shane,¹⁸ that influence female student's self-efficacy through social persuasion and vicarious experience are:

- Mentoring: provide like-gender mentors for female mentees. Mentors can be female faculty, students enrolled in the program, or active construction industry members.
- Establish Women in Construction Clubs: These clubs support both the professional and social needs of female construction management students by providing an environment of camaraderie.
- Summer Programs for Prospective Female Students: Summer program experiences encourage prospective students to explore the construction management field.

Future research will focus on determining whether or not female students had formal or informal mentors who influenced their academic and career decisions. Additionally, an instrument is being developed to investigate the influence of mentors on self-efficacy and confidence in construction management students. The instrument will be administered to a sufficiently large sample which will increase the number of female participants and allow refinement of the conclusions of this study.

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