THESIS

MENTORS, ROLE MODELS, AND DIFFERENCES IN SELF-EFFICACY AND MOTIVATION AMONG CONSTRUCTION MANAGEMENT STUDENTS

Submitted by

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ABSTRACT

MENTORS, ROLE MODELS, AND DIFFERENCES IN SELF-EFFICACY AND MOTIVATION AMONG CONSTRUCTION MANAGEMENT STUDENTS

Perceived self-efficacy, motivation, and the presence of mentors and role models have value as predictors of career choice and student success. To understand these constructs within the domain of construction education, a quantitative survey was administered to students enrolled in construction management courses ($n = 468$) at two large universities. Study results revealed that mean perceived self-efficacy toward construction education was significantly ($p < 0.001$) higher for construction management (CM) students who report having a role model. Further, CM students who report having a mentor reported a higher mean level of motivation to successfully complete construction education programs and courses ($p = 0.015$). Differences in self-efficacy and motivation toward construction education between male ($n = 410$) and female ($n = 56$) students suggest that female CM students have higher motivation towards construction education ($p = 0.024$) than their male counterparts. However, due to unequal gender distribution in the sample, coupled with violations of *t* test assumptions, gender-based findings should be interpreted with caution. This study indicates that students who report having a mentor or role model have higher self-efficacy and motivation toward construction education compared to students without a mentor or role model. The instrument adapted and utilized in the current study can be used to investigate these pertinent construction education-domain specific constructs in order to understand the influence of others on students' academic decisions and performance.

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CHAPTER 1: INTRODUCTION

According to the U.S. Department of Labor (2014a), the employment of construction managers is projected to grow 16% from 2012 to 2022. During that same period, the average growth rate of all occupations and management positions, are forecast to be 11% and 7%, respectively. While a portion of the workforce may qualify as construction managers with a high-school diploma and construction experience, “It is increasingly important for construction managers to have a bachelor’s degree in construction science, construction management, architecture, or engineering. As construction processes become more complex, employers are placing greater importance on specialized education” (United States Department of Labor, 2014a).

According to Schleifer (2002), women are “the largest untapped source of skilled and trainable labor available to the industry” (p. 101). However, the representation of women in the construction industry has declined despite efforts to increase participation in construction careers and education. According to Menches and Abraham (2007), the recruitment and retention of women in construction is hindered by several challenges including a poor image of the industry, a male-dominated culture, difficult work-life balance, and slow advancement. In order to attract and retain more women, “special initiatives are necessary to encourage young women to gain appropriate education and training and to seek career within construction” (Menches & Abraham, 2007, p. 704).

D. C. Koch, Greenan, and Newton (2009) explored the career influences of undergraduate construction management students and found that students’ interest in construction, hands-on activities, and inside/outside work environment were the most influential factors, and the most influential person was the father. According to Zeldin and Pajares (2000), the academic and career choices of women in mathematics, science, and technology careers were influenced most often by the encouraging messages and frequent exposure to mathematics through family members with related careers. Moore and Gloeckner (2007) reported similar findings for women with careers in construction; the majority of women had a parent with a construction industry-related occupation, and parental support influenced their decision to enter a non-traditional program. According to Koch et al. (2009), “A better understanding of student characteristics in construction is critical to provide educators a better understanding with respect to interests and motivations of CM students. Demographic information regarding the influences of students can assist construction management programs in strategic planning and program improvement” (p. 295).

Research Problem

The representation of women in the construction industry has declined despite efforts to increase participation of women in male-dominated fields such as construction. The ratio of women to all employees in construction peaked at 13.3% in 2009 and has since declined to 12.8% (United States Department of Labor, 2014b). Research has shown that factors including perceived self-efficacy, motivation, and the influence of others have value as predictors of career choice and student success (Bandura, 1977, 1986; Day & Allen, 2004; Fried & MacCleave, 2010; Kram & Isabella, 1985; Nauta & Kokaly, 2001). However, a review of literature revealed very few studies examining these relationships among students in construction education. Educators could better from a clearer understanding of how mentors and role models influence the self-efficacy, motivation, and academic decisions of students in construction education.

Purpose Statement

The purpose of this study was to examine and compare the existence of role models and mentors with students' levels of self-efficacy and motivation within the construction education domain. To accomplish this objective, a quantitative survey was administered to college students enrolled in undergraduate-level construction management courses. The survey was adapted from existing instruments for use within the domain of construction education. Data was used to investigate the difference in construction training self-efficacy (CTSE) between students who report having a role model and those who report having no role model as well as the difference in training motivation attitudes (TMA) between students who report having a mentor and those who report having no mentor. This study sought to explore the connection between the influence of others and students' self-efficacy and motivation regarding construction education.

Research Questions

1. Is there a significant difference in perceived self-efficacy toward construction education between students who report having or not having a role model?
2. Is there a significant difference in motivation attitudes towards construction education between students who report having or not having a mentor?

Definition of Terms

Construction Education: A post-secondary education that includes the social, economic, and technical aspects of construction project management and prepares students for a leadership role in the industry (American Council for Construction Education, 2014).

Construction Management: "A professional management practice consisting of an array of services applied to construction projects and programs through the planning, design, construction and post construction phases for the purpose of achieving project objectives including the management of quality, cost, time and scope" (Construction Management Association of America).

Construction Training: "A training intervention that focuses on improving or providing individuals with the needed skills to complete construction-related tasks" (Elliott, 2013, p. xiv).

Construction Training Self-Efficacy: Perceived self-efficacy towards construction training (Elliott, 2013); "perceived self-efficacy is defined as people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986, p. 391).

Educational (Degree) Program: "An education system with identified academic coursework, containing the bodies of knowledge necessary to obtain a postsecondary college or university degree in that field of study" (American Council for Construction Education, 2014, p. 4).

Mentor: A person who has influenced your academic decisions by actively giving advice, encouraging (or discouraging), supporting, providing information, or helping you make decisions (Fried & MacCleave, 2010, p. 485).

Role Model: A person who, either by doing something or by being admirable to you in one or more ways, has had an impact on the academic decisions you have made in your life. Role models may be people you know personally, or they may be people you simply know of (Nauta & Kokaly, 2001, p. 85).

Training Motivation Attitudes: Attitudes toward construction training that likely influence trainees' motivation to learn, apply newly acquired skills, or perform well in construction training (Elliott, 2013; Noe & Schmitt, 1986); an attitude is the degree to which a person has a favorable or unfavorable evaluation or appraisal of a specific behavior (Ajzen, 1991); motivated behavior is “any behavior intended to accomplish a particular end or purpose” (Eagle, 2012, p. 40).

Significance of the Study

The limited number of females participating in both construction careers and education programs is a documented problem, especially in light of the construction industry’s skilled labor shortage and lack of diversity (Menches & Abraham, 2007; Moir, Thompson, & Kelleher, 2011; Schleifer, 2002). According to the U.S. Department of Labor, 12.7% of all persons employed in construction are women (2014b) and only 7.3% of persons employed as construction managers are women (2013). Research has shown that factors including perceived self-efficacy, motivation, and the influence of others have value as predictors of career choice and student success (Bandura, 1977, 1986; Day & Allen, 2004; Fried & MacCleave, 2010; Kram & Isabella, 1985; Nauta & Kokaly, 2001). Studies exploring the relationships between these factors have been completed by others, and a review of literature revealed numerous studies on self-efficacy, motivation and the influence of others among women in STEM careers and education programs. However, very few studies examining these relationships for students in construction education were identified through an exhaustive review of literature.

In this study, female students reported higher levels of self-efficacy and motivation compared to male students. Further research is needed to investigate if the high scores observed in this study were a result of the decision by less-efficacious and less-motivated students to choose other programs. This study provides an instrument that can be used to investigate these constructs within the domain of construction education in order to understand how to recruit and retain students, especially women, in construction education. This study also provides exploratory results that indicate the influence of mentors and role models have a positive effect on self-efficacy and motivation - the constructs that are shown to influence student success.

Research Approach

The purpose of this study was to examine and compare the existence of role models and mentors with students' levels of self-efficacy and motivation within the construction education domain. A quantitative survey was administered to 635 college students enrolled in undergraduate-level construction management courses during the spring semester of 2014 at Colorado State University (CSU, n = 286) and Texas A&M University (TAMU, n = 349). The 52-item survey comprised 37 items from Elliott's (2013) Construction Training Attitudes and Intentions Scale (CTAIS) and 15 items from Nauta and Kokaly's (2001) Influence of Others on Academic and Career Decisions Scale (IOACDS). These instruments were adapted for use within the domain of construction education. The CTAIS identifies characteristics intended to contribute to attrition and performance in construction training programs (Elliott & Lopez del Puerto, in press). This study included the following subscales from the CTAIS: planned training behavior (PTB), construction training self-efficacy (CTSE), and training motivation attitudes (TMA). The IOACDS assesses the type and degree of influences of others on undergraduate students' academic and career decisions; the IOACDS includes support/guidance (SG) and inspiration/modeling (IM) subscales. The instrument and survey item adaptation are described in Chapter 3.

Delimitations

The sample was confined to college students who enrolled in construction management courses at two large western/mid-western universities. The data, from the convenience sample, was used to evaluate constructs adapted for use within the domain of construction education. For analysis, the researcher stratified the sample and majors; students with non-construction majors (e.g., interior design) were removed Limitations posed by the sample are discussed below and in Chapter 5.

Limitations and Assumptions

Study results must be understood within the context of the underlying assumptions. The first assumption is that an individual's perceptions of self-efficacy and motivation are important in predicting the behaviors of undergraduate construction management students. The second assumption is that respondents answered the questions honestly. The course instructors were not present during survey administration; however, it is possible that participants felt that their responses could be connected to their class grade, thus influencing their answers. The third assumption is that respondents could discern the difference between the terms of role model and mentor (specifically defined in the survey) and reported based on accurate understandings of these terms. The survey administration procedures are discussed in Chapter 3.

There were several limitations in the study design and sample. The purpose of this study was to examine and compare the existence of role models and mentors with students' levels self-efficacy and motivation within the construction education domain. The participants were selected from a convenience sample of students pursuing degrees at Colorado State University (CSU) and Texas A&M University (TAMU). The survey was administered to students enrolled in undergraduate-level construction management courses required for a Bachelor of Science in Construction Management (CSU) or Construction Science (TAMU). Construction education programs in the United States are associated with various disciplines including, but not limited to applied science, engineering, architecture, and business. The sampling of this study limits the generalizability of the conclusions for other construction education programs.

This study was limited to a quantitative cross-sectional survey designed to assess students' perceptions of self-efficacy and motivation regarding construction education. The unequal size of the sample limited comparisons by gender between female (n = 56) and male (n = 410) students. The gender distribution of the sample was representative of construction education programs. For example, 7.6% of construction management students at CSU (Colorado State University, 2014) and 7.5% of construction science students TAMU were female (Texas A&M University, 2014). For construction careers, 12.7% of all persons employed in construction are women (United States Department of Labor, 2014b) and only 7.3% of persons employed as construction managers are women (United States Department of Labor, 2013).

The responses were self-reported and were reflective of participants' current attitudes and beliefs. All survey responses were recorded on a Scantron® form, which limited the number of response options on several demographic items; the survey response form also limited how information on mentors and role models were reported. Since participation was voluntary and incentivized, the findings may be limited by response bias. Some responses may be overly positive and not accurately reflect the views of the sample; however, the high response rate (83.0%) indicates a smaller chance of response bias (Creswell, 2012). The limitations in the study design and sample have an impact on the interpretation of the findings and generalizability of the conclusions. A complete discussion on the limitations is provided in Chapter 5.

Researcher's Perspective

The researcher has been teaching an undergraduate construction estimating course at Colorado State University for the last two years and has ten years of experience in the construction industry. This experience includes working as a purchasing system manager, a residential designer, and as an assistant project manager. By completing this research, the author has increased her understanding of the factors that influence the confidence and motivation of students in construction education.

CHAPTER 2: REVIEW OF LITERATURE

Chapter 2 provides a review of the literature regarding factors that influence students' academic choice and performance. Research on both academic and career development are included in order to identify pertinent and applicable constructs to the domain of construction education. The review of literature revealed parallels between models of academic choice and career development. Lent, Brown, and Hackett (1994) acknowledged these similarities: "Interests and skills developed during the school years ideally become translated into career selections – although social and economic factors frequently intervene to affect the level and content of choices pursued (p. 81)." Persistence, achievement, and interest in STEM programs (e.g., science, technology, engineering, and mathematics) is related to students self-efficacy beliefs (Hutchison, Follman, Sumpter, & Bodner, 2006). The effectiveness of training programs is related to motivational and environmental factors, such as attitudes and expectations of trainees towards training outcomes (Noe, 1988).

The chapter begins with a review of self-efficacy and its relationship with behavior in academic and occupational domains. Next, attitudes and motivation toward education and career performance are discussed. To address objective of this study, the influence of role models and mentors on self-efficacy, motivation, and academic/career decisions are reviewed. Lastly, research on construction management and other STEM fields suggest differences in academic and career decision-making between male and female students. This chapter examines how various factors influence the academic choice and performance of women in construction and other traditionally male-dominated fields.

Self-Efficacy

According to Bandura's (1986) social cognitive theory, "human functioning is viewed as the product of the dynamic interplay of personal, behavior, and environmental influences" (Pajares, 2002). Social cognitive theory posits that human behavior is not directly influenced by environmental factors; rather, "how people interpret the results of their own behavior informs and alters their environments and the personal factors they possess which, in turn, inform and alter subsequent behavior" (Pajares, 2002). Social cognitive theory emphasizes the influence of self-beliefs on motivation and self-regulated behavior, which are determined primarily by self-efficacy beliefs (Bandura, 1991). "Perceived self-efficacy is defined as people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances. It is concerned not with the skills one has but with judgments of what one can do with whatever skills one possesses" (Bandura, 1986, p. 391).

According to Bandura, there are four sources of personal efficacy expectations: performance accomplishments, vicarious experience, verbal persuasion, and physiological states. Performance accomplishments are based on personal mastery experiences which are raised through repeated successes and lowered by repeated failures; the impact of failures on personal efficacy depends on the timing and overall experience. A strong perceived self-efficacy, developed through repeated successes, reduces the impact of failures on mastery expectations. Furthermore, occasional failures overcome by persistent effort raise mastery expectations. Personal efficacy expectations are also developed through vicarious experiences and modeling. The observer generates expectations of how their own performance can improve based on the experience of others; they recognize their own ability to overcome adverse situations by observing the persistence of another. The influence of the modeled behavior on efficacy expectations is greatest when observed outcomes are clear and unambiguous. Expectations of personal competence can be developed through verbal or social persuasion; however, this type of influence is often a weak source of self-efficacy beliefs. Lastly, physiological states (e.g., emotional reactions) refer to how personal experiences are cognitively appraised. For example, anxiety and fear reactions to situations can be diminished by developing coping skills through mastery experience and modeling (Bandura, 1977).

Lent, Brown, and Hackett (1994) developed a conceptual framework to understand the development of interest, choice, and performance in academic and career behavior. The framework was primarily derived from Bandura's (1986) social cognitive theory; it explores how occupationally relevant self-efficacy, outcome expectations, and goal representations are related to external, contextual, and learning factors. The authors' analysis of relevant research revealed a significant, and positive, correlation between vocational interests (i.e., occupational and academic interests) and self-efficacy ($r = 0.53$, $p < 0.001$) as well as outcome expectations ($r = 0.52$, $p < 0.001$); positive outcome expectations were related to self-efficacy beliefs ($k = 3$, $r = 0.49$, $p < 0.01$). A positive relationship was also observed between choice goals (e.g., aspirations such as declaring a major) and self-efficacy beliefs ($k = 8$, $r = 0.40$, $p < 0.01$), outcome expectations ($k = 3$, $r = 0.42$, $p < 0.01$), and relation to interests ($k = 6$, $r = 0.60$, $p < 0.001$).

Furthermore, the authors found that career/academic performance was influenced by self-efficacy beliefs ($k = 9$, $r = 0.38$, $p < 0.001$) and career/academic ability ($k = 8$, $r = 0.34$, $p < 0.001$). Lastly, the framework explored Bandura's (1977) four sources of efficacy expectations as related to career/academic activities; self-efficacy beliefs were positively related to personal performance accomplishments ($r = 0.51$, $p < 0.001$), vicarious learning ($r = 0.20$,

$p < 0.05$), and social persuasion ($r = 0.28$, $p < 0.05$) and were inversely related to emotional arousal (e.g., anxiety; $r = -0.40$, $p < 0.01$). The results indicate that personal performance accomplishments had the strongest effect on self-efficacy ($k = 3$, $r = 0.75$, $p < 0.001$) compared to the other sources (Lent et al., 1994).

Motivation

London's (1983) theory of career motivation "includes individual characteristics and behaviors that reflect career identity, insight into factors affecting one's career, and the determination to persist toward career goals" (Noe, Noe, & Bachhuber, 1990, p. 340). Noe and Schmitt (1986) investigated the relationship between motivational influences (e.g., attitude towards career and training) and training program effectiveness. The path-analytic results suggest the following causal relationships: reaction to skill assessment/reaction to training program (ß = 0.51, $p < 0.05$), job involvement/career planning (ß =0.34, $p < 0.05$), job involvement/learning (ß = 0.45, $p < 0.05$), and career planning/behavior changes (ß = 0.25). Trainees who reacted positively to the assessment of their skills were more likely to perceive the training course as effective. Job involvement was an antecedent of career planning as well as learning, and career planning was related to behavior improvement. While path coefficients were significant on several variables, it should be noted that the authors acknowledge the small sample size and study design limit the generalizability of the findings (Noe & Schmitt, 1986).

Noe et al. (1990) investigated personal characteristics (e.g., career stage, work role salience, position, distance from career goal, and the match between personal and organizational career plans) as well as situational characteristics (e.g., managerial support and job characteristics) of employees from various industries. They found that work role salience and job characteristics had the strongest relationship with career insight, identity, and resilience.

Regarding work role salience, the authors explained that "employees who place a high level of importance on their work role are likely to have higher levels of career insight, identity, and resilience than persons who have less interest and involvement in their work" (p. 342). The job characteristics that had a positive influence on motivation included feedback, use of a variety of skills, and autonomy (e.g., given complete responsibility for tasks). The authors observed that managerial support was also positively related to career resilience and insight. Managers influenced career motivation by providing support through coaching and feedback, communicating expectations, and by advising on career-related issues (Noe et al., 1990).

Mentors & Role Models

Research on the influence of others on self-efficacy, motivation, and academic/career decisions revealed various mentor and role model functions and definitions, including the following descriptions of mentors and role models:

Mentor

- "A mentor is an experienced employee *who serves as a role model* [emphasis added], provides support, direction and feedback regarding career plans and interpersonal development….also someone who is in a position of power, who looks out for you, gives you advice and/or brings your accomplishments to the attention of people who have power in the company" (Day & Allen, 2004, p. 77);
- "…mentor was a person who has influenced your career decisions by actively giving advice, encouraging (or discouraging), supporting, providing information, or helping you make decisions" (Fried & MacCleave, 2010, p. 485);
- "…define mentors as persons who provide advice and support to a protégé through an interactive relationship" (Gibson, 2004, p. 137);

- "In the psychosocial sphere, the mentor offers role modeling, counseling, confirmation, and friendship, which can help the yound adult to develop a sense of professional identity and competence" (Kram & Isabella, 1985, p. 111);

Role Model

- "The traditional idea of a role model is that of a person in an influential role position, such as a parent, teacher, supervisor or mentor, who provides an example for individuals to imitate" (Erikson, 1985 as cited by Gibson, 2004, p. 135);
- "…role model was defined as a person you know personally, or know of, who has influenced your career decisions by being admirable in one or more ways" (Fried & MacCleave, 2010, p. 485);
- "…define a role model as a cognitive construction based on the attributes of people in social roles and individual perceives to be similar to him or herself to some extent and desires to increase perceived similarity by emulating those attributes" (Gibson, 2004, p. 136);
- "A role model is someone to whom individuals look or to whom they turn for social and emotional support and affirmation or from whom they seek to learn something related to their 'person-ness'" (Mertz, 2004, p. 552); and
- "Role models are people who, either by doing something or by being admirable to you in one or more ways, have had an impact on the academic and career decisions you have made in your life. Role models may be people you know personally, or they may be people you simply know of. They may have had a positive influence on you, or they may have had a negative influence" (Nauta & Kokaly, 2001, p. 85).

Literature uses many different definitions of mentor and role model with various, sometimes contradictory, functions (Gibson, 2004; Mertz, 2004). In some cases, the terms of mentor and role model have been used reciprocally. Kram (1983) described mentors as providing two separate functions, psychosocial and career. Psychosocial functions of mentoring are "those aspects of a relationship that enhance an individual's sense of competence, identity, and effectiveness" and career functions are "those aspects of a relationship that enhance advancement in an organization" (Kram, 1985 as cited by Mertz, 2004, p. 549). Based on Kram's description, Mertz (2004) divided career functions of mentoring "into professional development (activities designed to help individuals grow and develop professionally) and career advancement (activities designed to help individuals advance professionally)" (p. 549).

The term role model has also been inconsistently used and vaguely defined in literature. Gibson (2004) differentiated role models from mentors and other types of developmental relationships. According to Gibson, role model relationships influence self-concept and provide learning, motivation and inspiration. Self-conception, as defined in Bandura's (1986) social cognitive theory, is the evaluation of oneself formed through experiences and evaluations of performances from signification others; a person's self-conceptions can be positive (i.e., judges oneself favorably) or negative (i.e., devalues oneself) and these perceptions may vary across activities.

Mentors, role models, and other supportive relationships generally fall into the following categories: family members (e.g., father, mother, uncle), significant other (e.g., friend, peer, partner), educational (e.g., teacher, instructor, advisor), career (e.g., co-worker, supervisor), and others (e.g., acquaintances, public figures, media personalities).

The Influence of Mentors and Role Models

Day and Allen (2004) examined the influence of career and psychosocial mentoring on career self-efficacy and motivation. Employees who reported having a mentor during their career were compared to those without a mentor; a mentor was defined as an experienced employee who provides support, direction and feedback regarding career plans and interpersonal development. The levels of career self-efficacy were not significantly different between mentored and non-mentored employees, as defined in the study. However, the results indicated mentored employees had significantly higher levels of career motivation compared to non-mentored employees. The relationship between the type of mentoring and each factor were also examined. A significant, and positive, correlation ($r = 0.29$, $p < 0.05$) between career mentoring and self-efficacy was observed, but the relationship between psychosocial mentoring and career self-efficacy was not significant. Career motivation was significantly, and positively, correlated with both career mentoring ($r = 0.28$, $p < 0.05$) and psychosocial mentoring ($r = 0.31$, $p < 0.05$) (Day & Allen, 2004).

D. C. Koch, Greenan, and Newton (2009) explored the career influences of undergraduate construction management students. Participants were asked to report the degree of influence of people and situations and the aggregate mean scores were ranked from most to least influential. The top three most influential items were students' interest in construction, hands-on activities, and inside/outside work environment, respectively. The most influential person was the father, which was fourth overall, and the least influential was the high school guidance counselor, which had the lowest mean score of all eighteen items. The means of overall career influence were compared by several demographic characteristics including students' age, gender, experience in career/technical programs in high school, volunteer experience, and paid work experience. A significant difference in mean career influence and amount of paid work experience was observed; however, there were no significant differences in age, gender, career/technical or volunteer experiences (Koch et al., 2009).

Types of Influential Relationships

Research on mentors and role models revealed several relationships categories (e.g., family members, significant others, educational, career, and others) that influenced self-efficacy beliefs and motivation as well as academic and career decisions. According to Zeldin and Pajares (2000), the academic and career choices of women in mathematics, science, and technology careers were influenced most often by a family member who modeled mathematics skills through related careers or experiences. The encouraging messages and frequent exposure to mathematics through family members developed women's self-efficacy beliefs and the resultant confidence to enter a male-dominated field (Zeldin & Pajares, 2000). Moore and Gloeckner (2007) reported similar findings for women with careers in construction. The majority of women had a parent with a construction industry-related occupation, and parental support influenced their decision to enter a non-traditional program; most often, the father had the strongest influence (Moore & Gloeckner, 2007). Similar findings were reported by D.C. Koch et al. (2009); when examining the career influences of undergraduate construction management students, participants reported fathers as the most influential person in career decisions (Koch et al., 2009).

Zeldin and Pajares (2000) recognized the confidence and abilities of women with careers in mathematics, science, and technology were also influenced by teachers. Through vicarious experiences and verbal persuasions, both male and female teachers that supported women in non-traditional fields were influential because "the teachers' enthusiasm for the subject matter and because of their passion regarding the success of women in the male domains" (Zeldin & Pajares, 2000, p. 232).

When assessing the career influences of undergraduate construction management students, D.C. Koch et al. (2009) found high school counselors to be the least influential person. Francis and Prosser (2014), examined career counselors' perceptions of the construction industry as a "good career option" for young men and women. Participants were also asked how often they directed young men and women to a career in construction. The factors (i.e., perceptions and frequencies) were measured independently and participants reported significantly higher scores for young men on both factors. This indicates that career counselors perceived construction careers to be a better career option for young men compared to young women. Further, young men were directed to careers in construction more often than young women were. The results showed no significant difference in scores between male and female counselors. While counselor gender was insignificant, the results suggest that counselors with a personal acquaintance in the construction industry and greater knowledge of construction careers were more likely to direct young women towards construction careers (Francis & Prosser, 2014).

Moore and Gloeckner (2007) found that only one out of the 24 women entered construction management as their first major after high school; the majors included programs in architecture, design, engineering, business, science, art, and education, and the reasons for changing majors varied. For those who first chose male-dominated majors (e.g., engineering), parental support had the greatest influence on their decision to enter a non-traditional major. However, the decision to change to a construction management program was influenced most often by significant others, such as boyfriends, husbands, and friends. According to Zeldin and Pajares (2000), women in mathematics-related careers reported that peers were less influential on academic and career decisions compared to family members and teachers; however, the influence of peers within the chosen major was an important contributor to confidence and ability. They also reported that supervisors were sources of motivation and confidence in their careers.

Gender of the Mentor and Role Model

Zeldin and Pajares (2000) recognized the confidence and abilities of women in non-traditional careers were influenced by others though vicarious experiences and verbal persuasions. Involvement with male and female significant others (e.g., family members, teachers, peers, and supervisors) formed self-efficacy beliefs and influenced their career decisions. The authors noted the degree of influence was related to how supportive the significant other was, regardless of gender. In the study of career counselors' perceptions of the construction industry, Francis and Prosser (2014) compared results by gender of the career counselor. While participants perceived construction careers to be a better career option for young men compared to young women, there was no significant difference between the scores for male and female counselors. Furthermore, although the career counselors were directing more young men than women to careers in construction, there was no significant difference in reported frequencies by counselor gender. The results suggest that male and female counselors had similar perceptions of the construction industry (Francis & Prosser, 2014).

Women in Construction

Research suggests that women in non-traditional fields who exhibit strong personal efficacy expectations are more resilient to obstacles and have greater persistence in their career and academic paths (Hutchison et al., 2006; Marra, Rodgers, Shen, & Bogue, 2009; Zeldin & Pajares, 2000). For male-dominated fields such as science, technology, engineering, and mathematics (STEM), women often feel a lack of inclusion which can result in lower perceived self-efficacy (Marra et al., 2009), and negative work environments are linked to attrition for women in non-traditional fields (Lopez del Puerto, Guggemos, & Shane, 2011). As a male-dominated field, construction management is a non-traditional career choice for women. According to the U.S. Department of Labor, 12.7% of all persons employed in construction are women (2014b) and only 7.3% of persons employed as construction managers are women (2013).

According to Bandura (1977), vicarious experiences and verbal persuasions, such as suggestions or social expectations, are less reliable sources of personal efficacy compared to mastery experiences. However, research suggests that vicarious experiences are often reported as a self-efficacy source for women in non-traditional fields, such as STEM (Hutchison et al., 2006; Zeldin & Pajares, 2000). Further, Zeldin and Pajares (2000) found that vicarious experiences and verbal persuasions were pivotal sources for self-efficacy beliefs in women with careers in mathematics, science, or technology. Involvement with significant others, such as family members, teachers, peers, and supervisors formed self-efficacy beliefs and influenced their career decisions.

Lopez del Puerto, Guggemos, and Shane (2011) investigated strategies for recruiting and retaining women in construction management education. The authors suggested that programs include a formal mentoring program to match students with a female faculty member or peer. Female role models and mentors provide guidance and support to female students, and they are effective in recruitment efforts. Other strategies for targeting and promoting the industry to females included addressing negative perceptions in the industry, engaging high school advisors, and establishing women in construction clubs (Lopez del Puerto et al., 2011).

In a longitudinal study of women in engineering degree programs, Marra, Rodgers, Shen, and Bogue (2009) measured perceptions of self-efficacy. They compared the differences in the following constructs after one year: perceptions of ability to overcome difficult situations or other barriers in order to succeed in engineering education (i.e., coping strategies), confidence in completing engineering degree requirements (i.e., engineering degree self-efficacy), the potential benefit of mathematics skills in engineering careers (i.e., math outcome expectations), sense of inclusion within the program (i.e., inclusion), and the perceived ability to succeed (i.e., engineering education self-efficacy). The mean scores on the following constructs had a significant positive change after one year: coping strategies (0.43, $t(176) = -4.34$, $p < 0.001$), engineering degree self-efficacy (0.53, $t(176) = -5.37$, $p < 0.001$), and math outcome expectations (0.41, $t(176) = -3.18$, $p < 0.002$). However, the participants reported a significant negative change for sense of inclusion within the program (-0.18, $t(194) = -4.34$, $p < 0.007$) after one year. While the difference was not significant, the engineering education self-efficacy (defined as perceived ability to earn an “A” or “B” in engineering courses) also decreased after one year (-0.08). The authors suggest that the female students “reported being more efficacious in areas of engineering education that are critical to success in completing a degree (p. 32)” after one year, even though their perceived inclusion and engineering education self-efficacy decreased (Marra et al., 2009).

Moore & Gloeckner (2007) observed that women in construction careers with high self-confidence exhibited high career self-efficacy. The participants self-reported their perceived confidence to complete career tasks (e.g., problem solving, communication, productivity, etc.) and responded to a questionnaire that assessed how different experiences influenced their confidence. For these women, the confidence to enter a non-traditional academic program was an outcome of several factors including mathematics and science skills, personality traits, self-efficacy, and the influence of role models, mentors, and significant others. They most often attributed personal experiences as the source of personal efficacy expectations; their personal accomplishments and physiological states significantly outscored vicarious experience and verbal persuasion (Moore & Gloeckner, 2007).

Summary

The review of the literature revealed several pertinent and applicable constructs that influence students' academic choice and performance: self-efficacy, motivation, and the influence of others. Research suggests differences between men and women concerning how these constructs influence academic choice and performance in traditionally male-dominated fields. Persistence, achievement, and interest in STEM programs is related to students self-efficacy beliefs (Hutchison et al., 2006); according to Bandura (1977), vicarious experiences and verbal persuasions are less reliable sources of personal efficacy compared to mastery experiences. However, the review of literature revealed that vicarious experiences are often reported as a self-efficacy source for women in non-traditional fields (Hutchison et al., 2006; Zeldin & Pajares, 2000). The effectiveness of training programs is related to motivational and environmental factors (Noe, 1988), and research indicates a positive relationship between the influence of others and protégé motivation (Day & Allen, 2004; Noe et al., 1990; Zeldin & Pajares, 2000). The methods used to investigate self-efficacy, motivation, and the influences of others within the domain of construction education are discussed in the following chapter.

CHAPTER 3: METHODS

Introduction

As identified in Chapter 2, a review of the literature revealed factors that influence students' academic choice and performance. Previous studies have observed a positive relationship between self-efficacy and the influence of others through vicarious experiences and modeled behavior (Bandura, 1977; Hutchison et al., 2006; Zeldin & Pajares, 2000). A review of career and training research indicated a positive relationship between the influence of others and protégé motivation (Day & Allen, 2004; Noe et al., 1990; Zeldin & Pajares, 2000).

A quantitative survey was used to investigate differences in construction education-domain level self-efficacy and motivation among construction management students who report having, or not having, a role model and/or mentor. The questionnaire used in the current study (hereafter, the survey) was administered in-person to college students who voluntarily enrolled in construction education courses at Colorado State University (CSU) and Texas A&M University (TAMU). The survey was adapted from two existing instruments in order to assess respondent perception of motivation and self-efficacy within the domain of construction education. In addition, the instrument assessed how others have influenced students' academic decisions. This chapter describes the study participants, instrument adaptation, demographic survey items, data collection methods and analysis used to investigate the following research questions:

1. Is there a significant difference in perceived self-efficacy toward construction education between students who report having or not having a role model?
2. Is there a significant difference in motivation attitudes towards construction education between students who report having or not having a mentor?

Study Participants

The pool of participants was composed of a convenience sample of students pursuing degrees at Colorado State University (CSU) and Texas A&M University (TAMU). The survey was administered to students enrolled in undergraduate-level construction management courses required for a Bachelor of Science in Construction Management or Construction Science degree. At CSU, the survey was administered in the following courses: Introduction to Construction Management (CON 101), Graphic Communications/CAD (CON 131), Construction Estimating I (CON 265), Construction Estimating II (CON 365), and Construction Project Scheduling and Cost Control (CON 461). The potential sample size at CSU was 362 students. At TAMU, the survey was administered in the following courses: Construction Graphics (COSC 175), Estimating I (COSC 275), Professional Ethics in Construction Industry (COSC 381), and Construction Industry Contemporary Issues (COSC 483). The potential sample size at TAMU was 435 students.

Prerequisite and co-requisite courses were chosen in order to reduce the likelihood of a student completing the survey multiple times. However, it is possible that students were enrolled in more than one course in which the survey was administered. Therefore, students were asked not to complete the survey if taken previously. In addition, the last four digits of the students' phone numbers were used as the participant ID and the response forms were screened for duplicate phone numbers. The combined potential sample size for CSU and TAMU was 797 students based on the spring 2014 enrollment in each course.

Instrument Selection

The survey was comprised of items from the Construction Training Attitudes and Intentions Scale (CTAIS) and the Influence of Others on Academic and Career Decisions Scale

(IOACDS). These instruments were adapted for use within the domain of construction management education. The author of the CTAIS (J. W. Elliott, personal communication, December 2, 2013) gave permission to adapt and utilize the instrument. The developers of IOACDS stated, “Other researchers do not need to contact us to obtain permission to use this scale” (Nauta & Kokaly, 2001, p. 91).

Elliott’s (2013) CTAIS identifies characteristics intended to contribute to attrition and performance in construction training programs (Elliott & Lopez del Puerto, in press). The CTAIS was developed in two phases by the use of surveys administered to construction management undergraduate students. The Phase 1 survey was created with 98 items from existing measures used in occupational and educational settings; these items were adapted for use within the domain of construction training and the adapted 98-item survey was administered to students in construction management courses. Phase 1 resulted in the removal of 54 items through analysis of inter-item correlations and exploratory factor analysis (EFA). Four factors emerged in Elliott’s (2013) study: Planned Training Behavior (PTB), Construction Training Self-Efficacy (CTSE), Training Motivation Attitudes (TMA), and Training Locus of Control (TLOC). During Phase 2, the 44-item CTAIS was administered to construction management students to measure these four constructs. The Cronbach’s Alpha statistics (0.83 - 0.91, see Table 3.1) reported suggest internal consistency reliability of the CTAIS and its four constructs (Elliott & Lopez del Puerto, in press).

Table 3.1
Internal Consistency Reliability for the CTAIS

Factor	Cronbach’s Alpha (α)
Planned Training Behavior (PTB)	0.91
Construction Training Self-Efficacy (CTSE)	0.95
Training Motivation Attitudes (TMA)	0.93
Training Locus of Control (TLOC)	0.83
Total	0.90

According to Elliott (2013), the 14 PTB items assess respondent intention and attitudes toward, as well as perceived norms regarding construction training on a 5-point bipolar adjective scale (e.g., *definitely false* 1 2 3 4 5 *definitely true*). PTB scores range from 14-70; higher scores indicate intention to perform well, favorable attitude towards construction training, and the perception of acceptance in the pursuit of construction training. Responses for the CTSE, TMA, and TLOC items are reported on a 5-point Likert scale (e.g., strongly disagree = 1 to strongly agree = 5). The 14 CTSE items assess respondent level of perceived self-efficacy toward construction training. CTSE scores range from 14-70; higher scores indicate elevated perceived self-efficacy toward construction training. The nine TMA items assess respondent attitudes and motivation toward construction training TMA scores range from 9-45; higher scores indicate high levels of motivation to complete or perform well in construction training. The seven TLOC items assess respondent perceptions of control; scores range from 7-35 and indicate whether respondents perceive that the outcome of their construction training is controlled by their own actions or by other forces. The TLOC subscale was not included in the current study in order to reduce the total number on survey items.

Nauta and Kokaly's (2001) IOACDS assesses how and to what degree others influence undergraduate students' academic and career decisions. The IOACDS was developed through four studies. The participants surveyed were students enrolled in undergraduate programs across various disciplines at the same university. In study 1 participants identified the role models that have the most influence on their academic and career decisions and described the type of influence provided by each role model. The responses were coded into five categories; gives advice, encourages/supports, inspires, models, and helps make decisions. Seven statements from each of the five categories were used to create a 35-item pool. Many of the respondents in study

1 reported types of influence, such as providing emotional support and reassurance, which are not typically associated with role models. As a result, the IOACDS was developed with the intent to measure the type and degree of influences of others on undergraduate students' academic and career decisions.

In study 2 respondents were asked to indicate their level of agreement with 35-items using a 5-point Likert scale (e.g., *strongly disagree* = 1 to *strongly agree* = 5). A two-factor solution, composed of support/guidance (SG, factor 1) and inspiration/modeling (IM, factor 2), was identified through EFA. The IOACDS contained 15 items after EFA, including eight items assessing support/guidance and seven items assessing inspiration/modeling. The 35-item IOACDS was administered in study 3 but only the 15 items with highest factor loadings from study 2 were analyzed. Confirmatory Factor Analysis (CFA) was used in study 4 to confirm the two-factor structure in studies 2 and 3. The Cronbach's Alpha statistics (0.89 - 0.91, see Table 3.2) observed in the four studies suggest internal consistency reliability of the IOACDS and its two constructs (Nauta & Kokaly, 2001).

Table 3.2
Internal Consistency Reliability for the IOACDS

	Cronbach's Alpha (α)			
Factor	Study 2	Study 3	Study 4 (test)	Study 4 (re-test)
Support/Guidance	0.90	0.91	0.89	0.94
Inspiration/Modeling	0.89	0.87	0.87	0.91
Total	0.91	0.90	0.89	0.91

The 15-item IOACDS aggregate score measures perceived influence of others on career and academic decisions; responses for the IOACDS items are reported on a 5-point Likert scale (e.g., *strongly disagree* = 1 to *strongly agree* = 5) yielding scores from 15-75. As previously stated, the IOACDS is comprised of two distinct factors; SG (8-item) assesses the perceived level of support and guidance from others and IM (7-item) assesses the level of inspiration and modeling. Higher scores indicate high perceived levels of influence of others on career and academic decisions.

Instrument and Survey Item Adaptation

The survey was adapted from existing instruments in order to assess students in construction education programs. The adapted survey included 52 items from five scales: PTB (14), CTSE (14), TMA (9), SG (8), and IM (7). PTB, CTSE, and TMA were adapted from the domain of construction training to the domain of construction education (e.g., "training/education" was changed to "education" and "program" was changed to "course" for some items). See Appendix A for a list of original and adapted survey items.

The PTB items were adapted to assess respondent attitudes and expectations regarding performance in or completion of construction education (e.g., "I would make an effort to attend the meetings of a construction training/education program on a regular basis" was changed to "I would make an effort to attend the meetings of construction education courses on a regular basis"). Responses were reported on a 5-point bipolar adjective scale (e.g., *definitely false* 1 2 3 4 5 *definitely true*); higher scores indicate favorable attitudes, high perceived value of construction education, and a high perception of acceptance by others regarding the pursuit of construction education.

The CTSE items were adapted to assess respondent efficacy toward performance in or completion of construction education programs (e.g., "My past experiences and accomplishments increase my confidence that I will be able to perform well in construction training/education" was changed to "My past experiences and accomplishments increase my confidence that I will be able to perform well in construction education"). Responses for CTSE items were reported on a 5-point Likert scale (e.g., *strongly disagree* = 1 to *strongly agree* = 5); higher scores indicate high perceived self-efficacy toward construction education.

TMA items were adapted to assess respondent attitudes and motivation toward construction education programs (e.g., “I value construction-related training/education” was changed to “I value construction-related education”). Responses for TMA items were also reported a 5-point Likert scale; higher scores indicate a high level of motivation for successful completion of construction education.

From Nauta & Kokaly’s (2001) IOACDS, items were adapted to assess the perceived level of influence of others on academic decisions within the domain of construction education (e.g., “there is someone I can count on to be there if I need support when I make academic and career choices” was changed to “there is someone I can count on to be there if I need support when I make academic choices” and “there is someone I am trying to be like in my academic or career pursuits” was changed to “there is someone I am trying to be like in my construction education pursuits”); see Appendix A for a list of original and adapted survey items.

Responses for the IOACDS items are reported on a 5-point Likert scale (e.g., *strongly disagree* = 1 to *strongly agree* = 5); higher scores indicate high perceived levels of influence from others. Higher scores on the SG scale indicates a high perceived level of influence from others through support and guidance; higher scores on the IM scale indicates a high perceived level of influence from others provided by inspiration and modeling.

Data Collection

Each survey item was assigned a unique factor ID (i.e., Inspiration/Modeling Item 1 = IM_01) and items were randomly distributed throughout the survey but clustered by similar response type as described below (See Appendix B for a list of factor IDs and corresponding survey items). Responses for items 1-38 were reported on a 5-point Likert scale (e.g., strongly disagree = A to strongly agree = E) and included items for the CTSE, TMA, SG, and IM constructs. The PTB subscale items were reported on a 5-point bipolar adjective scale and were distributed through items 39-52; PTB items with the same response option (e.g., definitely false A B C D E definitely true) were clustered. The factor ID naming procedure ensured that items could be organized by construct after random distribution within the survey.

Permission to administer the survey was obtained from CSU and TAMU (Appendix C) and human subjects exemption was granted from the Institutional Research Board (IRB) at CSU (Appendix D). The survey was administered at the beginning or end of each class session. Attendance in each course was recorded on the day of survey administration in order to determine the response rate. Course instructors were asked to leave the room during survey administration; if the course instructor was a researcher for this study, a research assistant administered the survey. Once the instructor exited the room, a verbal script (Appendix E) was used to introduce the survey and to inform the students there are no known risks associated with this survey and the survey responses are anonymous.

The researcher or a research assistant attended CON 101, 131, 265, and 461 to administer hard copies of the survey at CSU; assistants administered the survey in CON 365 because the researcher was an instructor of that course. Research assistants administered hard copies of the survey at TAMU and mailed completed surveys to CSU for analysis.

Each student was given a survey package that included a cover letter (Appendix F), survey (Appendix G), response sheet (Scantron® form, Appendix H), and blank note card. The cover letter (consent form) informed students that participation was voluntary and the instructor for the course would not know who participated and who did not. Students were reminded not to include their name, email address, or student identification numbers on the survey or response sheet. Students were instructed to include the last four digits of their phone number in the "Spaces for Student Number" section of the Scantron® form; as previously noted the four digits of the phone number were used to check for students completing the survey multiple times. The only personal identifying information, an email address, was collected on the note card for use in a gift card drawing as described below.

Survey responses and note cards were collected in separate envelopes and returned to the researcher at CSU. After the surveys were collected, the response sheets were ordered by the last four digits of the student phone numbers and the surveys were numbered. Survey response numbering was used as the participant ID in data analysis. Scantron® sheets were taken to CSU's testing center for data entry and compilation into an electronic dataset. The testing center was unable to process 45 Scantron® sheets administered and collected by TAMU, necessitating that the researcher manually entered responses from the 45 surveys into the dataset. For all other response sheets, the CSU testing center provided the researcher with Comma-Separated Values (CSV) files with survey response data sorted by Participant ID numbers.

The survey was incentivized with a chance to win an Amazon.com gift card valued at $10 each. To enter into the drawing for a chance to win one of the gift cards, respondents could voluntarily provide contact information, in the form of an email address, on the separate note card. Contact information was limited to student email addresses only. Email addresses were used for the gift card drawing process only, and the note cards were shredded immediately after the drawing process. Although they were handed out together, the note cards containing email addresses were never physically connected to survey responses. Survey responses were collected in a separate envelope from the note cards. There was no means by which to connect survey responses with participant email addresses.

Demographic Survey Items

Participants reported demographic information including gender, age, ethnicity, major, current year in school, grade point average, construction management experience, hands-on construction experience, number of construction internships, family involvement in the industry, and level of involvement in extra-curricular activities. Participants also reported information on the mentor and role model who had the greatest influence on their academic decisions. All survey responses were recorded on a Scantron® form, which limited responses to five categories. Therefore, age, grade point average, construction management experience, hands-on construction experience, and level of involvement in extra-curricular activities were reported in ranges. The level of involvement in extra-curricular activities (e.g., student clubs, students competition teams, fraternities or sororities, intercollegiate athletics, ROTC, etc.) was reported using a five-point semantic differential scale (e.g., *not active* 1 2 3 4 5 *very active*).

The demographic survey items were the same for each sample except for the item asking participants to identify their major. The response options for major were different as each institution had different majors represented in the sample. CSU response options were: construction management or pre-CM, interior design, undeclared, dual major (including construction management), and other. TAMU response options were: construction science, architecture or landscape architecture, agricultural leadership, dual major (including construction science), and other. See Appendix G for the survey administered at CSU and TAMU, including the modified response options on item 55 (i.e., “What is your major?”) for the survey administered at TAMU.

The response options for ethnicity were chosen based on student demographics reported by CSU (Colorado State University, 2013) and TAMU (Texas A&M University, 2013). Describing the ethnic identity of the sample was limited by the Scantron® format. Therefore, the four most frequently reported ethnic affiliations at CSU and TAMU were used for this study and a fifth category was chosen for all other ethnicities; the response options were Non-Hispanic White, Hispanic, Asian American, African American, and Other/International.

Age was reported in the following ranges: 17 years or younger, 18-19 years, 20-21 years, 22-24 years, and 25 years or older. These ranges were chosen so that participants who were minors at the time of survey (17 years or younger) and non-traditional students (25 years or older) could be isolated. A review of literature revealed there is no standard for non-traditional classification. According to Horn & Carroll (1996), non-traditional students can be characterized based on factors such as age, race, gender, enrollment status, residence, and level of employment. Bean and Metzner (1985) recommend that a student should have one or more of the following characteristics to be classified as non-traditional: part-time, commuter, and 25 years of age or older. In this study, participants were not asked to record enrollment status, residence (e.g., on-campus, commuter), or level of employment. Therefore, any participant 25 years of age or older was considered a non-traditional student.

Construction management and hands-on construction experience, as defined by Elliott (2013), were reported in number of months. Construction management experience was defined as “field or office management tasks; such as submittal/shop drawing review, writing requests for information (RFIs), preparing estimates or budgets, preparing or updating schedules, and so on” (p. 81). Hands-on construction experience was defined as “labor related tasks; such as, installing roofing materials, cleaning up the site, assisting in the installation of brick, placing concrete, placing reinforcing, and so on" (p. 81) Respondent participation in construction management internships was reported as the total number of experiences. Respondents reported if anyone in their family works in the construction industry in a dichotomous (Yes/No).

Participants reported if they had a mentor who influenced their academic decisions. A mentor, adapted from Fried and MacCleave (2010, p. 485), was defined in the survey as "a person who has influenced your academic decisions by actively giving advice, encouraging (or discouraging), supporting, providing information, or helping you make decisions." If the participant responded "yes", they were asked to identify the mentor who has the greatest influence on their academic decisions by selecting one of the following five response categories: family member, friend/peer/significant other (spouse/partner), professor/instructor/academic advisor, co-worker/supervisor, other. Respondents were then asked to report the gender of the mentor identified in the previous item and to report if the mentor works in the construction industry.

Participants reported if they had a role model. A role model, adapted from Nauta and Kokaly (2001, p. 85), was defined in this survey as "a person who, either by doing something or by being admirable to you in one or more ways, has had an impact on the academic decisions you have made in your life. Role models may be people you know personally, or they may be people you simply know of." If the participant responded "yes", they were asked to identify the role model who has the greatest influence on their academic decisions by selecting one of the following five response categories: family member, friend/peer/significant other (spouse/partner), professor/instructor/academic advisor, co-worker/supervisor, and "someone I know of, but do not know personally". Respondents also reported the gender of the role model and indicated if the role model works in the construction industry.

Data Screening

Screening of data was completed prior to analysis to identify participant responses that had outliers, missing and invalid responses. The intent of this study was to measure the self-efficacy and motivation of adult (18 years of age or older) undergraduate construction management students. Respondents who were graduate students, students with non-construction management majors, and minors (17 years old or younger) were identified and removed from the data prior to analysis.

Addressing Research Question One

Previous studies observed a relationship between self-efficacy and the influence of others through vicarious experiences and modeled behavior (Bandura, 1977; Hutchison et al., 2006; Koch, Johnson, & Marshall, 2013; Zeldin & Pajares, 2000). Career and academic choices are influenced by one's sense of self-worth, self-identity, and self-efficacy, and the development of these beliefs are related to the career options students will consider (Koch et al., 2009). The choice of STEM as a career is influenced by self-efficacy, motivation, persistence, achievement, and interest in related programs (Hutchison et al., 2006; Koch et al., 2013). For students pursuing careers in construction management and STEM, career decisions are most often influenced by family members (Koch et al., 2009; Moore & Gloeckner, 2007; Zeldin & Pajares, 2000).

Research question one addressed the difference in perceived construction training self-efficacy (CTSE) between students who report having a role model and those who report having no role model. The independent variable was having a role model and had a dichotomous response (i.e., yes/no). Responses were used to examine mean comparisons and answer the research question. The null and alternative hypotheses were as follows:

H_0: $\mu_{\text{students with role model}} = \mu_{\text{students without role model}}$ There is no difference in perceived CTSE between participants who report having a role model and participants who report not having a role model.

H_1: $\mu_{\text{students with role model}} \neq \mu_{\text{students without role model}}$ There is a difference in perceived CTSE between participants who report having a role model and participants who report not having a role model.

An independent samples *t* test was performed to address research question one. Aggregate mean CTSE scores of the group reporting having a role model and the group reporting having no role model were compared. In this study, several independent samples *t* tests were performed. The author recognized that, due to the exploratory nature of this study, a Bonferroni correction might have been appropriate. However, to reduce the risk of a type one error, a more conservative significance level ($p < 0.01$) was used for retaining the alternative hypothesis.

Addressing Research Question Two

A review of career and training research indicated a positive relationship between the influence of others and protégé motivation (Day & Allen, 2004; Noe et al., 1990; Zeldin & Pajares, 2000). Research question two addressed the difference in training motivation attitudes (TMA) between students who report having a mentor and those who report having no mentor. The independent variable was having a mentor and had a dichotomous response (i.e., yes/no). Responses were used to examine mean comparisons and answer the research question. The null and alternative hypotheses were as follows:

H_0: $\mu_{\text{students with mentor}} = \mu_{\text{students without mentor}}$ There is no difference in perceived TMA between participants who report having a mentor and participants who report not having a mentor.

H_1: $\mu_{\text{students with role model}} \neq \mu_{\text{students without role model}}$ There is a difference in perceived TMA between participants who report having a mentor and participants who report not having a mentor.

An independent samples *t* test was performed to address research question two. Aggregate mean TMA scores of the group reporting having a mentor and the group reporting having no mentor were compared. The significance level for retaining the alternative hypothesis was conservatively set at $p < 0.01$ for this study as explained previously.

Supplemental Data Analysis

Research suggests that women in non-traditional fields who exhibit strong personal efficacy expectations are more resilient to obstacles and have greater persistence in their career and academic paths (Hutchison et al., 2006; Marra et al., 2009; Zeldin & Pajares, 2000). However, female students in male-dominated fields often feel a lack of inclusion which can result in lower perceived self-efficacy (Marra et al., 2009). Elliott and Lopez del Puerto (2014) observed that female construction management students had significantly lower perceived self-efficacy regarding construction training compared to male students, and female students were also less motivated to attend training sessions compared to male students, though the difference was not significant. However, the sample size was small and further research is needed to understand these gender differences in construction-related training and education.

Supplemental analysis was completed to investigate if there was a difference in planned training behavior (PTB), construction training self-efficacy (CTSE), training motivation attitudes (TMA), support/guidance (SG), and inspiration/modeling (IM) between female and male students. The independent variable was gender and had a dichotomous response (i.e., female/male). Responses were used to complete independent samples *t* test to investigated mean difference for each of the dependent variables. Null and alternative hypotheses were created for each of the five constructs; an exemplary hypothesis for CSTE is provided as follows:

H_0: $\mu_{\text{female}} = \mu_{\text{male}}$ There is no difference in perceived CTSE between female and male students.

H_1: $\mu_{\text{female}} \neq \mu_{\text{male}}$ There is a difference in perceived CTSE between female and male students.

An independent samples *t* test was completed for each construct, and aggregate mean scores of female students and male students were compared. The significance level for retaining the alternative hypothesis was conservatively set at $p < 0.01$ for this study as explained previously.

Research on career and academic decision-making suggested that self-efficacy was positively correlated with support, guidance, inspiration, and modeling provided by others (Bandura, 1977; Day & Allen, 2004; Hutchison et al., 2006; Moore & Gloeckner, 2007; Zeldin & Pajares, 2000). Supplemental analysis was completed to investigate if there was an association between construction training self-efficacy (CTSE) and the influence of others on academic and career decisions (IOACDS). The following null and alternative hypotheses were developed to test the relationship between CTSE and IOACDS:

H_0: Perceived Construction Training Self-Efficacy (CTSE) is positively correlated with the Influence of Others on Academic and Career Decisions (IOACDS)

H_1: Perceived Construction Training Self-Efficacy (CTSE) is negatively correlated with the Influence of Others on Academic and Career Decisions (IOACDS)

In order to address the supplemental analysis, the associational hypothesis was tested using a two-tailed correlation matrix. The significance level for retaining the alternative hypothesis was conservatively set at $p < 0.01$ for this study as explained previously.

Conclusion

The purpose of this study was to examine and compare the existence of role models and mentors with students' levels of self-efficacy and motivation within the construction education domain. To accomplish this objective, a quantitative survey was administered to college students enrolled in undergraduate-level construction management courses. As described in this chapter, the survey was adapted from existing instruments for use within the domain of construction education. The survey was used to investigate the difference in CTSE between students who report having a role model and those who report having no role model as well as the difference in TMA between students who report having a mentor and those who report having no mentor. The survey results are discussed in the following chapter.

CHAPTER 4: RESULTS

Introduction

As described in Chapter 3, a quantitative survey was used to investigate differences in construction education-domain level self-efficacy and motivation among construction management students who report having, or not having, a role model and/or mentor. Supplemental analysis was completed to investigate differences in intentions, attitudes, perceived norms, self-efficacy, and motivation toward construction education between male and female students, and the degree to which others influence undergraduate students' academic decisions was compared by gender. In addition, the correlation between construction training self-efficacy and the influence of others on academic decisions was investigated. This chapter provides description of the survey administration, statistical procedures, and findings.

Survey Administration

The survey was administered to a convenience sample of 635 students enrolled in undergraduate-level construction management courses during the spring semester of 2014 at Colorado State University (CSU, $n = 286$) and Texas A&M University (TAMU, $n = 349$). Attendance in each course was recorded on the day of survey administration in order to determine the response rate. Table 4.1 shows the potential number of participants as determined by course attendance during survey administration, the actual number of surveys collected, and the response rate. Survey administration was completed in-person during class time; students were asked not to complete the survey if taken previously in another course. In addition, the last four digits of the phone number were included to reduce the chance of student taking the survey multiple times. Participants were given the opportunity to enter a drawing to win an

Amazon.com gift card valued at $10 each. Of the students invited to participate, 527 returned survey response sheets yielding a response rate of 83% (Table 4.1).

Table 4.1
Survey Sample Size and Response Rate by Course

Course	*n* Potential	*n* Actual	%
CSU			
CON 101	72	70	97.2
CON 131	72	64	88.9
CON 265	54	53	98.1
CON 365	52	41	78.8
CON 461	36	31	86.1
Total	286	259	90.6
TAMU			
COSC 175	116	105	90.5
COSC 275	117	97	82.9
COSC 381	55	7	12.7
COSC 483	61	59	96.7
Total	349	268	76.8
Total	635	527	83.0

Note. Numbers of participants are combined for all course sections.

Data Screening

Data (n = 527) were compiled into a single dataset and screened for outliers, missing and invalid responses. For missing data, the researcher found that one participant did not report their year in school, one did not report both year in school and major, and seven participants failed to complete the survey after starting; these nine participants were removed.

The responses were screened for outliers, defined as improbable but not invalid responses, which can be the result of failure to follow directions (McBurney & White, 2010). An example of an outlier would be reporting a valid response to an item the participant was instructed to skip. For example, the survey (Appendix G) asked “Do you have a role model?” and if the response was “No”, the participant was instructed to skip the following three items.

Responses to corresponding items were not included in the analysis if participant reported the first item as “No” or null (i.e., no response given).

The responses were screened for participants with invalid responses, such reporting “C”, “D”, or “E” to an item that had only “A” or “B” as response options (McBurney & White, 2010). The response sheet (Appendix H) had five response choices, but several survey items (Appendix G) had only two response options (e.g., “What is your gender?”, female or male). For these items, if the participant reported a response other than “A” or “B” the response was changed to null. The data was also screened for items with more than one response. For some occurrences, the testing center had recorded both the reported response as well as an erased response; the researcher verified the response and changed the dataset. If the participant recorded two responses, the response was changed to null on the dataset.

The data was screened for participants that had both outliers and invalid responses. One participant reported “E” for items 2-52, which indicated several conflicting responses (e.g., “There is someone I am trying to be like in my construction education pursuits” and “There is no one I am trying to be like in my construction education pursuits” were both reported as “Strongly Agree”); therefore, that participant was removed from the dataset due to invalid responses. For 13 participants, multiple (e.g., 7-12) items were identified as outliers and invalid responses, and it appeared they filled out the response sheet incorrectly; therefore, they were removed from the data. During data screening, the researcher identified a survey with a repeating pattern of responses that resulted in multiple outliers; this participant was removed from the dataset.

The intent of this study was to measure the self-efficacy and motivation of undergraduate construction management students. Therefore, seven graduate students were removed from the dataset. IRB protocol delimited the sample in this study to adult students (18 years of age or older); therefore, six respondents who reported their age as 17 years old or younger were removed. Participants were classified as construction management students if they reported one of the following majors: construction management or pre-CM, dual major (including construction management), construction science, and dual major (including construction science). Twenty-two participants with the following majors were removed: interior design, undeclared, architecture or landscape architecture, agricultural leadership, and other.

Of the 527 surveys collected, 59 surveys were removed through data screening procedures resulting in the inclusion of 468 usable surveys in the data analysis as shown in Table 4.2. The responses in the dataset were transformed from alphanumeric to numeric data (e.g., “A” = 1, “B” = 2, etc.) and numeric responses were imported into SPSS 22 statistical software. The data were imported into SPSS as Factor IDs (e.g., Survey Item 1 = IM_01); see Appendix B for a list of Factor IDs with corresponding survey items. Lastly, reverse-scored items (IM_02, IM_04, IM_05, SG_05, and SG_06) and were re-coded in SPSS.

Table 4.2
Survey Response Rate and Data Screening Procedures

Category	*n*	%
Students Invited to Participate	635	
Returned Surveys	527	83.0
Surveys Removed via Screening Procedures	59	
Study Sample Used in Analysis	468	
Removed Surveys by Reason (*n*=59)		
Missing Data	9	
Outliers and Invalid Responses	15	
Graduate Students	7	
Non-Construction Majors	22	
Minors (17 years old or younger)	6	

Sample

The demographic characteristics of the 468 participants are detailed in Appendix I. Of the respondents, 12.0% (56) were female and 88.0% (410) were male. At the time of survey, 91.5%

(428) reported being between the ages of 18-24 and 8.5% (40) were 25 years or older. For ethnicity, participants reported the following categories: Non-Hispanic White (80.1%, 371), Hispanic (14.3%, 66), Asian American (2.4%, 11), African American (1.5%, 7), and Other/International (1.7%, 8). For year in school, the respondents were 13.2% (62) freshman, 44.4% (208) sophomore, 21.2% (99) junior, and 21.2% (99) senior at the time of survey. Respondents reported their grade point average (GPA) in ranges: 0 - 1.0 (0.4%, 2), greater than 1.0 but less than 2.0 (2.0%, 9), greater than 2.0 but less than 3.0 (39.8%, 179), greater than 3.0 but less than 4.0 (55.6%, 250), and 4.0 or higher (2.2%, 10).

Participants also reported construction management experience, hands-on construction experience, and participation in construction management internships. For construction management experience (e.g., field or office management tasks; such as submittal/shop drawing review, writing requests for information (RFIs), preparing estimates or budgets, preparing or updating schedules, and so on), 32.5% (148) of respondents reported having no experience and 67.5% (308) reported having some experience. For hands-on construction experience (e.g., labor related tasks; such as, installing roofing materials, cleaning up the site, assisting in the installation of brick, placing concrete, placing reinforcing, and so on), 16.9% (77) of respondents reported having no experience and 83.1% (378) reported having some experience. For participation in construction management internships, 73.4% (334) had no internship experience and 26.6% (121) had some experience.

For family involvement in the construction industry (e.g., a construction-related business such as a general contractor or subcontractor, construction material supplier, etc.), 51.6% (232) responded yes (i.e., a family member works in the construction industry) and 48.4% (218) responded no. The level of participant involvement in extra-curricular activities (e.g., student clubs, students competition teams, fraternities or sororities, intercollegiate athletics, ROTC, etc.) was reported using a five-point semantic differential scale with bipolar adjectives (e.g., Not Active 1 2 3 4 5 Very Active); the mean score of respondents was 3.20 (n = 467, SD = 1.38).

Participants reported if they had a mentor or role model that influenced their academic decisions. For mentor (e.g., a person who has influenced your academic decisions by actively giving advice, encouraging (or discouraging), supporting, providing information, or helping you make decisions), 48.1% (221) students responded yes (i.e., they have a mentor) and 51.9% (238) reported no. The participants identified mentor relationships as the following: 64.6% family member; 16.5% friend, peer or significant other (spouse, partner); 13.2% professor, instructor, or academic advisor; 3.8% co-worker or supervisor; 1.9% other. For gender, 21.4% of mentors were female and 78.6% were male. When asked if the mentor works in the construction industry, 59.3% reported yes and 40.7% no.

For role model (e.g., a person who, either by doing something or by being admirable to you in one or more ways, has had an impact on the academic decisions you have made in your life. Role models may be people you know personally, or they may be people you simply know of), 72.9% (310) students responded yes (i.e., they have a role model) and 27.1% (115) responded no. The following role model categories were reported: 71.7% family member; 19.1% friend, peer or significant other (spouse, partner); 3.6% professor, instructor, or academic advisor; 3.6% co-worker or supervisor; 2.0% someone I know of, but do not know personally (e.g., considered a person who you do not know personally, but know of, such as through the media or through historical account). For gender, 18.1% of role models were female and 81.9% were male. When asked if the role model works in the construction industry, 53.8% reported yes and 46.2% no. The demographic characteristics are detailed in Appendix I.

Scale Reliability

The internal consistency reliability coefficients (Cronbach's Alpha, see Table 4.3) were calculated for CTAIS, IOACDS, and all subscales (PTB, CTSE, TMA, SG, and IM). According to Morgan, Leech, Gloeckner, and Barrett (2007), "alpha should be positive and usually greater than 0.70 provide good support for internal consistency reliability" (p. 129).

Table 4.3
Scale and Subscale Internal Consistency Reliability Coefficients (Cronbach's Alpha)

Scale	*n*	Number of Items	α
CTAIS	458	37	0.95
PTB	462	14	0.90
CTSE	464	14	0.93
TMA	466	9	0.92
IOACDS	464	15	0.89
SG	464	8	0.87
IM	467	7	0.88

Note. n = number of valid responses. α = Cronbach's alpha

Answering Research Question One

Research question one asked whether there was a significant difference in perceived construction education self-efficacy (CTSE) between students who report having a role model and those who report having no role model. The null and alternative hypotheses were as follows:

H_0: $\mu_{\text{students with role model}} = \mu_{\text{students without role model}}$ There is no difference in perceived CTSE between participants who report having a role model and participants who report not having a role model.

H_1: $\mu_{\text{students with role model}} \neq \mu_{\text{students without role model}}$ There is a difference in perceived CTSE between participants who report having a role model and participants who report not having a role model.

To address research question one, an independent samples *t* test was performed. The mean CTSE scores of participants who reported having a role model (n = 308, M = 4.28) were compared with those who reported not having a role model (n = 114, M = 3.99). The assumption of equal variances was violated (F = 3.928, $p = 0.048$), and the distribution of mean CTSE scores for participants with a role model and those with no role model were negatively skewed (-1.85 and -2.00, respectively) and leptokurtic (10.77 and 5.732, respectively). The *t* test is robust to violations of assumptions of homogeneity of variance and normality of distribution if the sample sizes are equal (Boneau, 1960). Results of the two-tailed independent samples *t* test (Table 4.4) with unequal sample sizes indicated a significant difference in mean CTSE score between students who reported having a role model and those who reported not having a role model, $t(154) = 4.09$, $p < 0.001$. The mean CTSE score of the group reporting having a role model was 0.29 points higher on a 5-point scale than the CTSE score of the group reporting having no role model, and the effect size (Cohen's $d = 0.53$) was typical (Morgan et al., 2007). The confidence intervals (95%) for means CTSE are displayed in Table 4.4.

Table 4.4
Independent Samples t Test Results for Construction Training Self-Efficacy (CTSE) by Having a Role Model

Variable	*n*	*M*	*SD*	*t*	*df*	*p*
CTSE				4.09[a]	154.06[a]	0.000
Students with role model	308	4.28 [4.22,4.34][b]	0.48			
Students without role model	114	3.99 [3.86,4.12][b]	0.70			

[a]t and df were adjusted due to unequal variances
[b]confidence intervals provided when mean differences were significant at < 0.05 level

To address the violations of the assumption of normality, two-tailed independent *t* tests were performed on samples of equal sizes. From the pool of participants who reported having a role model, 114 participants were randomly selected using SPSS software. The mean CTSE scores of the 114 randomly selected participants were compared with the mean CTSE scores of the 114 participants who reported not having a role model. The results of the five different independent samples *t* tests on equal sample sizes and confidence intervals (95%) are displayed in Table 4.5

Table 4.5

Independent Samples t Test Results for Construction Training Self-Efficacy (CTSE) by Having a Role Model for Equal Sample Sizes

Variable	*n*	*M*	*SD*	*t*	*df*	*p*
Sample A CTSE				3.68	226	0.000
Students with role model	114	4.29 [4.20,4.39][b]	0.53			
Students without role model	114	3.99 [3.86,4.12][b]	0.70			
Sample B CTSE				4.11	226	0.000
Students with role model	114	4.31 [4.23,4.38][b]	0.42			
Students without role model	114	3.99 [3.86,4.12][b]	0.70			
Sample C CTSE				3.57[a]	177.59[a]	0.000
Students with role model	114	4.26 [4.19,4.33][b]	0.39			
Students without role model	114	3.99 [3.86,4.12]b	0.70			
Sample D CTSE				3.57[a]	170.86[a]	0.000
Students with role model	114	4.26 [4.19,4.32][b]	0.37			
Students without role model	114	3.99 [3.86,4.12][b]	0.70			
Sample E CTSE				4.09	226	0.000
Students with role model	114	4.30 [4.23,4.38][b]	0.42			
Students without role model	114	3.99 [3.86,4.12][b]	0.70			

[a]t and df were adjusted due to unequal variances
[b]confidence intervals provided when mean differences were significant at < 0.05 level

The results of the *t* test answer research question one. The significance level for retaining the alternative hypothesis was conservatively set at $p < 0.01$ for this study; therefore, the alternative hypothesis was retained due to the significant differences in mean CTSE observed between students reporting having and role model and those reporting not having a role model.

Answering Research Question Two

Research question two asked whether there was a significant difference in training motivation attitudes (TMA) between students who report having a mentor and those who report having no mentor. The null and alternative hypotheses were as follows:

> H_0: $\mu_{\text{students with mentor}} = \mu_{\text{students without mentor}}$ There is no difference in perceived TMA between participants who report having a mentor and participants who report not having a mentor.
>
> H_1: $\mu_{\text{students with role model}} \neq \mu_{\text{students without role model}}$ There is a difference in perceived TMA between participants who report having a mentor and participants who report not having a mentor.

To address research question two, an independent samples *t* test was performed. The mean TMA scores of participants who reported having a mentor (n = 221, M = 4.39) were compared with those who reported not having a mentor (n = 236, M = 4.25). Results of the two-tailed independent samples *t* test (Table 4.6) indicated a significant difference in mean TMA between students who reported having a mentor and those who reported not having a mentor, $t(455) = 2.46$, $p = 0.015$. The mean TMA score of the group reporting having a mentor was 0.14 points higher on a 5-point scale than the TMA score of the group reporting having no role model, and the effect size (Cohen's $d = 0.23$) was smaller than typical (Morgan et al., 2007). The confidence intervals (95%) for means TMA are displayed in Table 4.6.

Table 4.6
Independent Samples t Test Results for Training Motivation Attitudes (TMA) by Having a Mentor

Variable	*n*	*M*	*SD*	*t*	*df*	*p*
TMA				2.44	455	0.015
Students with mentor	221	4.39 [4.32, 4.47][b]	0.57			
Students without mentor	236	4.25 [4.17, 4.33][b]	0.63			

[b]confidence intervals provided when mean differences were significant at < 0.05 level

The results of the *t* test answer research question two. While the results were positive at the $p < 0.05$ level, the significance level for retaining the alternative hypothesis was conservatively set at $p < 0.01$ for this exploratory study; therefore, the null hypothesis was retained. The researcher chose to maintain the more conservative significance level in initial analysis; administration on the adapted CTAIS among a larger sample will be completed to confirm the finding in future research.

Supplemental Data Analysis

Further analysis was completed to explore the difference in PTB, CTSE, TMA, SG, and IM between female and male students. Null and alternative hypotheses were created for each of the five constructs; exemplary hypothesis for CSTE is provided as follows:

H_0: $\mu_{female} = \mu_{male}$ There is no difference in perceived CTSE between female and male students.

H_1: $\mu_{female} \neq \mu_{male}$ There is a difference in perceived CTSE between female and male students.

The *t* test results of mean PTB, CTSE, TMA, SG, and IM by gender (Table 4.7) indicated no significance differences in PTB, CTSE, SG, and IM by gender. However, a significant difference in mean TMA by gender was observed. The TMA scores of female ($n = 56$, $M = 4.49$) participants were compared with male ($n = 408$, $M = 4.30$) participants. Results of the two-tailed independent samples *t* test indicated a significant difference in mean TMA between female and male students, $t(462) = 2.26$, $p = 0.024$. The mean TMA score of females was 0.19 points higher on a 5-point scale than the TMA score of males, and the effect size (Cohen's $d = 0.32$) was smaller than typical (Morgan et al., 2007). The confidence intervals (95%) for means TMA are displayed in Table 4.7.

Table 4.7
Independent Samples t Test Results for Planned Training Behavior (PTB), Construction Training Self-Efficacy (CTSE), Training Motivation Attitudes (TMA), Support/Guidance (SG), and Inspiration/Modeling (IM) by Gender

Variable	*n*	*M*	*SD*	*t*	*df*	*p*
TMA				2.26	462	0.024
Female	56	4.49 [4.38,4.61][b]	0.44			
Male	408	4.30 [4.25,4.36][b]	0.60			
PTB				0.35	458	0.724
Female	55	4.33	0.61			
Male	405	4.31	0.53			
CTSE				0.97	460	0.334
Female	56	4.26	0.48			
Male	406	4.19	0.55			
SG				0.04	460	0.970
Female	55	3.82	0.86			
Male	407	3.81	0.72			
IM				1.18	463	0.240
Female	56	3.46	1.02			
Male	409	3.31	0.91			

[b]confidence intervals provided when mean differences were significant at < 0.05 level

A significant difference in mean TMA was observed between female and male students when analyzed using unequal sample sizes. The *t* test is robust to violations of assumptions if the sample sizes are equal (Boneau, 1960). The distribution of mean TMA scores were negatively skewed for male participants (-2.28), so five *t* tests were performed on equal sample sizes to address the violation of the assumption of normal variance. The mean TMA scores of randomly selected male participants ($n = 56$) were compared with the female participants ($n = 56$). Results of the two-tailed independent *t* tests on equal samples sizes and confidence intervals (95%) are displayed in Table 4.8

Table 4.8
Independent Samples t Test Results for Training Motivation Attitudes (TMA) by Gender with Equal Sample Sizes

Variable	*n*	*M*	*SD*	*t*	*df*	*p*
Sample A TMA				3.15	110	0.002
Female	56	4.49 [4.38,4.61][b]	0.44			
Male	56	4.20 [4.06,4.35][b]	0.53			
Sample B TMA				1.88	110	0.063
Female	56	4.49	0.44			
Male	56	4.27	0.76			
Sample C TMA				1.97[a]	107.34[a]	0.051
Female	56	4.49	0.44			
Male	56	4.34	0.37			
Sample D TMA				1.51	110	0.133
Female	56	4.49	0.44			
Male	56	4.38	0.38			
Sample E TMA				1.34	110	0.182
Female	56	4.49	0.44			
Male	56	4.33	0.77			

[a]t and df were adjusted due to unequal variances
[b]confidence intervals provided when mean differences were significant at < 0.05 level

The results of the *t* tests indicated no significant difference between female and male students on CTSE, PTB and SG and IM; therefore, there is insufficient evidence to reject the null hypotheses for these supplemental analysis questions. In the case of TMA, a significant difference in mean TMA between female and male students was observed between unequal sample sizes (male $n = 406$, female $n = 56$). However, a significant difference in mean TMA between male and female students with equal sample sizes was observed in only one of the five *t* tests with randomly selected male participants. While the results with unequal sample sizes were significant at the $p < 0.05$ level, the significance level for retaining the alternative hypothesis was conservatively set at $p < 0.01$ for this exploratory study; therefore, the null hypothesis was retained. The researcher chose to maintain the more conservative significance level in initial analysis; administration on the adapted CTAIS among a larger sample will be completed to confirm the finding in future research. The results of the *t* tests using equal sample sizes suggest that further investigation is required due to the vulnerability of *t* tests to violations of assumptions if the sample sizes are unequal.

Supplemental analysis was conducted to investigate if there was a significant correlation between construction training self-efficacy (CTSE) and the influence of others on academic decisions (IOACDS). The following null and alternative hypotheses were developed to test the relationship between CTSE and IOACDS:

> H_0: Perceived Construction Training Self-Efficacy (CTSE) is positively correlated with the Influence of Others on Academic and Career Decisions (IOACDS)
>
> H_1: Perceived Construction Training Self-Efficacy (CTSE) is negatively correlated with the Influence of Others on Academic and Career Decisions (IOACDS)

The distribution of mean IOACDS was skewed (-2.09) and violated the assumption of normality. Therefore, a two-tailed Spearman's rho correlation matrix was developed for the non-parametric CTSE and IOACDS data; the results are displayed in Table 4.9. High perceived CTSE and high perceived IOACDS were significantly, and positively, correlated ($r_s = 0.39$, $p < 0.01$). Therefore, the null hypothesis, H_0, was retained.

Table 4.9
Correlation Matrix (Spearman's rho) for Construction Training Self-Efficacy (CTSE) and the Influence of Others on Academic and Career Decisions (IOACDS)

	Factor	1	2	*n*	*M*	*SD*
1	CTSE	1		462	4.19	0.56
2	IOACDS	.387*	1	462	3.58	0.70

*Correlation is significant at the < 0.01 level (2-tailed).

A significant positive correlation was observed between CTSE and IOACDS. The direction positive indicates that students reporting high perceived influence of others on academic decisions also reported high perceived construction education self-efficacy and vice versa. The effect size was smaller than typical (Morgan et al., 2007) and approximately 15% (r^2) of the variance in construction education self-efficacy can be predicted from the influence of others on academic decisions. The null hypothesis was retained due to the significant positive association between CTSE and IOACDS.

Conclusion

The intent of this research was to investigate the influence of role models and mentors on perceived self-efficacy and motivation of construction management students. A quantitative survey was administered to college students (n = 635) enrolled in construction education courses at Colorado State University (CSU) and Texas A&M University (TAMU). The survey was comprised of items from the Construction Training Attitudes and Intentions Scale (CTAIS) and the Influence of Others on Academic and Career Decisions Scale (IOACDS). The CTAIS included the following subscales: planned training behavior (PTB), construction training self-efficacy (CTSE), and training motivation attitudes (TMA). The IOACDS included the support/guidance (SG) and inspiration/modeling (IM) factors. These instruments were adapted for use within the domain of construction management education, and the adapted CTAIS, PTB, CTSE, TMA, IOACDS, SG, IM subscales were all shown to be reliable (Cronbach's alphas): 0.95, 0.90, 0.93, 0.92, 0.89, 0.87, and 0.88, respectively.

Within the domain of construction education, a significant difference in CTSE was observed between students who report having a role model and those who report having no role model, $t(154) = 4.09$, $p < 0.001$. A significant difference in TMA was observed between students who report having a mentor and those who report having no mentor, $t(455) = 2.46$, $p = 0.015$, and a significant difference in TMA was observed between female and male students, $t(462) = 2.26$, $p = 0.024$. However, the significance level for retaining the alternative hypothesis was conservatively set at $p < 0.01$ for this exploratory study. Further analysis was completed to explore the difference in CTSE, PTB, SG, and IM by gender and no significant difference was observed between female and male students. A significant and positive correlation between CTSE and IOACDS was observed during supplemental analysis, $r_s = 0.39$, $p < 0.01$. The researcher chose to maintain the more conservative significance level in initial analysis; these findings are addressed in the next chapter.

CHAPTER 5: DISCUSSION AND CONCLUSIONS

Chapter 5 provides a summary of the study as well as the findings, inferences, and conclusions drawn from the results presented in Chapter 4. The significance of the study, limitations, and areas of future research are discussed.

Study Summary

Numerous studies on self-efficacy and the influence of others for women in science, technology, engineering, and mathematics (STEM) careers and education programs were identified through review of literature. However, study of these constructs is limited within the domain on construction training and education. The purpose of the current study was to examine and compare the existence of role models and mentors with students' levels of self-efficacy and motivation within the construction education domain. A quantitative survey was administered to 635 college students enrolled in undergraduate-level construction management courses during the spring semester of 2014 at Colorado State University (CSU, n = 286) and Texas A&M University (TAMU, n = 349). The survey was comprised of items from Elliott's (2013) Construction Training Attitudes and Intentions Scale (CTAIS) and Nauta and Kokaly's (2001) Influence of Others on Academic and Career Decisions Scale (IOACDS). These instruments were adapted for use within the domain of construction education.

The CTAIS identifies characteristics intended to contribute to attrition and performance in construction training programs (Elliott & Lopez del Puerto, in press). This study included the following subscales from the CTAIS: planned training behavior (PTB), construction training self-efficacy (CTSE), and training motivation attitudes (TMA). Items were adapted in order to assess respondent perception of motivation and self-efficacy regarding construction education. The IOACDS assesses the type and degree of influences of others on undergraduate students' academic and career decisions; the IOACDS includes support/guidance (SG) and inspiration/modeling (IM) subscales. Items for both subscales were adapted to assess the influences of others on construction management students' academic decisions. The instrument and survey item adaptation are described in detail in Chapter 3. The study was designed to address the following research questions:

1. Is there a significant difference in perceived self-efficacy toward construction education between students who report having or not having a role model?
2. Is there a significant difference in motivation attitudes towards construction education between students who report having or not having a mentor?

The data was collected and screened, and 468 surveys were included in the data analysis as described in Chapter 4. To address the research questions, independent samples *t* tests were performed. Construction training self-efficacy (CTSE) scores were compared between students that report having a role model and those who report having no role model and training motivation attitudes (TMA) scores were compared between students that report having a mentor and those who report having no mentor. This study sought to explore the connection between the influence of others and students' self-efficacy and motivation regarding construction education.

Sample

The sample was composed of students (n = 468) enrolled in undergraduate-level construction management courses at Colorado State University (CSU) and Texas A&M University (TAMU). The sample was taken from the target population of students in construction education programs. Of the respondents, 12.0% were female and 88.0% were male. At the time of survey, 91.5% reported being between the ages of 18-24 and 8.5% were 25 years or older. For year in school, the respondents were 13.2% freshman, 44.4% sophomore, 21.2% junior, and 21.2% senior.

Participants reported if they had a mentor or role model that influenced their academic decisions. For mentor, 48.1% students reported having a mentor and 51.9% reported having no mentor. A mentor, adapted from Fried and MacCleave (2010, p. 485), was defined in the survey as “a person who has influenced your academic decisions by actively giving advice, encouraging (or discouraging), supporting, providing information, or helping you make decisions.” For role model, 72.9% students reported having a role model and 27.1% reported having no role model. A role model, adapted from Nauta and Kokaly (2001, p. 85), was defined in this survey as “a person who, either by doing something or by being admirable to you in one or more ways, has had an impact on the academic decisions you have made in your life. Role models may be people you know personally, or they may be people you simply know of.”

Participants also reported construction management experience, hands-on construction experience, participation in construction management internships, and family involvement in the industry. For construction management experience, 32.5% of respondents reported having no experience and 67.5% reported having some experience. For hands-on construction experience, 16.9% of respondents reported having no experience and 83.1% reported having some experience. For participation in construction management internships, 73.4% had no internship experience and 26.6% had some experience. Regarding family involvement in the construction industry, 51.6% responded that a family member works in the construction industry.

Findings

Research question one asked whether there was a significant difference in perceived self-efficacy toward construction education between students who report having or not having a role model. The null and alternative hypotheses were as follows:

> H_0: $\mu_{\text{students with role model}} = \mu_{\text{students without role model}}$ There is no difference in perceived CTSE between participants who report having a role model and participants who report not having a role model.
>
> H_1: $\mu_{\text{students with role model}} \neq \mu_{\text{students without role model}}$ There is a difference in perceived CTSE between participants who report having a role model and participants who report not having a role model.

In order to address this research question the mean CTSE score of respondents were compared by the dichotomous (yes/no) independent attribute variable, role model. The CTSE items assess respondent efficacy toward performance in and completion of construction education programs (e.g., "My past experiences and accomplishments increase my confidence that I will be able to perform well in construction education") and responses were reported on a 5-point Likert scale (e.g., strongly disagree = 1 to strongly agree = 5); higher scores indicate high perceived self-efficacy toward construction education. The independent samples *t* test revealed a significant difference in construction training self-efficacy (CTSE) between students who report having a role model ($n = 308$) and those who report having no role model ($n = 114$), $t(154) = 4.09$, $p < 0.001$. The mean CTSE scores of participants who reported having a role model ($M = 4.28$, 95% CI = 4.22, 4.34) were 0.29 higher than those who reported not having a role model ($M = 3.99$ 95% CI = 3.86, 4.12). The effect size (Cohen's $d = 0.53$) was typical according to Morgan et al. (2007). The results of the *t* test answer research question one; the alternative hypothesis was retained due to the significant differences ($p < 0.001$) in mean CTSE observed between students reporting having a role model and those reporting not having a role model.

Research question two asked whether there was a significant difference in motivation attitudes towards construction education between students who report having or not having a mentor. The null and alternative hypotheses were as follows:

> H_0: $\mu_{\text{students with mentor}} = \mu_{\text{students without mentor}}$ There is no difference in perceived TMA between participants who report having a mentor and participants who report not having a mentor.
>
> H_1: $\mu_{\text{students with role model}} \neq \mu_{\text{students without role model}}$ There is a difference in perceived TMA between participants who report having a mentor and participants who report not having a mentor.

In order to address this research question the mean TMA score of respondents were compared by the dichotomous (yes/no) independent attribute variable, mentor. The TMA items assess respondent attitudes and motivation toward construction education programs (e.g., "I value construction-related education") and responses were reported a 5-point Likert scale (e.g., strongly disagree = 1 to strongly agree = 5); higher scores indicate a high level of motivation for successful completion of construction education. The independent samples *t* test revealed a significant difference in training motivation attitudes (TMA) between students who report having a mentor ($n = 221$) and those who report having no mentor ($n = 236$), $t(455) = 2.46$, $p = 0.015$. The mean TMA scores of participants who report having a mentor ($M = 4.39$, 95% CI = 4.32, 4.47) were 0.14 higher than those who reported not having a mentor ($M = 4.25$, 95% CI = 4.17, 4.33). The effect size (Cohen's $d = 0.23$) was smaller than typical (Morgan et al., 2007).

The results of the *t* test answer research question two. While the results were positive at the $p < 0.05$ level, the significance level for retaining the alternative hypothesis was conservatively set at $p < 0.01$ for this exploratory study; therefore, the null hypothesis was retained. The researcher chose to maintain the more conservative significance level in initial analysis; administration on the adapted CTAIS among a larger sample will be completed to confirm the finding in future research.

Discussion

Research on the influence of others on self-efficacy and motivation revealed various mentor and role model functions and definitions. Literature provides many different definitions of mentor and role model with various, sometimes contradictory, functions (Gibson, 2004; Mertz, 2004). In some cases, the terms of mentor and role model have been used reciprocally. Kram (1983) described mentors as providing two separate functions: psychosocial and career. Psychosocial functions of mentoring are “those aspects of a relationship that enhance an individual’s sense of competence, identity, and effectiveness” and career functions are “those aspects of a relationship that enhance advancement in an organization” (Kram, 1985 as cited by Mertz, 2004, p. 549). The term role model has also been inconsistently and vaguely defined in literature, and Gibson (2004) differentiated role models from mentors and other types of developmental relationships. According to Gibson, role model relationships influence self-concept and provide learning, motivation and inspiration. Self-conception, as defined in Bandura’s (1986) social cognitive theory, is the evaluation of oneself formed through experiences and evaluations of performances from signification others; a person’s self-conceptions can be positive (i.e., judges oneself favorably) or negative (i.e., devalues oneself) and these perceptions may vary across activities.

The inconsistent descriptions of mentor and role models used in literature indicate there are no universally accepted definitions. Therefore, this study defined these terms in order to frame the questions. A mentor, adapted from Fried and MacCleave (2010, p. 485), was defined in the survey as “a person who has influenced your academic decisions by actively giving advice, encouraging (or discouraging), supporting, providing information, or helping you make decisions." A role model, adapted from Nauta and Kokaly (2001, p. 85), was defined in this survey as "a person who, either by doing something or by being admirable to you in one or more ways, has had an impact on the academic decisions you have made in your life. Role models may be people you know personally, or they may be people you simply know of."

Previous studies have observed a relationship between self-efficacy and the influence of others through vicarious experiences and modeled behavior (Bandura, 1977; Hutchison et al., 2006; Zeldin & Pajares, 2000). Bandura (1986) defined perceived self-efficacy as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances. It is concerned not with the skills one has but with judgments of what one can do with whatever skills one possesses" (p. 391).

The results of this study suggest that construction management students' self-efficacy towards construction education is higher when students have a role model who influenced their academic decisions. Students without a role model had significantly lower perceived self-efficacy towards construction education. This finding is supported by previous research, which suggests that vicarious experiences and modeled behavior are sources of self-efficacy beliefs.

The results of this study also suggest that students with a mentor have a higher level of motivation for successful completion of construction education. Students without a mentor who influenced their academic decisions had lower motivation towards construction education ($p < 0.05$). This finding is supported by previous research on career and training performance that have observed a relationship between the influence of others and protégé motivation (Day & Allen, 2004; Noe et al., 1990; Zeldin & Pajares, 2000).

Supplemental Analysis

Due to the scope of this thesis, supplemental analysis was limited to comparisons of mean planned training behavior (PTB), construction training self-efficacy (CTSE), training motivation attitudes (TMA), support/guidance (SG), and inspiration/modeling (IM) by gender as well as investigating the correlation between CTSE and IOACDS. For comparison by gender, null and alternative hypotheses were created for each of the five constructs (i.e., PTB, CTSE, TMA, SG, IM); exemplary hypothesis for CSTE is provided as follows:

> H_0: $\mu_{female} = \mu_{male}$ There is no difference in perceived CTSE between female and male students.
>
> H_1: $\mu_{female} \neq \mu_{male}$ There is a difference in perceived CTSE between female and male students.

The results of the *t* test indicated no significant differences between female and male student on CTSE, PTB and SG and IM; therefore, there is insufficient evidence to reject the null hypotheses for these supplemental analysis questions. However, a significant difference ($t(462) = 2.26$, $p = 0.024$) in TMA was observed between female ($n = 56$) and male students ($n = 408$). The mean TMA scores of female students ($M = 4.49$, 95% CI = 4.38, 4.61) were 0.19 higher than male students' scores (M = 4.30, 95% CI = 4.25, 4.36). The effect size (Cohen's $d = 0.32$) was smaller than typical (Morgan et al., 2007).

It was noted that a significant difference in mean TMA was observed between female and male students when analyzed using unequal sample sizes. The *t* test is robust to violations of assumptions if the sample sizes are equal (Boneau, 1960). The distribution of mean TMA scores were negatively skewed for male participants (-2.28), so five *t* tests were performed on equal sample sizes to address the violation of the assumption of normal variance. The mean TMA scores of randomly selected male participants ($n = 56$) were compared with the female participants ($n = 56$), and a significant difference in mean TMA was observed in only one of the five *t* tests with equal sample sizes.

While the results with unequal sample sizes were positive at the $p < 0.05$ level, the significance level for retaining the alternative hypothesis was conservatively set at $p < 0.01$ for this exploratory study; therefore, the null hypothesis was retained. The researcher chose to maintain the more conservative significance level in initial analysis; administration on the adapted CTAIS among a larger sample will be completed to confirm the finding in future research. The results of the *t* tests using equal sample sizes suggest that further investigation is required due to the vulnerability of *t* tests to violations of assumptions if the sample sizes are unequal.

It should be noted that the gender distribution of respondents in the sample was representative of the ratio of women to men employed in construction. A limited number of females participating in both construction careers and education programs is a documented problem, especially in light of the construction industry's skilled labor shortage and lack of diversity (Menches & Abraham, 2007; Moir et al., 2011; Schleifer, 2002). According to the U.S. Department of Labor, 12.7% of all persons employed in construction are women (2014b) and only 7.3% of persons employed as construction managers are women (2013). Therefore, *t* test comparisons of construction management samples by gender can expect to have unequal sample sizes until the uneven gender distribution is addressed in the construction industry and construction management higher education programs. Future studies with larger and more diverse samples may help address the impact of unequal samples sizes violations on *t* test results.

The results of the supplemental analysis suggest that male and female students in construction education have similar levels of perceived self-efficacy and female students have higher motivation towards construction education. Previous studies indicate that women in male-dominated fields such as science, technology, engineering, and mathematics (STEM) often feel a lack of inclusion which can result in lower perceived self-efficacy (Marra et al., 2009). Elliott and Lopez del Puerto (2014) observed that female construction management students had significantly lower CTSE compared to male students; female students also had lower TMA compared to male students, though the difference was not significant. However, the authors acknowledged that the sample size was small and therefor the results were not generalizable. The results of supplemental analysis, compared to previous research found in literature, suggest that further research is needed to understand these gender differences in construction-related training and education.

Research on career and academic decision-making suggested that self-efficacy was positively correlated with support, guidance, inspiration, and modeling provided by others (Bandura, 1977; Day & Allen, 2004; Hutchison et al., 2006; Moore & Gloeckner, 2007; Zeldin & Pajares, 2000).The correlation between CTSE and IOACDS was investigated during supplemental analysis, and the following null and alternative hypotheses were developed to test the relationship:

> H_0: Perceived Construction Training Self-Efficacy (CTSE) is positively correlated with the Influence of Others on Academic and Career Decisions (IOACDS)
>
> H_1: Perceived Construction Training Self-Efficacy (CTSE) is negatively correlated with the Influence of Others on Academic and Career Decisions (IOACDS)

A significant positive correlation between CTSE and IOACDS was observed in the supplemental analysis, $r_s = 0.39$, $p < 0.01$. The CTSE items assess respondent efficacy toward performance in and completion of construction education programs (e.g., “Successfully completing a construction education program is within the scope of my abilities”) and responses were reported on a 5-point Likert scale (e.g., *strongly disagree* = 1 to *strongly agree* = 5); higher scores indicate high perceived self-efficacy toward construction education. The IOACDS items assess perceived level of influence of others on academic decisions within the domain of construction education (e.g., “There is someone I can count on to be there if I need support when I make academic choices” and “There is someone I am trying to be like in my construction education pursuits”) and responses were reported on a 5-point Likert scale; higher scores indicate high perceived levels of influence of others. A high score on the SG scale indicates a high perceived level of influence from others through support and guidance; a high score on the IM scale indicates a high perceived level of influence from others provided by inspiration and modeling.

The results of the two-tailed Spearman’s rho correlation matrix were significant ($p < 0.01$); therefore, the null hypothesis (i.e., positive correlation) was retained. The positive direction indicates that students reporting high perceived influence of others on academic decisions also reported high perceived construction education self-efficacy and vice versa. These findings are consistent with what others have previously observed in empirical research and provide support for convergent construct validity of CTSE and IOACDS.

Significance of the Study

The limited number of females participating in both construction careers and education programs is a documented problem, especially in light of the construction industry’s skilled labor shortage and lack of diversity (Menches & Abraham, 2007; Moir et al., 2011; Schleifer, 2002). According to the U.S. Department of Labor, 12.7% of all persons employed in construction are women (2014b) and only 7.3% of persons employed as construction managers are women (2013). Research has shown that factors including perceived self-efficacy, motivation, and the influence of others have value as predictors of career choice and student success (Bandura, 1977, 1986; Day & Allen, 2004; Fried & MacCleave, 2010; Kram & Isabella, 1985; Nauta & Kokaly, 2001). Studies exploring the relationships between these factors have been completed by others, and a review of literature revealed numerous studies on self-efficacy, motivation and the influence of others among women in STEM careers and education programs. However, very few studies examining these relationships for students in construction education were identified through an exhaustive review of literature.

In this study, female students reported higher levels of self-efficacy and motivation compared to male students. Further research is needed to investigate if the high scores observed in this study were a result of the decision by less-efficacious and less-motivated students to choose other programs. This study provides an instrument that can be used to investigate these constructs within the domain of construction education in order to understand how to recruit and retain students, especially women, in construction education. This study also provides exploratory results that indicate the influence of mentors and role models have a positive effect on self-efficacy and motivation - the constructs that are shown to influence student success.

Limitations

This study was limited to a quantitative cross-sectional survey designed to assess students' perceptions of self-efficacy and motivation regarding construction education. The study sample was composed of 468 college students enrolled in construction management courses at CSU and TAMU. The unequal size of the sample limited comparisons by gender between female (n = 56) and male (n = 410) students. However, the distribution of genders in the sample was representative of the ratio of women to men employed in construction. According to the U.S. Department of Labor, 12.7% of all persons employed in construction are women (2014b) and only 7.3% of persons employed as construction managers are women (2013). The survey was administered in-person during prerequisite courses and participation was voluntary. Participation was incentivized with a chance to win an Amazon.com gift card valued at $10 each. The responses were self-reported and were reflective of participants' current attitudes and beliefs. Since participation was voluntary and incentivized, the findings may be limited by response bias. Some responses may be overly positive and not accurately reflect the views of the sample; however, the high response rate (83.0%) indicates a smaller chance of response bias (Creswell, 2012). The limitations in the study design and sample have an impact on the interpretation of the findings and generalizability of the conclusions.

All survey responses were recorded on a Scantron® form, which limited responses to five categories. Therefore, age, grade point average, construction management experience, hands-on construction experience, and level of involvement in extra-curricular activities were reported in ranges. The survey design also limited how information on mentors and role models were reported. Participants were limited to identifying only one mentor and/or role model who had the greatest influence on academic decisions. The response options were limited to five response categories for mentor (e.g., family member, friend/peer/significant other [spouse/partner], professor/instructor/academic advisor, co-worker/supervisor, other) and role model (e.g., family member, friend/peer/significant other [spouse/partner], professor/instructor/academic advisor, co-worker/supervisor, and "someone I know of, but do not know personally").

The participants were selected from a convenience sample of students pursuing degrees at Colorado State University (CSU) and Texas A&M University (TAMU). The survey was administered to students who were voluntarily enrolled in undergraduate-level construction management courses required for a Bachelor of Science in Construction Management (CSU) or

Construction Science (TAMU). Construction education programs in the United States are associated with various disciplines including, but not limited to applied science, engineering, architecture, and business. The sampling of this study limits the generalizability of the conclusions for other construction education programs.

Further Research

In this study, the internal consistencies reliabilities were high and correlation between the constructs were in line with previous research. However, instrument validation is a continuous and ongoing process (Beattie, Pinto, Nelson, & Nelson, 2002; Yang, 2003) and future studies with CTAIS and IOACDS would provide insight regarding the impact of mentors and role models on CTSE, TMA, PTB, and TLOC. In this study, the TLOC subscale was removed from CTAIS due to the length of the survey; future studies should include all subscales adapted for use within the domain of construction education. Based on the results of the supplemental analysis and in light of the limitations previously noted, further research in warranted to investigate the difference in samples with larger numbers of female participants.

The instrument in this study can be used in construction education to assess students' self-efficacy and motivation. Male and female students in this study reported high levels of self-efficacy and motivation, with females reporting higher levels on both constructs compared to male students. Further research is needed to investigate if the high scores observed in this study were a result of the decision by less-efficacious and less-motivated students to choose other programs. For example, future studies should assess if lower scores are a predictor of attrition. By administering this survey in a longitudinal design, levels of self-efficacy and motivation could be compared with retention and success rates to determine the effectiveness of this instrument in predicting student outcomes. Furthermore, students with low levels of self-efficacy and motivation, as measured by CTAIS, should be encouraged to participate in appropriate interventions, such as mentoring and role modeling programs. The effectiveness of such interventions could be measured by completing pre- and post-testing of students using a mixed-method study.

The study would benefit from the inclusion of open-ended questions or interviews to explore the influence of others in further detail and to address some of the limitations previously noted. Participants in this study were able to recognize only one mentor and/or role model and were limited to categories of relationships (e.g., family, significant other, etc.). Students could have more than one mentor and/or role model that each had varying levels and types of influence and a more descriptive mentor/role model profile should be obtained. Future mixed-method studies should investigate how mentors and role models affected academic (e.g., changes in major) and career decisions (e.g., internship and job decisions), when these persons of influence entered their lives, and level of mentor/role model involvement (e.g., how much contact they had). Further investigation would provide educators with a better understanding of how mentors and role models influence self-efficacy, motivation, and academic decisions.

In addition, a qualitative component could contribute to establishing accepted definitions and functions of mentors and role models within the domain of construction training and education. Future studies should compare the construct subscales by the type of supportive relationship. For example, the mean score of CTSE should be compared between students that report a family member as the person with the greatest influence and students that report a peer as having the greatest influence on their academic decisions. Furthermore, the differences in mentoring and modeling functions (e.g., vicarious experience, verbal persuasion, etc.) by relationship type should be investigated using a qualitative study. Establishing commonalities in academic and career choice, development of self-efficacy beliefs, patterns of behavior and attitudes, and the influence of others could help educators develop effective interventions such as mentoring and modeling programs.

Conclusion

A quantitative survey was administered to college students (*n* = 635) enrolled in undergraduate-level construction management courses in order to examine and investigate the existence of role models and mentors and differences in construction management students' mean levels of self-efficacy and motivation. The survey was comprised of items from the Construction Training Attitudes and Intentions Scale (CTAIS; Elliott, 2013) and the Influence of Others on Academic and Career Decisions Scale (IOACDS; Nauta & Kokaly, 2001). Items from these instruments were adapted for use within the domain of construction education.

Research has shown that factors including perceived self-efficacy, motivation, and the influence of others have value as predictors of career choice and student success (Bandura, 1977, 1986; Day & Allen, 2004; Fried & MacCleave, 2010; Kram & Isabella, 1985; Nauta & Kokaly, 2001). The CTAIS identifies characteristics intended to contribute to attrition and performance in construction training programs (Elliott & Lopez del Puerto, in press). This study included the following subscales from the CTAIS: planned training behavior (PTB), construction training self-efficacy (CTSE), and training motivation attitudes (TMA). The IOACDS assesses the type and degree of influences of others on undergraduate students' academic and career decisions; the IOACDS includes support/guidance (SG) and inspiration/modeling (IM) subscales. The Cronbach's Alpha statistics observed in the current study provide good support for internal consistency reliability of the adapted CTAIS ($\alpha = 0.95$; PTB, CTSE, and TMA, $\alpha = 0.90$, 0.93, and 0.92 respectively) and IOACDS ($\alpha = 0.89$; SG, $\alpha = 0.87$; IM, $\alpha = 0.88$).

Very few studies examining these relationships for students in construction education were identified through an exhaustive review of literature. The results of this study suggest that construction management students' self-efficacy towards construction education is higher when students have a role model who influenced their academic decisions. Students without a role model had significantly lower perceived self-efficacy towards construction education. This finding is supported by previous research, which suggests that vicarious experiences and modeled behavior are sources of self-efficacy beliefs (Bandura, 1977; Hutchison et al., 2006; Koch et al., 2013; Zeldin & Pajares, 2000). The results of this study also suggest that students with a mentor have a higher level of motivation for successful completion of construction education. Students without a mentor who influenced their academic decisions had lower motivation towards construction education ($p < 0.05$). This finding is supported by previous research on career and training performance that have observed a relationship between the influence of others and protégé motivation (Day & Allen, 2004; Noe et al., 1990; Zeldin & Pajares, 2000).

Male and female students in this study reported high levels of self-efficacy and motivation, with females reporting higher levels of self-efficacy and motivation toward construction education when compared to male students. Further research is needed to investigate if the high scores observed in this study were a result of the decision by less-efficacious and less-motivated students to choose other programs. This study provides an instrument that can be used to investigate these constructs in order to understand how to recruit and retain students, especially women, in construction education. The limited number of females participating in both construction careers and education programs is a documented problem, especially in light of the construction industry's skilled labor shortage and lack of diversity

(Menches & Abraham, 2007; Moir et al., 2011; Schleifer, 2002). The results of supplemental analysis, compared to previous research found in literature, suggest that further research is needed to understand these gender differences in construction-related training and education.

Future studies with CTAIS and IOACDS would provide insight regarding the effectiveness of this instrument in predicting student outcomes. The study would benefit from the inclusion of open-ended questions or interviews, and further investigation would provide educators with a better understanding of how mentors and role models influence self-efficacy, motivation, and academic decisions. Establishing commonalities in academic and career choice, development of self-efficacy beliefs, patterns of behavior and attitudes, and the influence of others could help educators develop effective interventions such as mentoring and modeling programs. This study provides exploratory results that indicate the influence of mentors and role models have a positive effect on self-efficacy and motivation, the constructs that are shown to influence student success.

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APPENDIX A: SURVEY ITEM ADAPTATION

Table A.1

Planned Training Behavior (PTB) and Adapted Construction Education Items

Factor ID	Original Item	Adapted Item
PTB_01	I will attend the meetings of this construction training/education program on a regular basis:	I will attend the meetings of this construction education program on a regular basis:
PTB_02	I will successfully complete this construction training/education course:	I will successfully complete this construction education course:
PTB_03	I would make an effort to attend the meetings of a construction training/education program on a regular basis:	I would make an effort to attend the meetings of construction education courses on a regular basis:
PTB_04	I would make an effort to successfully complete a construction training/education program:	I would make an effort to successfully complete a construction education program:
PTB_05	I intend to attend the meetings of a construction training/education program on a regular basis:	I intend to attend the meetings of a construction education program on a regular basis:
PTB_06	I intend to successfully complete construction training/education:	I intend to successfully complete construction education:
PTB_07	Most people who are important to me think that [I should - I should not] attend construction training/education.	Most people who are important to me think that [I should - I should not] participate in construction education:
PTB_08	It is expected that I attend the meetings of a construction training/education program on a regular basis:	It is expected of me that I attend the meetings of a construction education program on a regular basis:
PTB_09	It is expected of me that I would successfully complete a construction training/education program:	It is expected of me that I would successfully complete a construction education program:
PTB_10	Most people whose opinions I value would approve of my participating in a construction training/education program:	Most people whose opinions I value would approve of my participating in a construction education program:
PTB_11	For me to successfully complete construction training/education is:	For me to successfully complete construction education is:
PTB_12	For me to attend the meetings of a construction training/education program is:	For me to attend the meetings of a construction education program is:
PTB_13	For me to complete construction training/education is:	For me to complete a construction education program is:
PTB_14	For me to attend the meeting of a construction training/education program is:	For me to attend the meeting of a construction education program is:

Table A.2

Construction Training Self-Efficacy (CTSE) and Adapted Construction Education Items

Factor ID	Original Item	Adapted Item
CTSE_01	My past experiences and accomplishments increase my confidence that I will be able to perform well in construction training/education.	My past experiences and accomplishments increase my confidence that I will be able to perform well in construction education.
CTSE_02	My past experiences and accomplishments increase my confidence that I will be able to successfully complete a construction training/education program.	My past experiences and accomplishments increase my confidence that I will be able to successfully complete a construction education program.
CTSE_03	Construction training/education is within the scope of my abilities.	Construction education is within the scope of my abilities.
CTSE_04	Successfully completing a construction training/education program is within the scope of my abilities.	Successfully completing a construction education program is within the scope of my abilities
CTSE_05	I am usually a good judge of my own capabilities.	I am usually a good judge of my own capabilities.
CTSE_06	Other people that know me well perceive me as being a capable person.	Other people that know me well perceive me as being a capable person.
CTSE_07	My estimates of how well I can deal with a new situation are usually very accurate.	My estimates of how well I can deal with a new situation are usually very accurate.
CTSE_09	I expect to be able to do things that need to be done to successfully complete a construction training/education program.	I expect to be able to do things that need to be done to successfully complete a construction education program.
CTSE_11	If I take construction training/courses which involved many different tasks, some easy and some difficult, I would probably do very well at almost all of them.	If I take construction courses which involved many different tasks, some easy and some difficult, I would probably do very well at almost all of them.
CTSE_13	If I take construction training/courses in an unfamiliar area, I expect to be able to successfully complete the training/courses.	If I take a construction course in an unfamiliar area, I expect to be able to successfully complete the course.
CTSE_14	If I were asked to take training/courses in an area of construction which I didn't know much about, I could do well.	If I were asked to take a course in an area of construction which I didn't know much about, I could do well.
CTSE_15	If I were asked to take training/courses in an area of construction which I didn't know much about, I could successfully complete the training/courses.	If I were asked to take a course in an area of construction which I didn't know much about, I could successfully complete the training/courses.
CTSE_16	I can generally do the work necessary to accomplish my goals in training/education courses.	I can generally do the work necessary to accomplish my goals in education courses.
CTSE_18	I am confident that I can do well in construction training/educations that deal with things (e.g., tool operation, using tools or body to move objects).	I am confident that I can do well in construction education that deal with tool operation, using tools or body to move objects.

Table A.3

Training Motivation Attitudes (TMA) and Adapted Construction Education Items

Factor ID	Original Item	Adapted Item
TMA_01	I value construction-related training/education.	I value construction-related education.
TMA_02	Construction training/education programs are useful for my development.	Construction education is useful for my development.
TMA_03	I will be able to apply what I have learned in construction training/education to a job.	I will be able to apply what I have learned in construction education to a job.
TMA_04	I am motivated to learn the skills taught in construction training/education programs.	I am motivated to learn the skills taught in construction education programs.
TMA_05	I would like to improve my construction-related skills.	I would like to improve my construction-related skills
TMA_06	I am willing to invest effort to improve construction-related skills and competencies just for the sake of learning.	I am willing to invest effort to improve construction-related skills and competencies just for the sake of learning.
TMA_07	I am willing to invest effort to improve my skills and competencies in order to prepare myself for a construction-related job.	I am willing to invest effort to improve my skills and competencies in order to prepare myself for a construction-related job.
TMA_08	Taking construction training/education courses is a high priority for me.	Taking construction education courses is a high priority for me.
TMA_09	I am willing to invest effort on my personal time to develop construction-related skills.	I am willing to invest effort on my personal time to develop construction-related skills.

Table A.4

Support/Guidance (SG) and Adapted Construction Education Items

Factor ID	Original Item	Adapted Item
SG_01	There is someone who tells or shows me general strategies for a successful life.	There is someone who tells or shows me general strategies for a successful life.
SG_02	There is someone who helps me weigh the pros and cons of academic and career choices I make.	There is someone who helps me weigh the pros and cons of academic choices I make.
SG_03	There is someone I can count on to be there if I need support when I make academic and career choices.	There is someone I can count on to be there if I need support when I make academic choices.
SG_04	There is someone who stands by me when I make important academic and career decisions.	There is someone who stands by me when I make important academic decisions.
SG_05	There is no one who shows me how to get where I am going with my education or career.	There is no one who shows me how to get where I am going with my education.
SG_06	There is no one who supports me when I make academic and career decisions.	There is no one who supports me when I make academic decisions.
SG_07	There is someone who supports me in the academic and career choices I make.	There is someone who supports me in the academic choices I make.
SG_08	There is someone who helps me consider my academic and career options.	There is someone who helps me consider my academic options.

Table A.5

Inspiration/Modeling (IM) and Adapted Construction Education Items

Factor ID	Original Item	Adapted Item
IM_01	There is someone I am trying to be like in my academic or career pursuits.	There is someone I am trying to be like in my construction education pursuits.
IM_02	There is no one particularly inspirational to me in the academic or career path I am pursuing.	There is no one particularly inspirational to me in the construction education path I am pursuing.
IM_03	In the academic or career path I am pursuing, there is someone I admire.	In the construction education path I am pursuing, there is someone I admire.
IM_04	There is no one I am trying to be like in my academic and career pursuits.	There is no one I am trying to be like in my construction education pursuits.
IM_05	In the academic or career path I am pursuing, there is no one who inspires me.	In the construction education path I am pursuing, there is no one who inspires me.
IM_06	I have a mentor in my academic or career field.	I have a mentor in my academic field.
IM_07	I know of someone who has a career I would like to pursue.	I know of someone who has a construction career I would like to pursue.

APPENDIX B: DISTRIBUTION OF CONSTRUCTS

Table B.1

Distribution of Constructs on Survey by Response Type

5-point Likert				5-point bipolar adjective	
Item	Factor ID	Item	Factor ID	Item	Factor ID
1	IM_01	20	SG_03	39	PTB_08
2	CTSE_11	21	CTSE_07	40	PTB_09
3	TMA_02	22	CTSE_06	41	PTB_11
4	CTSE_03	23	SG_04	42	PTB_01
5	IM_02	24	SG_05	43	PTB_02
6	TMA_04	25	IM_06	44	PTB_14
7	CTSE_02	26	CTSE_16	45	PTB_13
8	TMA_07	27	SG_06	46	PTB_12
9	IM_03	28	CTSE_04	47	PTB_04
10	IM_04	29	SG_07	48	PTB_03
11	CTSE_05	30	CTSE_18	49	PTB_07
12	SG_01	31	TMA_05	50	PTB_06
13	TMA_09	32	IM_07	51	PTB_10
14	TMA_06	33	CTSE_01	52	PTB_05
15	SG_02	34	CTSE_09		
16	CTSE_14	35	CTSE_13		
17	CTSE_15	36	TMA_08		
18	IM_05	37	TMA_03		
19	TMA_01	38	SG_08		

Note. Excludes demographic survey items.

APPENDIX C: LETTER OF COOPERATION

COLLEGE OF ARCHITECTURE
Department of Construction Science

TEXAS A&M UNIVERSITY

October 9, 2013

Colorado State University
Institutional Review Board
321 General Services Building
Campus Delivery 2011
Fort Collins, CO 80523-2011
Attention: Janell Barker, Senior IRB Coordinator

Dear Ms. Barker;

We are aware that a research team composed of Jon Elliott (assistant professor) and Melissa Thevenin (graduate student) in the Department of Construction Management at Colorado State University (CSU), are conducting a research study entitled: Investigating the Role of Mentors, Role Models Attitudes, and Intentions in Construction Education Decision Making. The research team has shared with us the details of the study. We feel comfortable that the participants of this study will be adequately protected, and give permission to administer this survey in our courses in the Department of Construction Science at Texas A&M University.

I request that the research team at Colorado State University keep any student information confidential in the research results or publications. The research team at CSU has assured me, and I trust that the study results will be published in their aggregate/summarized form only. Finally, the research team has agreed to provide me with a copy of the CSU IRB approval document(s) before any data collection will commence.

Sincerely,

Joe Horlen

Joe Horlen
Department Head, Associate Professor
Department of Construction Science
Texas A&M University

3137 TAMU
College Station, TX 77843-3137

Tel. 979.845.1017 Fax. 979.862.1572
http://cosc.arch.tamu.edu

APPENDIX D: HUMAN SUBJECTS APPROVAL

Research Integrity & Compliance Review Office
Office of Vice President for Research
Fort Collins, CO 80523-2011
(970) 491-1553
FAX (970) 491-2293

Date: January 7, 2014

To: Jonathan Elliott, Construction Management
Melissa Thevenin, Construction Management

Janell Barker

From: Janell Barker, IRB Coordinator

Re: The Influence of Role Models and Mentors on Construction Management Students' Self-Efficacy and Motivation

IRB ID: 001-14H **Review Date:** January 7, 2014
This project is valid from three years from the review date.

The Institutional Review Board (IRB) Coordinator has reviewed this project and has declared the study exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b)(2): Research involving the use of educational tests,….survey procedures, interview procedures or observation of public behavior, unless: a) **information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects.**

The IRB determination of exemption means that:

- **This project is valid for three years from the initial review.** After the three years, the file will be closed and no further research should be conducted. If the research needs to continue, please let the IRB Coordinator know before the end of the three years. You do not need to submit an application for annual continuing review.

- You must carry out the research as proposed in the Exempt application, including obtaining and documenting (signed) informed consent if stated in your application or if required by the IRB.

- Any modification of this research should be submitted to the IRB through an email to the IRB Coordinator, prior to implementing any changes, to determine if the project still meets the Federal criteria for exemption.

- Please notify the IRB Coordinator if any problems or complaints of the research occur.

Please note that you must submit all research involving human participants for review by the IRB. **Only the IRB or designee may make the determination of exemption**, even if you conduct a similar study in the future.

APPENDIX E: VERBAL SCRIPT

Verbal Recruitment Script

Good Morning/Afternoon,

I am here to invite you to participate in a study entitled *The Influence of Role Models and Mentors on Construction Management Students' Self-Efficacy and Motivation.* The purpose of this study is to understand student attitudes, motivation, and confidence regarding construction education and the influence of role models and/or mentors on academic decisions.

This study is being conducted in collaboration between Colorado State University, University of Wisconsin – Stout, and Texas A & M University. Construction and design students at these institutions have been selected to participate in this study by completing a voluntary survey which will take approximately 20 minutes.

There are no known risks associated with this survey and the survey responses are anonymous. The survey does NOT ask for your name and your names will NOT be linked to your data. The instructor of the course will not know who participated in the study and who did not. Your grade for this course is in no way linked to your participation in the study.

The summarized results of the study will be shared between the collaborating research teams at Colorado State University, University of Wisconsin – Stout, and Texas A & M University. The data may also be shared with other researchers as anonymous and aggregate data. The intent of the researchers is to publish the survey results as part of a thesis and articles. Publications will be made available for educational purposes. If you choose to participate, your personal information will NOT be included in the any published material or articles.

As a thank you for participating in the study, you may choose to be entered into a drawing to win an Amazon.com gift card. If you would like to be included in the gift card drawing, please provide your email address on the note card provided. Completed email address note cards should be placed in the separate envelope provided.

If you are willing to participate in the study, please complete the Scranton response sheet. Please include the last four digits of your phone number in the "Spaces for Student Number" section of the Scantron sheet. Do not include any personal information (name, Student ID, etc.) on the surveys response sheets. Once completed, please return all documents to the field investigator.

Are there any questions?

Thank you for your time, we appreciate your willingness to participate.

Field Investigator

APPENDIX F: INFORMED CONSENT DOCUMENT

Date _______________

Dear Participant,

My name is Melissa Thevenin and I am a researcher from Colorado State University in the Construction Management department. We are conducting a research study to understand student attitudes, motivation, and confidence regarding construction education and the influence of role models and/or mentors on academic decisions. The title of our project is *The Influence of Role Models and Mentors on Construction Management Students' Self-Efficacy and Motivation*.

This study is being conducted in collaboration between Colorado State University, University of Wisconsin – Stout, and Texas A & M University. Construction and design students at these institutions have been selected to participate in this study by completing a survey which will take approximately 20 minutes; your participation is voluntary.

There are no known risks associated with this survey and the survey responses are anonymous. That means that your names or email address will not be recorded on the surveys or survey answer sheets. Your answers will never be linked to your personal information. The instructor of the course will not know who participated in the study and who did not. Your grade for this course is in no way linked to your participation in the study.

The summarized results of the study will be shared between the collaborating research teams at Colorado State University, University of Wisconsin – Stout, and Texas A & M University. The data may also be shared with other researchers as anonymous and aggregate data. The intent of the researchers is to publish the survey results as part of a thesis and articles. Publications will be made available for educational purposes. If you choose to participate, your personal information will not be included in the any published material or articles.

As a thank you for participating in the study, you may choose to be entered into a drawing to win 1 of 10 Amazon.com gift cards valued at $10 each. If you would like to be included in the gift card drawing, please provide your email address on the note card provided. Email addresses will not be shared with anyone and will only be used to randomly select gift card winners. Electronic gift cards will be distributed to selected winners via the email addresses provided. Completed email address note cards should be placed in the separate envelope provided.

If you are willing to participate in the study, please complete the Scranton response sheet. Please include the last four digits of your phone number in the "Spaces for Student Number" section of the Scantron sheet. The survey responses are anonymous. The last four digits of your phone number will only be used for ordering the surveys and potentially connecting these data with future surveys. Additional research on students in construction education may be conducted at this university in the future; if you should choose to participate in future research, we may ask for your phone number at that time. Participation in future research would be voluntary. As a reminder, please do not include any personal information (name, Student ID, etc.) on the surveys response sheets. Once completed, please return all documents to the field investigator.

- **If you are willing to participate, please complete the attached survey.**
- **In not, please return the blank survey and note card to the researcher**

Thank you for your time, we appreciate your willingness to participate.

If you have questions about the study please contact:

Jon Elliott, Principal Investigator, 970-491-1845 or by email at jon.elliott@colostate.edu; or,
Melissa Thevenin, Co-Principal Investigator, 219-688-3992 or by email at melissa.thevenin@colostate.edu; or,

If you have any questions about your rights as a volunteer in this research, contact Janell Barker, Human Research Administrator, at 970-491-1655.

APPENDIX G: SURVEY

Directions: In this section, please select your level of agreement with each statement on the scale.

Please use a #2 pencil to record your response on the Scantron sheet provided.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	There is someone I am trying to be like in my construction education pursuits.	A	B	C	D	E
2	If I take construction courses which involved many different tasks, some easy and some difficult, I would probably do very well at almost all of them.	A	B	C	D	E
3	Construction education is useful for my development.	A	B	C	D	E
4	Construction education is within the scope of my abilities.	A	B	C	D	E
5	There is no one particularly inspirational to me in the construction education path I am pursuing.	A	B	C	D	E
6	I am motivated to learn the skills taught in construction education programs.	A	B	C	D	E
7	My past experiences and accomplishments increase my confidence that I will be able to successfully complete a construction education program.	A	B	C	D	E
8	I am willing to invest effort to improve my skills and competencies in order to prepare myself for a construction-related job.	A	B	C	D	E
9	In the construction education path I am pursuing, there is someone I admire.	A	B	C	D	E
10	There is no one I am trying to be like in my construction education pursuits.	A	B	C	D	E
11	I am usually a good judge of my own capabilities.	A	B	C	D	E
12	There is someone who tells or shows me general strategies for a successful life.	A	B	C	D	E
13	I am willing to invest effort on my personal time to develop construction-related skills.	A	B	C	D	E
14	I am willing to invest effort to improve construction-related skills and competencies just for the sake of learning.	A	B	C	D	E
15	There is someone who helps me weigh the pros and cons of academic choices I make.	A	B	C	D	E
16	If I were asked to take a course in an area of construction which I didn't know much about, I could do well.	A	B	C	D	E
17	If I were asked to take a course in an area of construction which I didn't know much about, I could successfully complete the training/courses.	A	B	C	D	E
18	In the construction education path I am pursuing, there is no one who inspires me.	A	B	C	D	E
19	I value construction-related education.	A	B	C	D	E
20	There is someone I can count on to be there if I need support when I make academic choices.	A	B	C	D	E

Survey Continues on Next Page

Directions: In this section, please select your level of agreement with each statement on the scale.

Please use a #2 pencil to record your response on the Scantron sheet provided.

		Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
21	My estimates of how well I can deal with a new situation are usually very accurate.	A	B	C	D	E
22	Other people that know me well perceive me as being a capable person	A	B	C	D	E
23	There is someone who stands by me when I make important academic decisions.	A	B	C	D	E
24	There is no one who shows me how to get where I am going with my education	A	B	C	D	E
25	I have a mentor in my academic field.	A	B	C	D	E
26	I can generally do the work necessary to accomplish my goals in education courses.	A	B	C	D	E
27	There is no one who supports me when I make academic decisions.	A	B	C	D	E
28	Successfully completing a construction education program is within the scope of my abilities	A	B	C	D	E
29	There is someone who supports me in the academic choices I make.	A	B	C	D	E
30	I am confident that I can do well in construction education that deal with tool operation, using tools or body to move objects.	A	B	C	D	E
31	I would like to improve my construction-related skills	A	B	C	D	E
32	I know of someone who has a construction career I would like to pursue.	A	B	C	D	E
33	My past experiences and accomplishments increase my confidence that I will be able to perform well in construction education.	A	B	C	D	E
34	I expect to be able to do things that need to be done to successfully complete a construction education program.	A	B	C	D	E
35	If I take a construction course in an unfamiliar area, I expect to be able to successfully complete the course.	A	B	C	D	E
36	Taking construction education courses is a high priority for me.	A	B	C	D	E
37	I will be able to apply what I have learned in construction education to a job.	A	B	C	D	E
38	There is someone who helps me consider my academic options.	A	B	C	D	E

Survey Continues on Next Page

<u>Directions:</u> In this section, please select the response which best describes your feeling about each statement.

PLEASE record your response on the Scantron sheet provided.

39	It is expected of me that I attend the meetings of a construction education program on a regular basis:	Definitely False : A B C D E : Definitely True
40	It is expected of me that I would successfully complete a construction education program:	Definitely False : A B C D E : Definitely True
41	For me to successfully complete construction education is:	Extremely Bad : A B C D E : Extremely Good
42	I will attend the meetings of this construction education program on a regular basis:	Extremely Unlikely : A B C D E : Extremely Likely
43	I will successfully complete this construction education course:	Extremely Unlikely : A B C D E : Extremely Likely
44	For me to attend the meeting of a construction education program is:	Extremely Unpleasant : A B C D E : Extremely Pleasant
45	For me to complete a construction education program is:	Extremely Worthless : A B C D E : Extremely Valuable
46	For me to attend the meetings of a construction education program is:	Extremely Worthless : A B C D E : Extremely Valuable
47	I would make an effort to successfully complete a construction education program:	I Definitely Will Not : A B C D E : I Definitely Will
48	I would make an effort to attend the meetings of construction education courses on a regular basis:	I Definitely Would Not : A B C D E : I Definitely Would
49	Most people who are important to me think that [I should - I should not] participate in construction education:	I Should Not : A B C D E : I should
50	I intend to successfully complete construction education:	Strongly Disagree : A B C D E : Strongly Agree
51	Most people whose opinions I value would approve of my participating in a construction education program:	Strongly Disagree : A B C D E : Strongly Agree
52	I intend to attend the meetings of a construction education program on a regular basis:	Strongly Disagree : A B C D E : Strongly Agree

Survey Continues on Next Page

Directions: For the following questions, please select the response that best describes you.

53	How active are you in extra-curricular activities (student clubs, students competition teams, fraternities or sororities, intercollegiate athletics, ROTC, etc.)?	Not Active : A B C D E : Very Active

		A	B	C	D	E
54	What is your current year in school?	Freshman	Sophomore	Junior	Senior	Graduate
55	What is your major?	Construction Management or Pre-CM	Interior Design	Undeclared	Dual Major (Including Construction Management)	Other
56	What age range best describes you?	17 years or younger	18-19 years	20-21 years	22-24 years	25 years or older
57	What is your ethnicity?	Non-Hispanic White	Hispanic	Asian American	African American	Other or International
58	What is your gender?	Female	Male			

Survey Continues on Next Page

Question 55 Response Options for Texas A&M University

		A	B	C	D	E
55	What is your major?	Construction Science	Architecture or Landscape Architecture	Agricultural Leadership	Dual Major (Including Construction Science)	Other

Directions: For the following questions, please select the response that best describes you.

		Yes	No			
59	**Do you have a mentor?**	A	B			

**In this study, a "mentor" is considered a person who has influenced your academic decisions by actively giving advice, encouraging (or discouraging), supporting, providing information, or helping you make decisions.*

		Family Member	Friend, Peer, or Significant Other (Spouse, Partner)	Professor, Instructor, or Academic Advisor	Co-Worker or Supervisor	Other
60	If you answered Question #59 with "no", please skip to Question #63. If you answered Question #59 with "yes", identify the person whom you consider a **mentor**. If you have more than one mentor, answer based on the mentor that has the greatest influence on your academic decisions:	A	B	C	D	E

		Female	Male
61	What is the gender of the **mentor** identified in Question #60?	A	B

		Yes	No
62	Does the **mentor** identified in Question #60 work in the construction industry?	A	B

		Yes	No
63	**Do you have a role model?**	A	B

**In this study, a "role model" is considered a person who, either by doing something or by being admirable to you in one or more ways, has had an impact on the academic decisions you have made in your life. Role models may be people you know personally, or they may be people you simply know of.*

		Family Member	Friend, Peer, or Significant Other (Spouse, Partner)	Professor, Instructor, or Academic Advisor	Co-Worker or Supervisor	Someone I know of, but do not know personally
64	If you answered Question #63 with "no", please skip to Question #67. If you answered Question #63 with "yes", identify the person whom you consider a role model. If you have more than one role model, answer based on the role model that has the greatest influence on your academic decisions: **In this study, "someone I know of, but do not know personally" is considered a person who you do not know personally, but know of, such as through the media or through historical account.*	A	B	C	D	E

		Female	Male
65	What is the gender of the **role model** identified in Question #64?	A	B

		Yes	No
66	Does the **role model** identified in Question #64 work in the construction industry?	A	B

Survey Continues on Next Page

Directions: For the following questions, please select the response that best describes you.

		0 - 1.0	Greater than 1.0 but less than 2.0	Greater than 2.0 but less than 3.0	Greater than 3.0 but less than 4.0	4.0 or higher
67	What category best describes your current GPA?	A	B	C	D	E

		None	More than "none" but less than 6 months	More than 6 months but less than 12 months	More than 12 months but less than18 months	More than 18 months
68	**How much construction management experience do you have?** **In this study "management experience" is considered field or office management tasks; such as submittal/shop drawing review, writing requests for information (RFIs), preparing estimates or budgets, preparing or updating schedules, and so on.*	A	B	C	D	E

		None	More than "none" but less than 6 months	More than 6 months but less than 12 months	More than 12 months but less than18 months	More than 18 months
69	**How much hands-on construction experience do you have?** **In this study "hands-on construction experience" is considered labor related tasks. Such as, installing roofing materials, cleaning up the site, assisting in the installation of brick, placing concrete, placing reinforcing, and so on.*	A	B	C	D	E

		0	1	2	3	More than 3
70	How many construction management internships have you completed?	A	B	C	D	E

		Yes	No
71	**Does anyone in your family work in the construction industry?** **In this study the "construction industry" is considered a construction-related business such as a general contractor or subcontractor, construction material supplier, etc.*	A	B

Thank you for your participation!
Please turn in your survey responses to the researcher.

APPENDIX H: SURVEY RESPONSE SHEET

SCANTRON Mark Reflex® MM83388-2:17 ED05

ANSWER SHEET

SCHOOL OR ORGANIZATION	NAME OF TEST
DATE OF TEST (MONTH DAY YEAR)	GRADE AND SECTION

SPACES FOR STUDENT NUMBER

0 1 2 3 4 5 6 7 8 9

SEE MARKING INSTRUCTIONS

MARKING INSTRUCTIONS

Use a No. 2 pencil only.
Do not use ink, ballpoint, or felt tip pens.
Make solid marks that fill the response completely.
Erase cleanly any marks you wish to change.
Make no stray marks on this form; they may count against you.

CORRECT: ●
INCORRECT: ⊘ ⊗ ◒ ⊙

MARK YOUR TEST VERSION HERE
Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

SPACES FOR STUDENT NAME

LAST NAME

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

FIRST INITIAL

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

SECOND INITIAL

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

← MAKE NO MARKS BEYOND THIS LINE

	T F		T F		T F		T F		T F		T F
1	A B C D E	31	A B C D E	61	A B C D E	91	A B C D E	121	A B C D E	151	A B C D E
2	A B C D E	32	A B C D E	62	A B C D E	92	A B C D E	122	A B C D E	152	A B C D E
3	A B C D E	33	A B C D E	63	A B C D E	93	A B C D E	123	A B C D E	153	A B C D E
4	A B C D E	34	A B C D E	64	A B C D E	94	A B C D E	124	A B C D E	154	A B C D E
5	A B C D E	35	A B C D E	65	A B C D E	95	A B C D E	125	A B C D E	155	A B C D E
6	A B C D E	36	A B C D E	66	A B C D E	96	A B C D E	126	A B C D E	156	A B C D E
7	A B C D E	37	A B C D E	67	A B C D E	97	A B C D E	127	A B C D E	157	A B C D E
8	A B C D E	38	A B C D E	68	A B C D E	98	A B C D E	128	A B C D E	158	A B C D E
9	A B C D E	39	A B C D E	69	A B C D E	99	A B C D E	129	A B C D E	159	A B C D E
10	A B C D E	40	A B C D E	70	A B C D E	100	A B C D E	130	A B C D E	160	A B C D E
11	A B C D E	41	A B C D E	71	A B C D E	101	A B C D E	131	A B C D E	161	A B C D E
12	A B C D E	42	A B C D E	72	A B C D E	102	A B C D E	132	A B C D E	162	A B C D E
13	A B C D E	43	A B C D E	73	A B C D E	103	A B C D E	133	A B C D E	163	A B C D E
14	A B C D E	44	A B C D E	74	A B C D E	104	A B C D E	134	A B C D E	164	A B C D E
15	A B C D E	45	A B C D E	75	A B C D E	105	A B C D E	135	A B C D E	165	A B C D E
16	A B C D E	46	A B C D E	76	A B C D E	106	A B C D E	136	A B C D E	166	A B C D E
17	A B C D E	47	A B C D E	77	A B C D E	107	A B C D E	137	A B C D E	167	A B C D E
18	A B C D E	48	A B C D E	78	A B C D E	108	A B C D E	138	A B C D E	168	A B C D E
19	A B C D E	49	A B C D E	79	A B C D E	109	A B C D E	139	A B C D E	169	A B C D E
20	A B C D E	50	A B C D E	80	A B C D E	110	A B C D E	140	A B C D E	170	A B C D E
21	A B C D E	51	A B C D E	81	A B C D E	111	A B C D E	141	A B C D E	171	A B C D E
22	A B C D E	52	A B C D E	82	A B C D E	112	A B C D E	142	A B C D E	172	A B C D E
23	A B C D E	53	A B C D E	83	A B C D E	113	A B C D E	143	A B C D E	173	A B C D E
24	A B C D E	54	A B C D E	84	A B C D E	114	A B C D E	144	A B C D E	174	A B C D E
25	A B C D E	55	A B C D E	85	A B C D E	115	A B C D E	145	A B C D E	175	A B C D E
26	A B C D E	56	A B C D E	86	A B C D E	116	A B C D E	146	A B C D E	176	A B C D E
27	A B C D E	57	A B C D E	87	A B C D E	117	A B C D E	147	A B C D E	177	A B C D E
28	A B C D E	58	A B C D E	88	A B C D E	118	A B C D E	148	A B C D E	178	A B C D E
29	A B C D E	59	A B C D E	89	A B C D E	119	A B C D E	149	A B C D E	179	A B C D E
30	A B C D E	60	A B C D E	90	A B C D E	120	A B C D E	150	A B C D E	180	A B C D E

APPENDIX I: DEMOGRAPHIC CHARACTERISTICS

Table I.1
Demographic Characteristics of Construction Management Students (n = 468)

Characteristic	*n*	%
Gender		
Female	56	12.0
Male	410	88.0
Age (years)		
18-19 years	115	24.6
20-21 years	214	45.7
22-24 years	99	21.2
25 years or older	40	8.5
Ethnicity		
Non-Hispanic White	371	80.1
Hispanic	66	14.3
Asian American	11	2.4
African American	7	1.5
Other or International	8	1.7
Current year in school at the time of survey		
Freshman	62	13.2
Sophomore	208	44.4
Junior	99	21.2
Senior	99	21.2
Grade point average		
0 - 1.0	2	0.4
Greater than 1.0 but less than 2.0	9	2.0
Greater than 2.0 but less than 3.0	179	39.8
Greater than 3.0 but less than 4.0	250	55.6
4.0 or higher	10	2.2
Construction management experience		
None	148	32.5
More than "none" but less than 6 months	160	35.1
More than 6 months but less than 12 months	77	16.9
More than 12 months but less than18 months	34	7.5
More than 18 months	37	8.1
Hands-on construction experience		
None	77	16.9
More than "none" but less than 6 months	165	36.3
More than 6 months but less than 12 months	87	19.1
More than 12 months but less than18 months	37	8.1
More than 18 months	89	19.6

Table I.1 Continued

Characteristic	*n*	%
Participation in construction management internships		
0	334	73.4
1	83	18.2
2	25	5.5
3	7	1.5
More than 3	6	1.3
Family involvement in the construction industry		
Yes	232	51.6
No	218	48.4
Has a mentor		
Yes	221	48.1
No	238	51.9
Has a role model		
Yes	310	72.9
No	115	27.1

Note. Includes Construction Management or Pre-CM and Dual Major (Including Construction Management) at Colorado State University, and Construction Science and Dual Major (Including Construction Science) at Texas A&M University.

Table I.2

Demographic Characteristics of Role Models and Mentors

	Mentor (n = 221)		Role Model (n = 310)	
Characteristic	*n*	%	*n*	%
Category				
Family member	137	64.6	218	71.7
Friend, peer, or significant other (spouse, partner)	35	16.5	58	19.1
Professor, instructor, or academic advisor	28	13.2	11	3.6
Co-worker or supervisor	8	3.8	11	3.6
Other	4	1.9		
Someone I know of, but do not know personally			6	2.0
Gender				
Female	46	21.4	55	18.1
Male	169	78.6	249	81.9
Works in the construction industry				
Yes	127	59.3	163	53.8
No	87	40.7	140	46.2