FACTORS INFLUENCING A FEMALE'S SELECTION OF A CONSTRUCTION MANAGEMENT DEGREE: A STUDY OF JUNIOR- AND SENIOR-LEVEL UNDERGRADUATE STUDENTS

A Thesis

by

LISA MARIE RITTER

Submitted to the Office of Graduate and Professional Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Chair of Committee,	Ben Bigelow
Co-Chair of Committee,	David Bilbo
Committee Member,	Shannon Van Zandt
Head of Department,	Joseph Horlen

August 2014

Major Subject: Construction Management

ABSTRACT

The under representation of women in construction pervades the industry and academia. With growing demand for a skilled workforce in the industry, professionals, and researchers attempt to understand what influences a female's decision to enter the industry so they may tap into this market segment. Many influential factors have been identified as to a female's decision to pursue a career in the construction industry, starting with their decision to pursue an undergraduate construction management (CM) degree.

This study provides a mixed-method study on what the most positive influential factors for females in selecting and remaining in a CM undergraduate degree program for Junior- and Senior-level students. The research was completed through a self-administered, researcher-designed survey at Arizona State University, Auburn University, Colorado State University, Purdue University, and Texas A&M University. The strongest positive influential factors for selecting an undergraduate CM degree were the career opportunities and having an internship and the strongest positive influences for remaining in a CM degree program were internships in the program and the community of classmates in the program.

ACKNOWLEDGEMENTS

I would like to first and foremost thank God. It is through Him that all things are possible. To my Chair, Dr. Ben Bigelow, and Co-Chair Dr. David Bilbo, thank you for your guidance and support in my research. To my committee member, Dr. Shannon Van Zandt, thank you for your insightfulness. Each of you has enhanced this research and I am grateful for the opportunity to have worked with each of you.

To my professors and classmates at Texas A&M University, thank you for educating me on so much more than Construction Management. I extend a special thank you to Professor Robert Segner. I admire you greatly and feel blessed to have had the opportunity to learn from you. To my classmates, thank you for listening, for supporting, for laughing, and for the adventures in and out of the classroom. Graduate school has been so much more rewarding because I was able to share it with you.

To my parents and siblings, your unconditional love and support across the miles as meant the absolute world to me. Thank you for being there every step of the way. To my friends who are family, thank you for your prayers, encouragement, letters, phone calls, and conversations which have helped me in this journey more than you will ever know. I am so very blessed to have such *amazing* people in my life.

NOMENCLATURE

ASU	Arizona State University
CM	Construction Management
CSU	Colorado State University
NAWIC	National Association of Women in Construction
STEM	Science, Technology, Engineering, and Mathematics
TAMU	Texas A&M University

TABLE OF CONTENTS

Page

LIST OF FIGURES

Page

LIST OF TABLES

Page

1. INTRODUCTION AND LITERATURE REVIEW

1.1 Background

Construction represents a growing industry in the United States with an ever-increasing demand for a knowledgeable, professional workforce. As demand increases, without an increase in the supply of workers, the industry seeks new avenues to recruit and fill the unmet demand (Menches & Abraham, 2007). One of the largest underrepresented labor resources in the construction workforce is women. There are 813,000 construction managers in the United States and only 7.3 percent are women (BLS, 2013). In addition, women are significantly underrepresented in undergraduate CM programs (Sewalk & Nietfeld, 2013). This research assumes that with an increase in the representation of women in undergraduate CM programs, the industry would witness an increase in the representation of women. In order to increase the representation of women in undergraduate CM programs, it is important to understand the factors which influence females to select Construction Management (CM). This understanding will allow universities to appropriately inform young women about the construction industry and more effectively target them in their recruiting efforts.

The main objective for this research was to gain an understanding of the most influential factors as to why women select CM as their undergraduate field of study. It is believed that the factors might change as a student moves through her undergraduate career and/or transfers from a two-year program, therefore this research focuses on Junior- and Senior-level undergraduate females, including transfer students.

1.2 Problem Statement

This study served to identify and analyze the factors that most positively influence a female's selection of an undergraduate degree in CM as well as those factors which retain them in the degree program.

1.3 Research Purpose

The purpose of this study was to identify and analyze the most positive influential factors for Junior- and Senior-level undergraduate students as to why they selected an undergraduate CM degree.

The Research Questions for this study are:

1. Which factors most influence students' decision to select CM as an undergraduate degree?
2. Which factors most influence students' decision to remain in a CM undergraduate degree?
3. Is there a difference in the factors which influence a transfer student to enter or remain in a CM degree compared to a student who went directly into a four-year CM degree?

1.4 Significance of Research

This study provides universities an understanding as to what factors females believe had the most positive influence on their selection of CM as their undergraduate field of study as well as their decision to remain in the program. This research analyzed

factors previously identified in literature to identify which were the most positively influential. Universities could potentially increase female student enrollment in CM programs with this understanding as they could appropriately market the degree program to attract more females. In addition, the understanding of the factors which most positively influence a female's decision to remain in the CM degree could help universities retain females by ensuring that those factors are part of the student's experience while enrolled in the degree program.

1.5 Delimitations

This study was delimited to: female; Junior- or Senior-level undergraduate students at Arizona State University (ASU), Auburn University, Colorado State University (CSU), Purdue University and Texas A&M University (TAMU) during Spring 2014.

1.6 Assumptions

There were assumptions made in this study. "Assumptions are so basic that, without them, the research problem itself could not exist" (Leedy & Ormrod, 2013, p. 44). This study assumed that the survey participants are representative of the population considered in this study. In addition, it was assumed that the participants had the prerequisite knowledge to be able to answer the questions and then answered the questions honestly. The confidentiality of the study aided in participants feeling

comfortable to respond truthfully. It was also assumed that the survey instrument tested what the researcher intended.

1.7 Definitions

Construction Management: Career and university programs dedicated to construction project management; does not refer to construction engineering or construction trades.

Internship(s): On-the-job learning experience sponsored by an educational institutional whereby the student receives course credit. This may be paid or unpaid.

Field Position: Field Engineer or Superintendent track position in which the individual spends the majority of their time working on a job site overseeing field operations.

Male-Dominated Industry: An industry in which males comprise 75% or more of total employment.

Non-Internship Work Experience: Work experience not sponsored by an educational institution.

Office Position: Project Manager track position in which the individual spends the majority of their time working on project controls and management of office operations.

Non-Traditional Career: According to the Department of Labor (2009) it is a career field "in which women comprise 25% or less of total employment."

2. REVIEW OF RELATED LITERATURE

2.1 Overview

The purpose of this study was to develop an understanding of what factors influence a woman's selection of an undergraduate degree in Construction Management and remaining in that degree, specifically looking at Junior- and Senior-level undergraduate students. Within this review of literature, a general overview of women in the construction industry will be reviewed, along with factors that have been identified as to why women choose to pursue a non-traditional career choice. A non-traditional career choice is identified as a career which is typically a male dominated industry.

2.2 Women in the Construction Industry

The underrepresentation of women in the construction industry has been around for decades and is not only a problem in the United States, but across the globe, including in the United Kingdom, Australia, Japan, and Canada (Menches & Abraham, 2007). In the United Kingdom in 1988, women represented only 7% of the construction workforce (Gale, 1994). In Alberta, Canada, although the Construction industry represented the region's third largest industry, women represented just 14% of the workforce (Alberta Innovation, n.d.). According to the Bureau of Labor and Statistics in 2013, out of 813,000 construction managers in the United States only 7.3% are women (BLS, 2014). The National Association of Women in Construction (NAWIC) reported that as of December 31, 2011, there were 828,000 women employed in the construction

industry, approximately 9% of the industry (NAWIC, 2012). Within this 74% of the women work in sales and office positions; 13% in professional and management positions; 2% in Natural Resources, Construction & Maintenance; 20% in service occupations; and 3% in transportation and material moving.

The United States, Canada, and the United Kingdom all have begun initiatives to increase the recruitment of women and other underrepresented minorities (Menches & Abraham, 2007). In Canada, they sought to improve the work-life balance of the construction industry and develop mentoring programs to support women and other minority groups in the construction industry (Alberta Innovation, n.d.). The United Kingdom created the Construction Industry Training Board (CITB) in 2006 to assist in providing apprenticeships and other training resources to entry-level workers (Menches & Abraham, 2007).

The recognition that women needed additional support in the construction industry in the United States began decades ago as illustrated through the creation of the NAWIC, which gained national charter in 1955 (NAWIC, 2012). The sole purpose of the organization was to create a support network for women in the male-dominated construction industry and to encourage their advancement in the field. In 1980, the Professional Women in Construction (PWC) non-profit was started with a similar purpose of supporting and advancing the careers of women in construction and related industries (“About PWC,” 2013).

2.3 Barriers for Women in the Construction Industry

With an understanding that there is an underrepresentation of women in the construction industry, it is important to understand why there are not more women in the industry. One theory was that women were excluded from management positions within the construction industry because they lacked the managerial competencies (Arditi & Balci, 2009). However, in that study a management development questionnaire determined that there were no differences in the managerial competencies of men and women. Rather women are underrepresented in the industry due to its culture, the nature of the work, and project-based setup. The theory of management incompetency is further disproven when looking at the success of CH2M HILL's Women's Leadership Initiative (Rast, 2009). This initiative set out in 2003 to attract, develop, retain, and promote women into leadership positions. From 2003 to 2008, women's representation in senior leadership positions at CH2M HILL increased from 2.9% to 18% and women project managers grew from 20.5% to 30.3%.

Barriers women face when entering the construction industry as identified in literature include: the construction industry's image; career knowledge amongst children and adults; selection criteria and male dominated courses; recruitment practices and procedures; sexist attitudes; male dominated culture; and the work environment (Fielden, Davidson, Gale, & Davey, 2000). Greed (1997) reported that it did not seem to be the "dirtiness" of the work that deterred women but rather the culture of the male dominated industry, and bullying. The construction industry appeared to encourage a culture whereby women feel isolated segregated, and there was little opportunity for career

development (Bennett, Davidson, & Gale, 1999). They identified that women might initially chose to enter the industry but decide to leave to have children. Gender stereotyping was a barrier identified by Knight, Mappen, & Knight (2011) when looking to increase the representation of women in Science, Technology, Engineering and Math (STEM) disciplines. High school females were dissuaded from pursuing a career in a STEM related field as there were stigmas surrounding these male dominated industries. The male-dominated image of the industry has historically dissuaded women from pursuing a career in the industry (Dainty, Bagilole, & Neale, 2000; Fielden, Davidson, Gale, & Davey, 2001; Gale, 1994; Greed, 1997; Menches & Abraham, 2007).

Sewalk and Nietfeld (2013) completed a research study through the Associated Schools of Construction (ASC) in the United States to determine the barriers of entry for women into undergraduate CM programs. Their research confirmed many of the barriers which have been identified for many years; the sexist industry image, unfavorable work-life balance, long hours, unequal pay, and slow career progression. These correspond to the barriers identified by Menches and Abraham (2007): slow career progression, work-life balance, male dominated industry, and culture of conflict and aggression, as well as Dainty et al.'s (2000) research on the slow career progression of women in construction.

2.4 Factors Influencing a Non-traditional Career Choice

Given the barriers women face in entering the construction industry, and other male dominated industries, the question becomes why does a woman choose to enter the industry? What factors influence her decision? Moore (2006) completed one of the most

recent, comprehensive studies aimed at creating a theory of women's career choice and development within the construction industry. Moore's study was comprised of focus groups and written surveys of 24 professional women in the construction industry. In her study, she identified that the following variables were found to influence and/or support a non-traditional career choice: androgynous gender role socialization and strong family ties, specifically a strong connection to their fathers; a self-efficacy trait in which these women succeed through their own personal sense of strength; and these women showed an interest and aptitude for science and mathematics. In addition, they had role models, mentors, and significant others who were considered to be the greatest positive environmental influence on their decision to enter a Construction Management program.

Moore's (2006) findings support previous research done in the area. She identified the three areas which previous research had discovered as factors of non-traditional career choice: 1) family background variables; 2) individual or psychological variables; and 3) environmental or sociological variables. Bennett, et al. (1999) identified that women's career choice was significantly influenced by family background values and that these women often had a strong role model who worked in the industry.

A study by Yates (2013) demonstrated that increasing the awareness through educational reform, had a strong positive impact on increasing the enrollment in collegiate engineering studies. During the five year period of the study, not only did overall engineering enrollment increase due to the educational reforms, female enrollment increased from 6.4% to 10.1%. It was identified that 40% of the incoming

freshman found out about the College of Engineering through high school teachers and counselors.

Literature reveals that having a working mother (Bennett et al., 1999; Moore, 2006; Davey & Stoppard, 1993) or a female role model (Bennett et al., 1999; Gale, 1994; Fielden et al., 2001; Menches & Abraham, 2007; Moore, 2006) can influence a non-traditional career choice for women. In addition, mentoring programs may encourage a female's decision to enter a non-traditional career field (Moore, 2006; Menches & Abraham, 2007). Exposure to the construction industry, or another non-traditional career field, may influence a female's decision to pursue a career in that field. The exposure may come from a variety of different avenues, such as internships or site visits (Fielden et al., 2000; Menches & Abraham, 2007), work experience (Bennett et al., 1999; Gale, 1994; Menches & Abraham, 2007; Fielden et al. 2000), or having a parent take them to work (Fielden et al., 2000). Females also perceive the industry as one with opportunity and security (Gale, 1994).

2.5 Recruiting and Retaining Women in Construction Management

The first question when trying to increase female enrollment in a construction management program is how do you recruit females? Tsui (2009) revealed that there needs to be recruitment efforts targeted toward females; there needs to be community outreach in the elementary, middle, and high schools so females are aware of the program and opportunities; and that undergraduate students should assist in the efforts as they can relate to the younger students.

Sewalk and Nietfield (2013) found positive correlations between women's enrollment in construction management and several factors, namely having female faculty and female support/social groups. This is consistent with previous research (Moore, 2006; Shane, Lopez Del Puerto, Strong, Mauro, & Wiley-Jones, 2012). In a study completed at Midwestern University's Construction Engineering program it was identified that women need to have a sense of belonging through networking and support groups outside of the classroom (Shane et al., 2012). Lopez del Puerto, Guggemos, and Shane (2011) identified eight factors, consistent with previous research, which are believed to increase female enrollment in construction management programs: 1) mentoring; 2) targeting females; 3) countering negative gender stereotypes; 4) hire female faculty; 5) have female faculty recruit students; 6) establish women in construction organizations; 7) hold camps for prospective females; and 8) promote the program to high school advisors.

Once female students are in a construction-related program the question then becomes, how are they retained in the program? Research has revealed that the same things which were introduced as ways to overcome the barriers of entering the industry are those required to retain students in the program. Midwestern University has implemented several programs to increase the female students' integration into the program as well as develop their identity in a male-dominated industry; programs include socials, faculty mentoring, networking through NAWIC, and job site visits (Shane et al., 2012). This is consistent with Moore's finding that networking and social integration were key in a female's success (Moore, 2006). Moore and Gloeckner (2007)

identified three keys to retain students in construction, both through school and then into their career; 1) be honest about the challenging culture women face, 2) develop a mentoring program, and 3) incorporate internships or other work experience into the program.

2.6 Summary

This review has summarized the literature in regard to the current role of women in the construction industry and the barriers they face when entering the industry. It then reviewed what influences a female's decision to pursue a career in CM, select an undergraduate CM degree, and remain in a CM degree program. This study enhances existing research as no one has completed a quantitative study of female students in the United States as to the most influential factors which influence a female's selection and retention in an undergraduate Construction Management degree program.

3. METHODOLOGY

3.1 Overview

In order to assess the factors that contribute to a female's selection of pursing an undergraduate degree in CM, a self-administered, researcher-designed survey was completed. The survey was developed by analyzing factors previously identified in existing literature. Survey participants were students in the CM programs at ASU, Auburn, CSU, Purdue, and TAMU. These universities were selected as they are five of the largest CM programs in the United States with more than 340 students enrolled. In addition, each university had at least a 5% female enrollment during Spring 2014.

3.2 Sample

The population considered was female undergraduate students in CM degree programs at ASU, Auburn, CSU, Purdue, and TAMU. These five universities were selected as they are five of the largest CM programs in the United States (enrollment of more than 340 students with at least a 5% female enrollment) and they agreed to participate in the research study. There are two other universities which met this size requirement but did not agree to participate in the research. This research was based only on Junior-and Senior-level students. Therefore, the population was 113 students based on Spring 2014 enrollment figures from the universities. The selected sample was 88 students. Those 88 students represent all of the females enrolled in the CM degree at ASU, Auburn, and Purdue as well as a sample of the female students who were enrolled

in the classes at CSU and TAMU where the researcher was allowed to administer the survey. The intent was to survey all of the students at CSU and TAMU but the researcher was not allowed in all of the classrooms to administer the survey.

The researcher received 56 responses resulting in a response rate of 50%. With a 95% confidence level, there is a 9.34 confidence interval. Table 1 presents the information on the population, selected sample, the actual sample, and the response rates.

Table 1: Population, Sample, and Response Rates

University	Population	Selected Sample	No. of Responses	Response Rate
Arizona State University	21	21	7	33.3%
Auburn University	14	14	10	71.4%
Colorado State University	22	10	9	40.9%
Purdue University	19	19	6	31.6%
Texas A&M University	37	24	24	64.9%
Total	113	88	56	49.6%

The researcher intended to increase the sample size by sending the survey to National Association of Women in Construction (NAWIC) student members. Only four surveys were received and the respondents of these surveys did not attend universities which held at least 340 student enrollment in Spring 2014. In addition, four responses is not representative sample which can be generalized to the larger population and had the potential to dilute the results from this study. According to Gliner, Morgan, & Leech, (2009), you need at least 30 individuals in a sample in order to generalize. Therefore, the

NAWIC surveys were not factored into the results and not included as part of the sample being studied in this research.

3.3 External Validity

External validity addresses the ability to generalize the findings to a larger context (Leedy & Ormrod, 2013). The researcher obtained external validity by obtaining a representative sample at all five of the universities in the population. There was a convenience sample completed of students at ASU, Auburn, and Purdue where all students were invited to participate. The researcher was not able to administer the survey to all of the students at CSU and TAMU; however, the sample surveyed was a high percentage of the population at those universities. At CSU the actual sample was 40.9% of the population and at TAMU the actual sample was 64.9% of the population. With this high percentage of the population included in the study, it allowed the researcher the ability to generalize to the entire population given that such a large portion of the population was surveyed.

3.4 Survey Instrument

The researcher-designed survey consisted of 18 questions regarding the factors which influenced a student's decision to enter a CM degree program. See Appendix A for the survey. This survey was tested in two different focus groups prior to being utilized in the research to enhance the reliability of the instrument and mitigate the threat to internal validity of an unproven survey.

The factors in the survey were identified through a review of relevant literature. Previous research has proven these factors to be a positive influence on a female's selection and retention in a CM degree. Sixteen factors were analyzed in regard to their selection of a CM degree and 15 factors in regard to their decision to remain in a CM degree. The factors are listed in Table 2. Students were also provided open ended questions to add additional factors.

Two questions in the survey contained multiple factors rated on a 5-point Likert scale. The first set of Likert-scaled questions measured the factors which influenced a student's decision to enter a CM degree program and the second set measured the factors which influenced a student's decision to remain in a CM degree program. Leedy and Ormrod (2013) indicate that scaled responses have limitations as the results are limited by the numerical response and no clarification is available. To provide additional depth, the survey included seven open-ended questions. This allowed participants to identify factors that influenced them which were not found in existing research.

In January 2014, the researcher obtained approval from the Institutional Review Board (IRB) at TAMU. See Appendix B for IRB Approval Letters from TAMU and support letters from the other universities. The researcher administered surveys to students at TAMU and a graduate researcher at CSU administered the survey there. The researcher at CSU did not participate in research but merely facilitated data collection. Simultaneously, the researcher provided a link to an electronic survey to ASU, Auburn, and Purdue. The researcher did not have access to e-mail addresses at those universities and a member of the staff at the universities sent the survey to the students.

Table 2: Factors Analyzed in Survey

16 Factors for Selecting CM Program	15 Factors for Remaining in CM Program
Internship(s) (Menches & Abraham, 2007)	Internship after enrolling in the construction related degree (Moore & Gloeckner, 2007)
Field trips to job sites (Menches & Abraham, 2007)	Non-Internship construction work experience after enrolling in college (Moore & Gloeckner, 2007)
Previous non-internship work experience in the industry (Menches & Abraham, 2007)	In-classroom innovation in construction classes (use of videos, gadgets etc) (Knight et al., 2011)
Community service (Lopez del Puerto et al., 2011)	Mentoring (Shane et al., 2012)
TV or Magazine ads (Amaratunga, Haigh, Shanmugam, Lee, & Elvitigalage, 2006)	Tutoring (Tsui, 2007)
Scholarship or other funding opportunities in the degree (Fielden et al., 2000)	Workshops and Seminars (Tsui, 2007)
Father working in the industry (Moore, 2006)	Scholarships and Fellowships (Fielden et al., 2000)
Mother working in the industry (Moore, 2006)	Individual involvement in construction-related research (Tsui, 2007)
Father taking you to work (Fielden et al., 2000)	Faculty members of your gender (Sewalk & Nietfield, 2013)
Mother taking you to work (Fielden et al., 2000)	Students of your gender in the program (Milgram, 2011)
Male role model, not your parent (Moore, 2006)	Involvement in construction related student organizations (Shane et al., 2012)
Female role model, not your parent (Menches & Abraham, 2007)	Hands on experience in construction lab classes (Knight et al., 2011)
A high school advisor/counselor (Yates, 2013)	Community of construction students/ classmates (Shane et al., 2012)
A college advisor/counselor (Moore & Gloeckner, 2007)	Academic advising (Knight et al., 2011)
Mentoring program at school (Shane et al., 2012)	Courses based on mathematical analysis (e.g. structures, estimating) (Moore, 2006)
Career Opportunities after Graduation (Gale, 1994)	

3.5 Internal Validity

Internal validity is the extent to which the researcher can determine cause-and-effect relationships and other relationships within the data collected (Leedy & Ormrod, 2013). Internal validity was achieved by conducting two pilot studies/focus groups with female CM undergraduate students at TAMU. Participants in the pilot study took the survey and provided feedback on any questions, concerns, and/or confusion with the survey. After completion of the first pilot study, the researcher adjusted the survey based on the feedback received and provided the revised survey to the second group of participants. This allowed for continual improvement of the survey instrument and mitigated the threat to internal validity.

3.6 Data Collection

The survey was administered in person in construction courses at CSU and TAMU. At TAMU there is a Junior-level internship course in which the students are working for companies away from campus. The survey was sent electronically by the TAMU professor overseeing the course to those students. At ASU, Auburn, and Purdue an e-mail was sent out with the link to the survey by a staff member at each university. Two follow up e-mails were sent to the survey participants as this has been shown to increase the response rate (Leedy & Ormrod, 2013).

The remaining respondents at TAMU and CSU completed the survey in a classroom setting where they were provided the Informed Consent letter (See Appendix C), the survey instrument, and a notecard. Please see Appendix D for the verbal

recruitment script from the in-person survey administration. The notecard was given so students could provide their e-mail address if they were willing to answer further questions in regard to the study. In addition, any student who entered their e-mail address was entered for a chance to win one of three (3) $10 gift cards. Respondents at ASU, Auburn, and Purdue were sent an e-mail (See Appendix E) with a link to the previously referenced Informed Consent and the electronic survey.

There were 61 responses to the survey. The responses were then filtered to ensure each respondent met the required delimitations. One response was removed as the participant was not pursuing a CM undergraduate degree. After filtering, there were 56 usable responses from the five universities where data was collected. This resulted in an overall response rate of 49.6%.

3.7 Data Analysis

This was a mixed-method research study. JMP Pro 10, a SAS software program, was utilized for all quantitative analysis. Research questions 1 through 3 were analyzed primarily utilizing descriptive statistics based on the ordered categorical data from the Likert-scaled responses. In addition, there were seven open-ended questions in the survey. These open-ended responses were coded and analyzed for repetitive words and phrases. The demographic questions were utilized to describe the sample. The researcher utilized pairwise deletion to analyze the results allowing the use of all of the responses for each question, regardless of whether the entire survey was answered. This resulted in a different *n* for each question when calculating the descriptive statistics.

3.8 Summary

A self-administered, researcher-designed survey was completed at ASU, Auburn, CSU, Purdue, and TAMU in order to identify and analyze the most influential factors as to why females select and are retained in CM degree programs. The survey considered 16 influential factors of a female's selection of a CM degree and 15 influential factors for a female's decision to remain in a CM degree.

4. DATA AND ANALYSIS

4.1 Introduction

The purpose of this study was to identify and analyze the factors that most influence a female's selection of an undergraduate degree in CM, and which factors most influence them to stay in the program. The study focuses on Junior- and Senior-level undergraduate students, including transfer students.

The Research Questions for this study are:

1. Which factors most influence students' decision to select CM as an undergraduate degree?
2. Which factors most influence students' decision to remain in a CM undergraduate degree?
3. Is there a difference in the factors which influence a transfer student to enter or remain in a CM degree compared to a student who went directly into a four-year CM degree?

4.2 Sample Characteristics

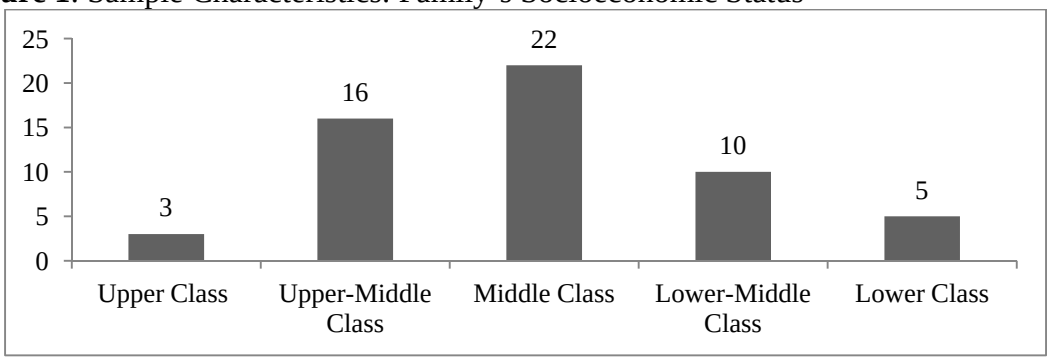
The following section describes the sample characteristics. First, Table 3 provides the number of students from each of the five universities which were in the actual sample.

Table 3: Sample Characteristics: University Attended Spring 2014

University	*n*
ASU	7
Auburn	10
CSU	9
Purdue	6
TAMU	24
Total	56

Participants came from all socioeconomic statuses, the largest representation coming from a middle-class family background (39%). There were 5% of students from upper-class families, 29% from upper-middle-class, 18% from lower-middle-class and 9% from lower class families as reflected in Figure 1. The parameters defining each class were not specified and therefore were self-identified by the survey participant. This finding is consistent with literature indicating that the majority of females in CM come from middle-class families (Moore, 2006).

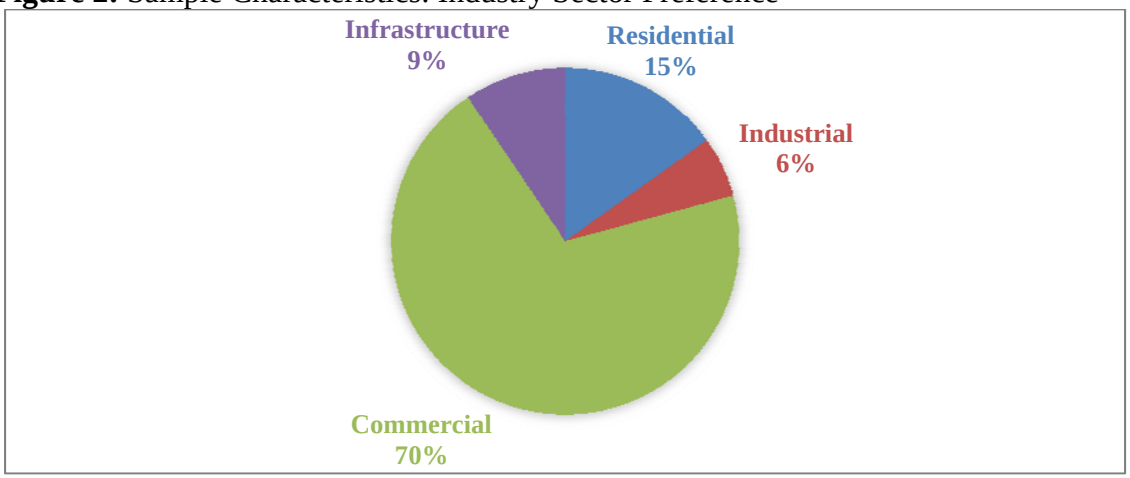
Figure 1: Sample Characteristics: Family's Socioeconomic Status



Fifty-one participants planned to work in the construction industry after graduation and two participants did not plan on entering the construction industry. Of the

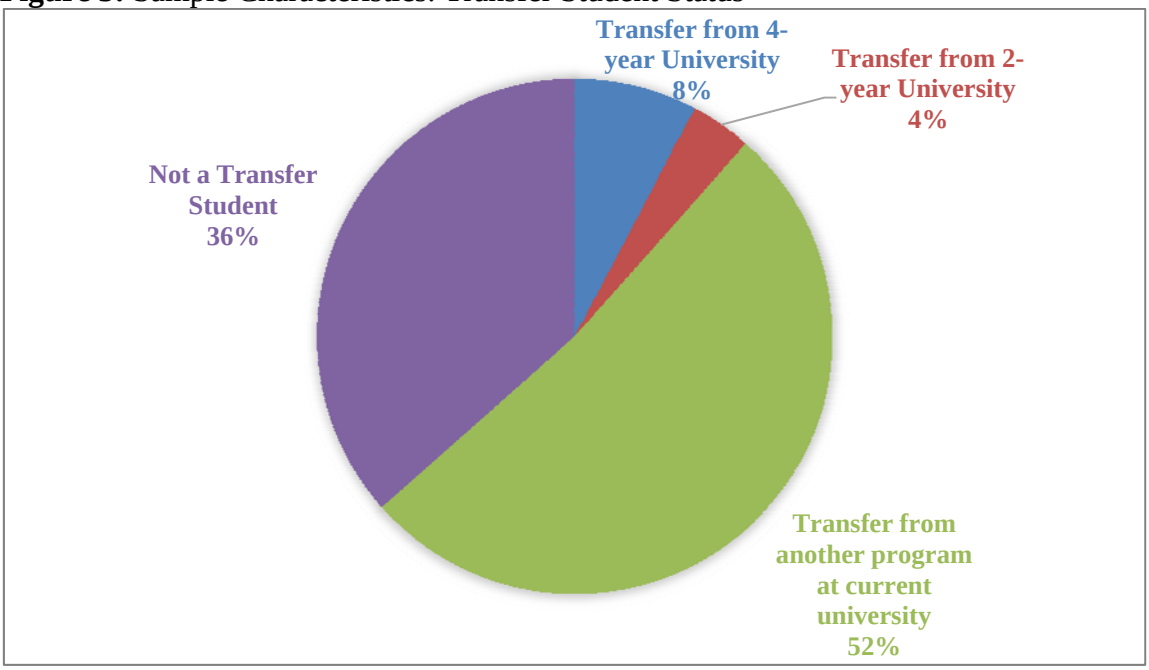
students who planned on entering the industry, 28 participants (54.90%) planned on working in the field and 23 (45.10%) planned on working in the office. Participants planned on working in all sectors of the industry as shown in Figure 2. Seventy percent intend to work in commercial construction, 15% in Residential, 9% in Infrastructure, and 6% in the Industrial sector after graduation.

Figure 2: Sample Characteristics: Industry Sector Preference



There were 33 respondents who identified themselves as a transfer student; four transferred from another four-year university, two from a two-year university, and 27 from a different program at the university they were currently attending. There were 19 participants who did not transfer. Figure 3 presents the data on transfer student status.

Figure 3: Sample Characteristics: Transfer Student Status



Overall the actual sample was comprised of females from middle-class family backgrounds, with the majority wanting to work in the commercial construction industry sector. The desire to work in the field was about the same as the desire to hold an office position for the sample. The majority of the students in the sample were transfer students, either from another program at their current university or from another university.

4.3 Data Analysis

4.3.1 Research Question 1: Which factors most influence students' decision to select Construction Management as an undergraduate degree?

The researcher explored this question through descriptive statistics and an analysis of the themes which arose from the open-ended questions. Descriptive statistics were used to analyze the 16 factors reported by the literature to influence a female's decision to select a CM degree program. The response options to the statements on the survey were: Not Applicable, Highly Positive (1), Slightly Positive (2), No Influence (3), Slightly Negative (4), and Highly Negative (5). With these numeric values, there is a stronger level of agreement or disagreement with the statement as the mean deviates from 3.0. The Not Applicable responses were not included in the calculation of the mean, and standard deviation calculations utilizing pairwise deletion. The statistics reported represent the values for only those individuals who indicated some level of influence for the factor.

All 16 factors have an overall positive influence on a female's selection of a CM degree. Results indicated that participants rated career opportunities after graduation (M=1.32, SD=0.6528) and internship(s) (M=1.381, SD=0.7636) as the two most positive influential factors in selecting CM as their undergraduate degree.

Field trips to job sites (M=1.7556, SD=0.7433), previous non-internship work experience in the industry (M=1.775, SD=0.8317), father working in the industry (M=1.8485, SD=0.9056), father taking you to work (M=1.9688, SD=0.9327), and a male role model, not parent (M=1.9722, SD=0.8447) followed as the next most positive

influences on a female's decision to select a CM undergraduate degree program. The least positive influential factors reported by the participants were a high school counselor or advisor (M=2.9231, SD=0.7028), television or magazine ads (M=2.909, SD=0.5202), and mentoring programs (M=2.5769, SD=0.9454). Table 4 summarizes the descriptive statistics for all of the factors.

Table 4: Rank Order of Positive Influential Factors in Selecting CM Degree

Rank	Factor	*n*	M *	Std. Dev.
1	Career opportunities after graduation	50	1.3200	0.6528
2	Internship(s)	42	1.3810	0.7636
3	Field trips to job sites	45	1.7556	0.7433
4	Previous non-internship work experience in the industry	40	1.7750	0.8317
5	Father working in the industry	33	1.8485	0.9056
6	Father taking you to work	32	1.9688	0.9327
7	A male role model, not parent	36	1.9722	0.8447
8	A college advisor/counselor	48	2.0000	0.9676
9	Scholarship or other funding opportunities in the degree	47	2.0213	1.0319
10	Community service	50	2.1200	0.7461
11	A female role model, not parent	30	2.3667	0.8087
12	Mother taking you to work	23	2.4783	0.9941
13	Mother working in the industry	22	2.5000	1.0118
14	Mentoring program at school	26	2.5769	0.9454
15	TV or Magazine ads	44	2.9090	0.5202
16	A high school advisor/counselor	39	2.9231	0.7028

** M<3: Positive Influence; M=3: No Influence; M>3: Negative Influence*

The influence of career opportunities after graduation received 38 highly positive responses from participants and internship(s) received 33 highly positive influential responses. Figures 4 and 5 presents detailed information on how participants responded to the career opportunities after graduation and internship(s) factors, respectively. See Appendix F for the figures on how students responded to all of the remaining factors.

Figure 4: Career Opportunities in Selecting CM Degree

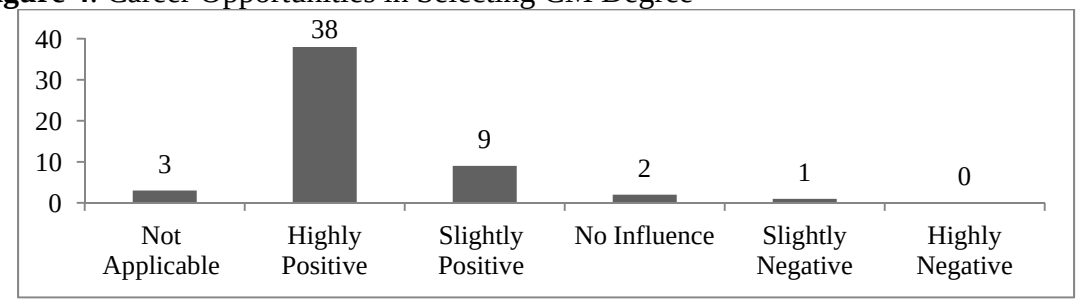
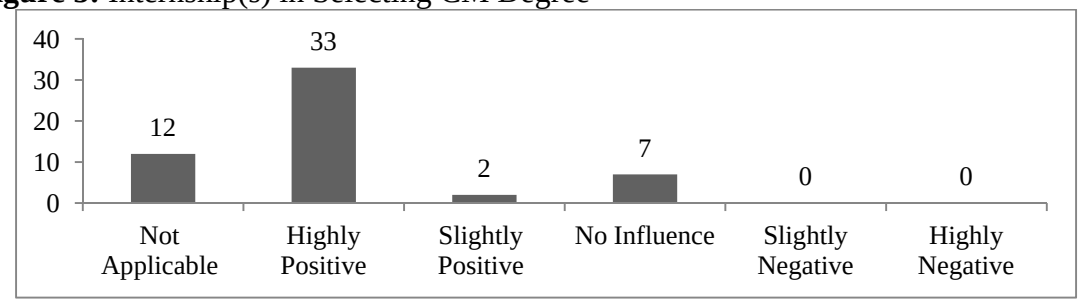


Figure 5: Internship(s) in Selecting CM Degree



There were three factors in which over half (50%) of the participants responded Not Applicable, indicating they did not have exposure to that factor. Those factors were having a mother working in the industry (30 responses; 58.49%), a mother taking you to work (31 responses; 56.60%), and a mentoring program at school (28 responses;

51.85%). In addition, these factors had a significant number of participants respond with No Influence; mother working in the industry had 13 responses, mother taking you to work had 13 responses, and mentoring programs had 17 responses. With such a large number of Not Applicable and No Influence responses these do not appear to be areas in the current state of the industry which are influential factors. Given the underrepresentation of women in construction, it is not surprising that female students do not have mother's working in the industry or taking them to work at a job which would influence their decision to enter construction. Figures 6, 7, and 8 reflect the number of responses for each of these three factors.

Figure 6: Mother Working in Industry in Selecting CM Degree

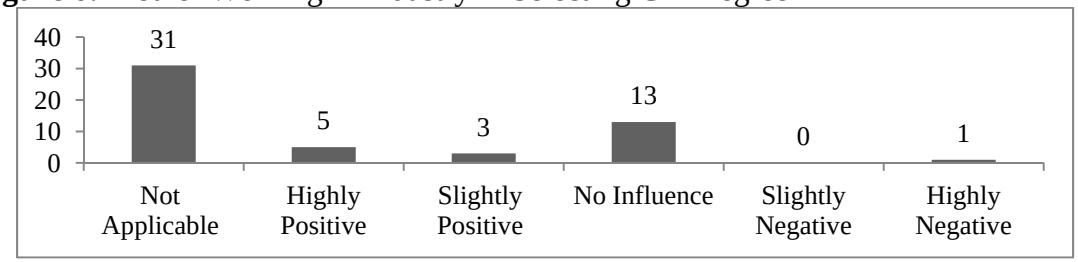


Figure 7: Mother Taking You to Work in Selecting CM Degree

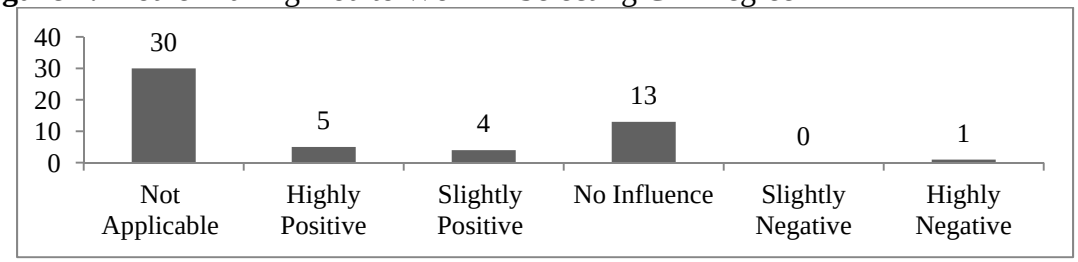
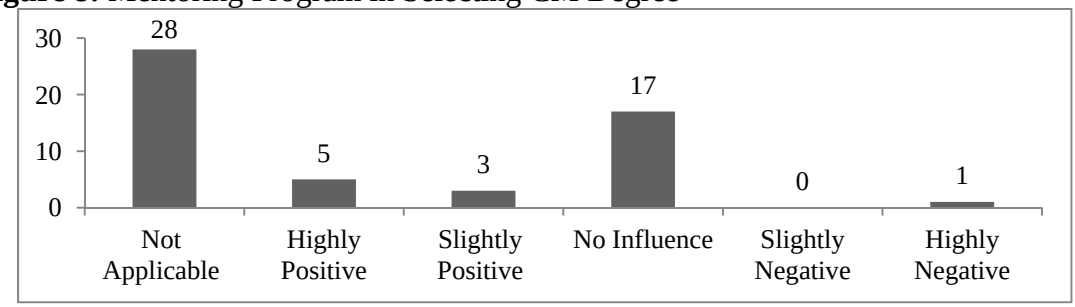
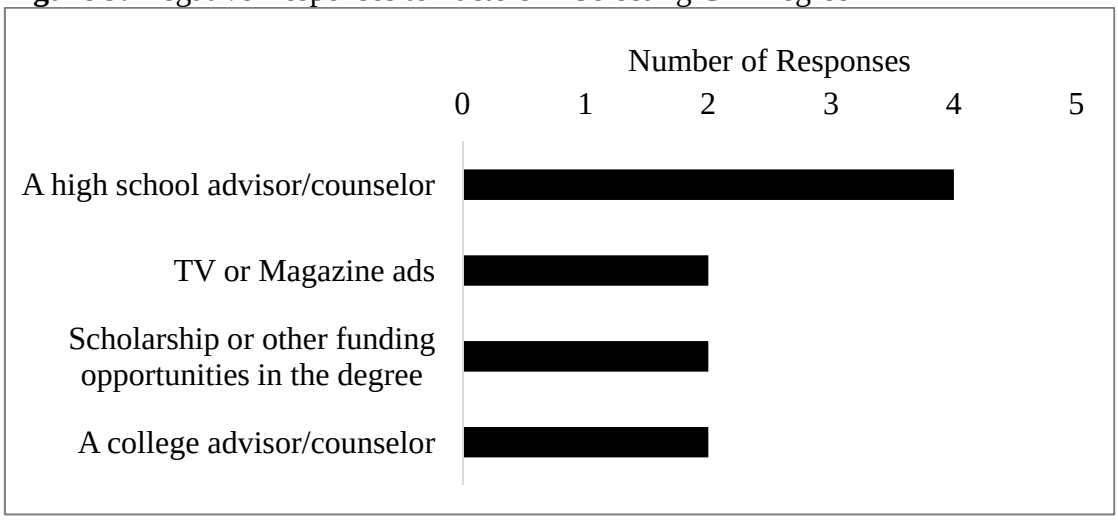


Figure 8: Mentoring Program in Selecting CM Degree



Seven factors were rated by every respondent as either a positive influence or no influence at all. There were nine factors in which a small number of participants rated the factor as a negative influence to some degree, either Slightly Negative or Highly Negative. Given the small number of respondents who reported these as negative influences it is possible these were just bad personal experience. The factor does not appear to be a negative influence for the overall population. Only four of those had two or more participants respond negatively as shown in Figure 9.

Figure 9: Negative Responses to Factors in Selecting CM Degree

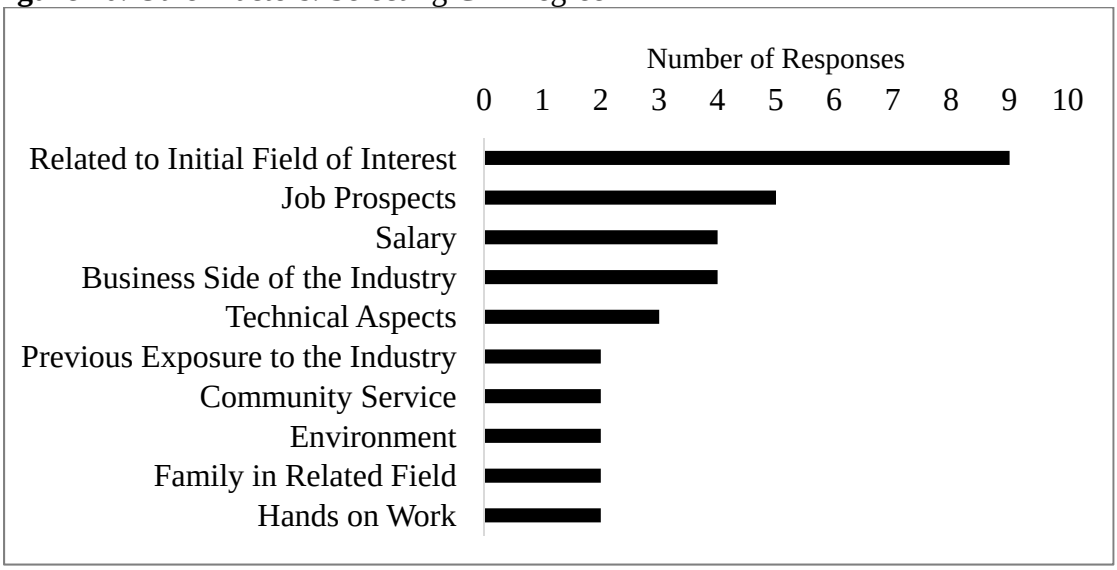


The researcher identified themes that arose on the two open ended questions in regard to a female student's decision to enter a construction management program. (*Question 1: What other factors influenced you to select your degree?; Question 2: What other programs could positively influence students to select your degree program? Any ideas or suggestions?)* There were 37 responses to other factors which influenced their decision to select a CM degree.

Nine participants indicated they started out in a different field related to construction (i.e. Architecture or Engineering) and decided to transfer into a CM program. This supports literature which identifies that students are not aware of the CM program when selecting a degree. Participants reiterated several of the factors which were analyzed in the Likert-scaled responses, such as job prospects (five responses) and community service (two responses). Four respondents indicated that a higher salary upon graduation was influential in their decision as well as that the business side of the industry influenced their decision. Three respondents reported that the technical aspects of the industry influenced their decision. Two respondents each reported that previous exposure to the industry, the environment, the fact that they had family who worked in a related field, and that it was hands-on work that influenced their decision to enter the CM degree program. Although these were not specifically reported factors in existing literature it supports the fact that the students had exposure to the industry and were therefore aware of the opportunity. Participant responses to the other factors which influenced their decision to select a degree in CM are summarized in Figure 10.

There were 12 other individual responses as to what other factors influenced their decision to enter the undergraduate degree program. Those other single responses can be found in Appendix G with all of the reported responses.

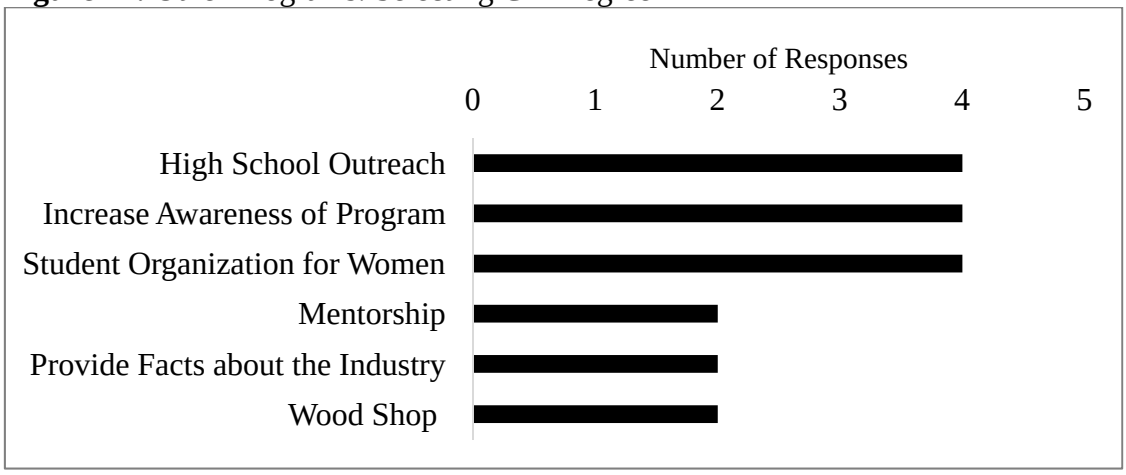
Figure 10: Other Factors: Selecting CM Degree



There were 22 responses to what other programs could positively influence students to select a CM degree. Four participants reported that high school outreach, increasing the awareness of the program, and a student organization for women in construction could positively influence the decision. This is consistent with the research by Lopez del Porto et al. (2011) which recommended targeting females in high school and providing female student organizations. Mentorship, providing facts about the industry, and wood shop classes each had two respondents indicate those programs could positively influence the decision to enter a CM degree. Lopez del Porto et al.'s research also recommended mentorship programs. Figure 11 summarizes these responses.

There were five other responses to other programs which could positively influence a female to select a CM degree. All of the responses to this question are reported in Appendix H.

Figure 11: Other Programs: Selecting CM Degree



4.3.2 Research Question 2: Which factors most influence students' decision to remain in a Construction Management undergraduate degree program?

The researcher explored this question through descriptive statistics and through an analysis of the themes that arose in the open-ended questions. Descriptive statistics were used to analyze the 15 factors believed to influence a female's decision to remain in a construction management degree program. The response options to the statements were: Not Applicable, Highly Positive (1), Slightly Positive (2), No Influence (3), Slightly Negative (4), and Highly Negative (5). There is a stronger level of agreement or disagreement with the statement as the mean deviates from 3.0. The Not Applicable responses were removed from the mean and standard deviation calculations utilizing

pairwise deletion. The aforementioned statistics represent the values for only those individuals who indicated some level of influence for the factor.

All 15 factors received an overall positive influence response. Results indicated that participants rated an internship after enrolling in the construction related degree (M=1.1818, SD=0.6203) and the community of construction students/classmates (M=1.2885, SD=0.5718) as the two most positive influential factors in their decision to remain in a construction management undergraduate degree program.

Hands-on experience in construction lab classes (M=1.3200, SD=0.6207), in-classroom innovation in construction classes (use of videos, gadgets, etc.) (M=1.6538, SD=0.7108), involvement in construction related student organizations (M=1.66, SD=0.7174), scholarships and fellowships (M=1.6957, SD=0.7263), and non-internship construction work experience after enrolling in college (M=1.7838, SD=1.0836) were the next most positive influences on a female's decision to remain in a CM undergraduate degree program. Tutoring (M=2.5278, SD=0.6964), female faculty members (M=2.1915, SD=1.0138), and workshops and seminars (M=2.1190, SD=0.7715) were the least positive influential factors. A summary of the descriptive statistics are presented in Table 5.

The influence of internships after enrolling in the construction related degree received 40 highly positive responses from participants and community of construction students/ classmates received 40 highly positive influential responses. Figures 12 and 13 present detailed information on how participants responded to the internship after enrolling in the construction related degree and the community of construction

students/classmates factors, respectively. Please see Appendix I for the figures on how students responded to all of the remaining factors.

Table 5: Rank Order of Positive Influential Factors for Remaining in CM Degree

Rank	Factor	*n*	M*	Std. Dev.
1	Internship after enrolling in the construction related degree	44	1.1818	0.6203
2	Community of construction students/ classmates	52	1.2885	0.5718
3	Hands on experience in construction lab classes	50	1.3200	0.6207
4	In-classroom innovation in construction classes (use of videos, gadgets, etc.)	52	1.6538	0.7108
5	Involvement in construction related student organizations	50	1.6600	0.7174
6	Scholarships and Fellowships	46	1.6957	0.7263
7	Non-Internship construction work experience after enrolling in college	37	1.7838	1.0836
8	Mentoring	40	1.9000	0.8712
9	Academic advising	50	1.9600	0.7814
10	Individual involvement in construction-related research	36	2.0556	0.9545
11	Students of your gender in the program	50	2.0600	1.0382
12	Courses based on mathematical analysis (e.g. structures, estimating)	52	2.1154	1.0600
13	Workshops and Seminars	42	2.1190	0.7715
14	Faculty members of your gender	47	2.1915	1.0138
15	Tutoring	36	2.5278	0.6964

** M<3: Positive Influence; M=3: No Influence; M>3: Negative Influence*

Figure 12: Internship after Enrolling or Remaining in CM Degree

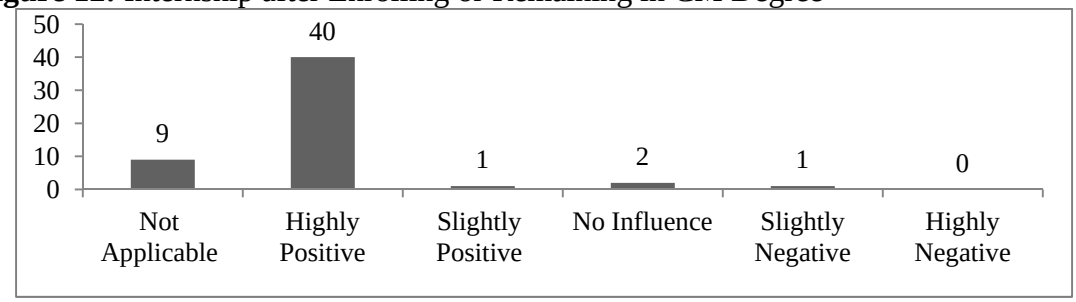
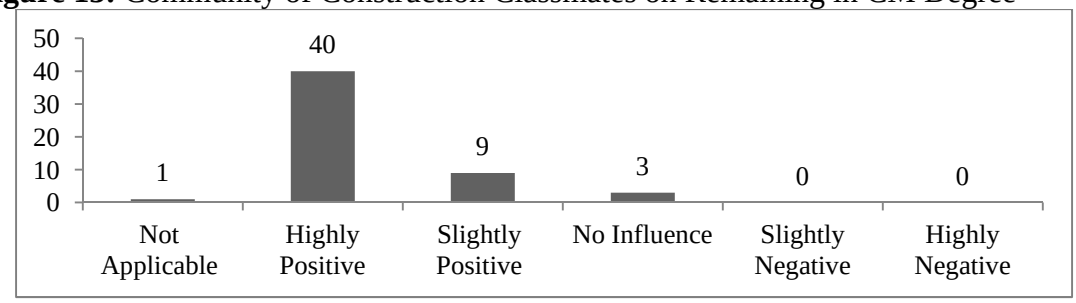


Figure 13: Community of Construction Classmates on Remaining in CM Degree



The factors which reflect the most number of participants who did not have exposure to the factor were tutoring (17 responses; 32.08%), individual involvement in construction-related research (16 responses; 30.77%), non-internship construction work experience after enrolling in college (15 responses; 28.85%), and mentoring (13 responses; 24.53%). Figures 14, 15, 16, and 17 reflect the number of responses for each of these three factors.

Figure 14: Tutoring on Remaining in CM Degree

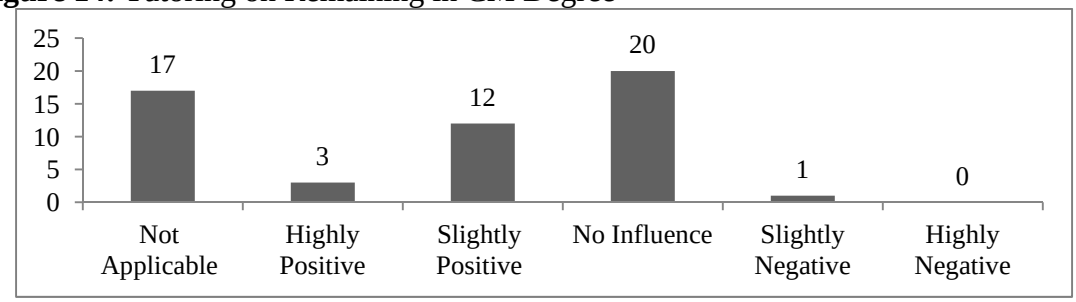


Figure 15: Involvement in Construction-Related Research on Remaining in CM Degree

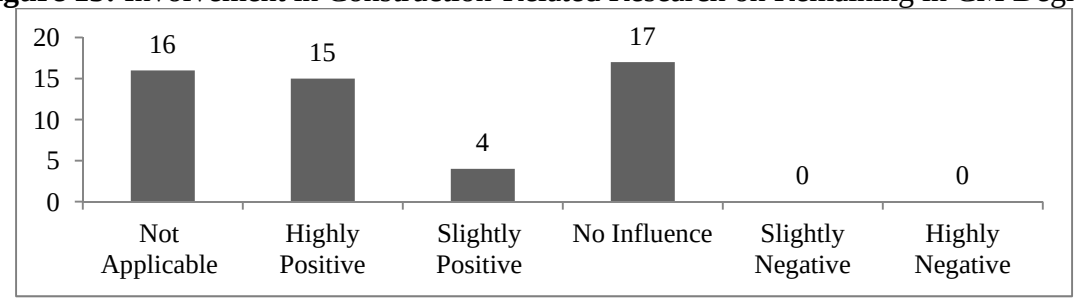


Figure 16: Non-Internship construction work experience after enrolling in CM Degree

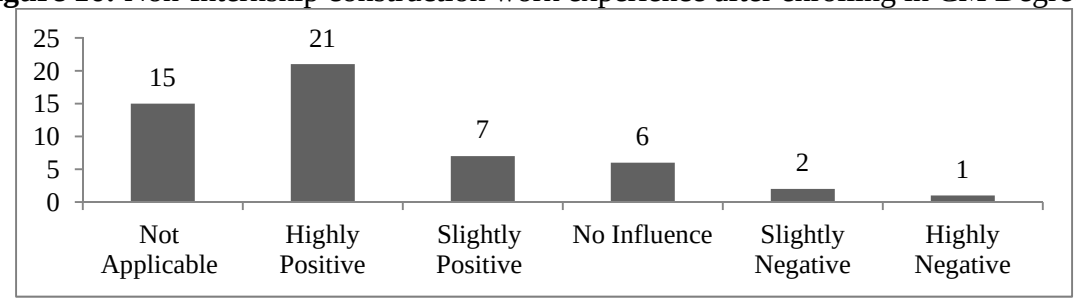
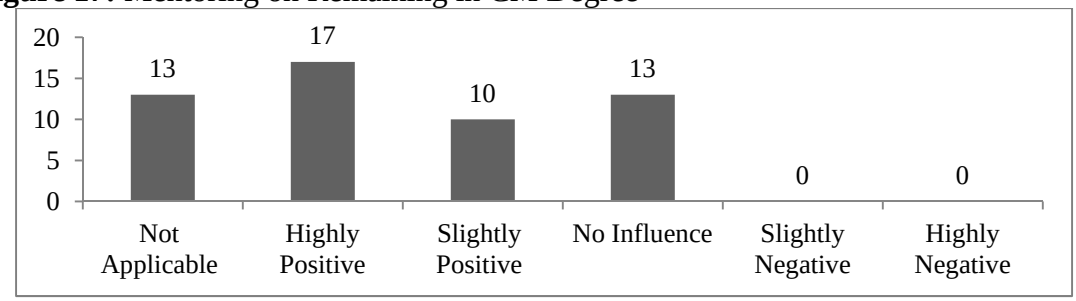
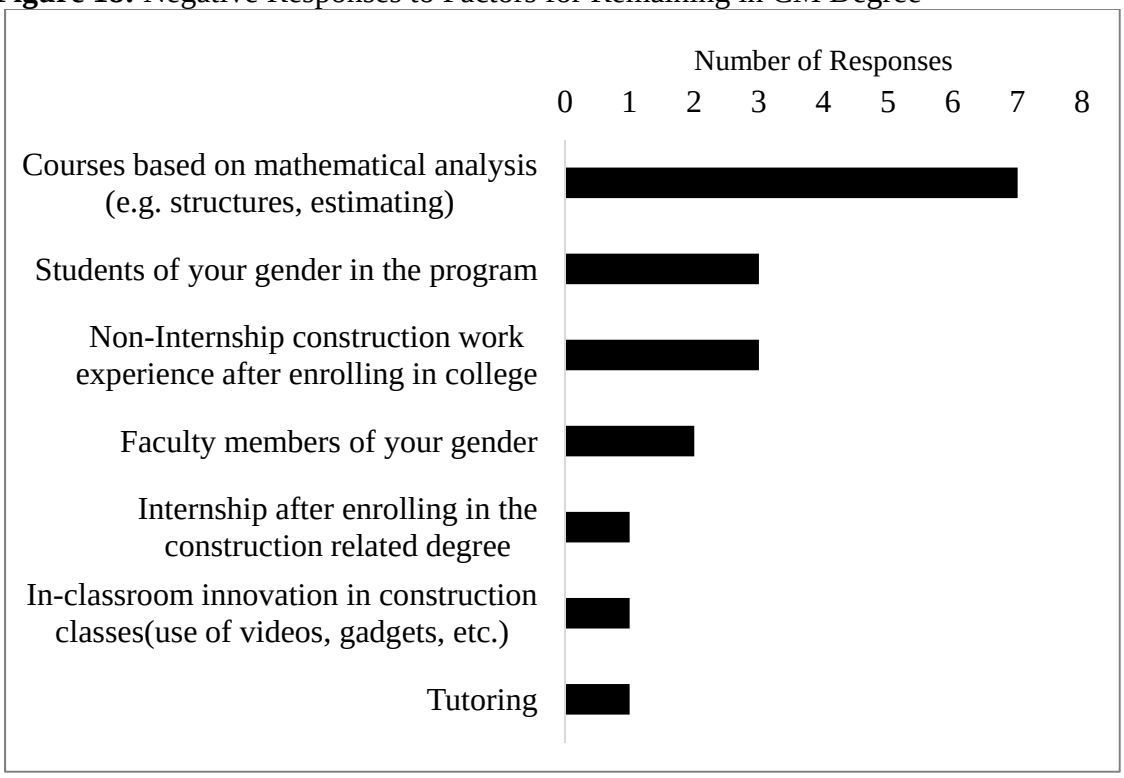


Figure 17: Mentoring on Remaining in CM Degree



Eight factors were rated by every respondent as either a positive influence or no influence at all. There were seven factors in which a small number of participants rated the factor as negative to some degree, either Slightly Negative or Highly Negative. These are identified in Figure 18. These factors did not have an overall negative influence for the population it was simply reported as negative by a small percentage of the sample.

Figure 18: Negative Responses to Factors for Remaining in CM Degree

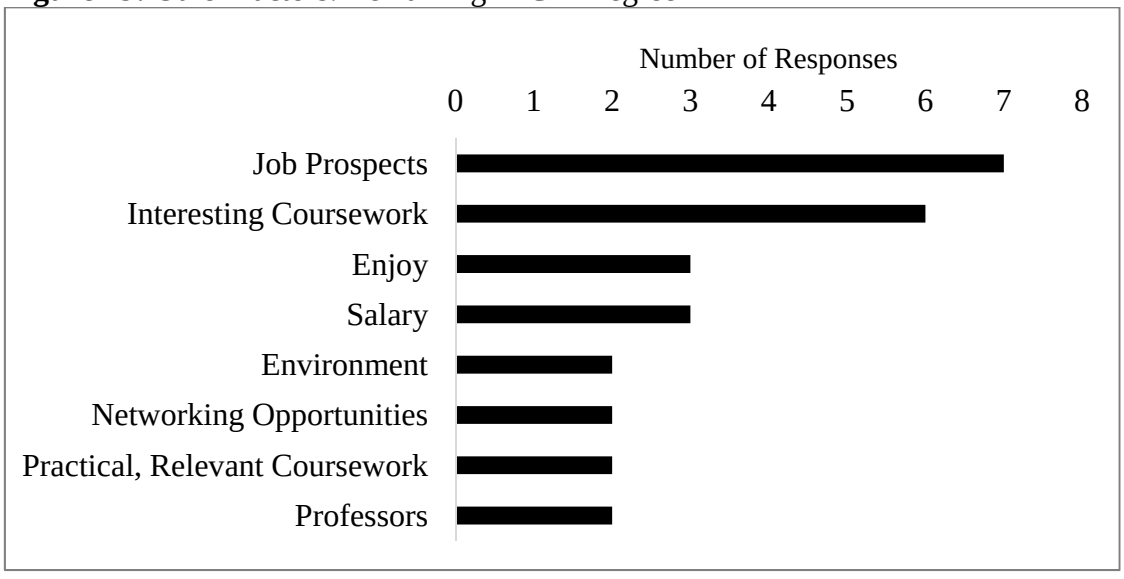


The researcher analyzed the two open ended questions in regard to a female student's decision to remain in a CM degree program by identifying themes which arose. (*Question 1: What other factors influenced your decision to remain in the construction*

related degree program?; Question 2: What other programs could positively influence students' decision to remain in your degree program? Any ideas or suggestions?)

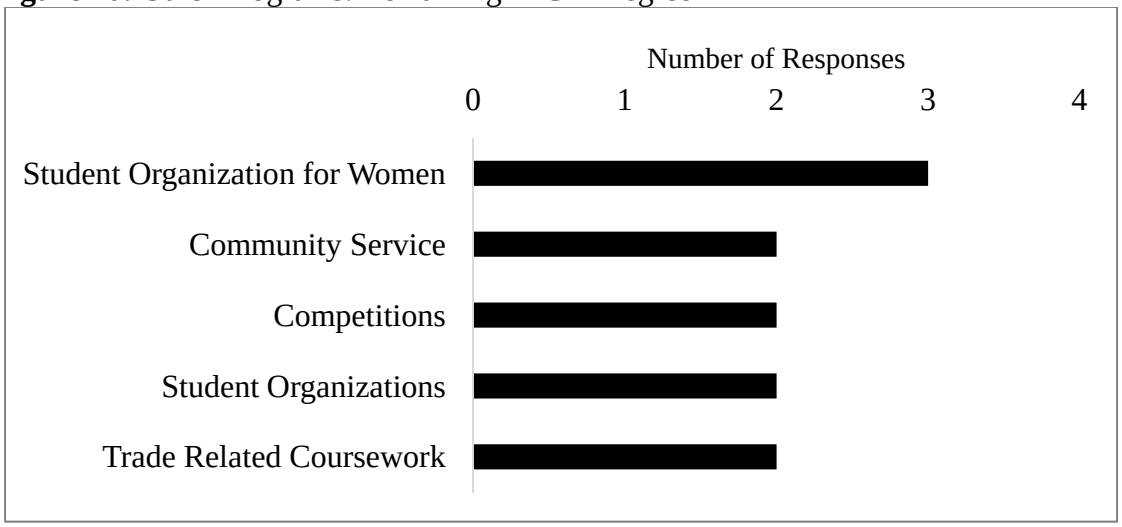
Seven participants indicated that job prospects were influential in their decision to remain in the program and six students indicated that the interesting coursework was influential. Three respondents each indicated that they enjoy the program/industry and that salary upon graduation was influential in their decision to remain in the program. The environment, networking opportunities, practical, relevant coursework, and professors each had two participants indicate that they were influential in their decision to remain in the program. Figure 19 presents a summary. See Appendix J for a complete list of responses.

Figure 19: Other Factors: Remaining in CM Degree



In response to what other programs could positively influence a female's decision to remain in a CM degree program, three respondents indicated that student organizations for women could positively influence a female's decision to remain in a CM undergraduate degree program. Two participants each reported that community service, competitions, student organizations, and trade related coursework could positively influence a female student's decision to remain in a CM degree program. Participant responses to what other programs could positively influence a students' decision to remain in a CM degree program are summarized in Figure 20. There were 12 other single responses as to what programs could positively influence a female's decision to remain in a CM degree program. A complete list of responses may be found in Appendix K.

Figure 20: Other Programs: Remaining in CM Degree

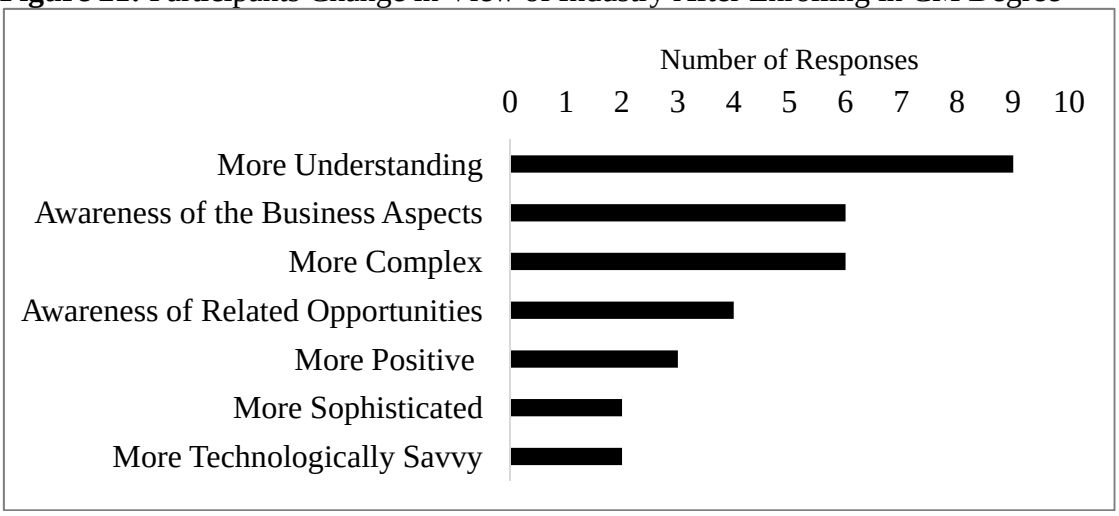


Survey participants were asked in an open-ended question whether their perception of the industry changed after enrolling in the CM program (*Question: Has*

your perception of the construction industry changed after entering the program? If yes, how and why?). There were 13 individuals (26%) who responded *No* and 37 (74%) who responded *Yes*. For those individuals who responded *Yes*, it was generally a positive change in perception. Nine participants reported they gained more understanding about the industry, six participants each responded they became more aware of the business aspects of the industry and the fact that it was more complex than originally thought. Three had a more positive impression of the industry. Two individuals each responded they became more aware of the related opportunities, more aware of the endless opportunities, that the industry was more sophisticated than originally thought, and that the industry is more technologically savvy than anticipated.

There were 14 other responses. The other positive responses included the fact that they became more aware of the office jobs, it was not as difficult being a woman, it was less stressful, and it was more enjoyable. Some single negative changes in the perception of the industry were reported, including that it is difficult being a women, there was more male dominance than anticipated, more sexism, and that it was more stressful. Figure 21 presents the data from the analysis. A complete list of the responses may be found in Appendix L.

Figure 21: Participants Change in View of Industry After Enrolling in CM Degree



4.3.3 Research Question 3: Is there a difference in the factors which influence a transfer student compared to a student who went directly into a four-year Construction Management degree program?

4.3.3.1 Factors for Selecting CM Undergraduate Degree Program: Transfer vs. Non-Transfer Students

First, the researcher explored this question by testing if there was a difference in the factors which influences a female's decision to enter a CM undergraduate degree program, based on whether they are a transfer student or not. *(Did you transfer into the construction related degree program?*) There were 33 transfer students and 19 non-transfer students included in the actual sample. With only 19 non-transfer students in the actual sample, there is a threat to external validity as 30 participants in each group are desired to make comparisons according to Gliner and Leech (2009).

Three different types of transfer students were considered: from another four-year university, from a two-year university, and from another program at current university. For the purposes of this analysis, all three transfer student types were coded as a one and non-transfer students were coded as zero. Table 6 reflects the breakdown of the transfer students.

Table 6: Type of Transfer Student

Type	*n*
Yes, from another 4-year University	4
Yes, from a 2-year University	2
Yes, from another program at current university	27
No, Not a Transfer Student	19
Total	52

Given that the data is non-normal, the Wilcoxon (Mann-Whitney) Test for nonparametric statistics was completed to determine if there was a difference in the means between the transfer and non-transfer students. There were six factors found to be significant at either a 95% or a 99% confidence level. This means that with 95% or 99% confidence, there is a difference in the exposure and/or influence of the factor between transfer students and non-transfer students. Community service and female role model (not a parent) were significant with 99% confidence ($p < 0.01$). Scholarship/funding opportunities, mother working in the industry, mother taking you to work, and a male role model, not a parent were each significant with 95% confidence ($p < 0.05$). The means reflected in Table 7 include the Not Applicable responses.

Table 7: Rank Order for Difference in Influence of Factors between Transfer and Non-Transfer Students for Selecting a CM Degree

		Transfer		Non-Transfer		
Rank	Factor	*n*	M ***	*n*	M ***	*p*
1	Female role model, not your parent	33	1.7273	19	0.5790	0.0023**
2	Community service	33	2.2424	19	1.5263	0.0033**
3	Mother taking you to work	32	1.3750	19	0.4211	0.0208*
4	Male role model not your parent	33	1.5758	19	0.8421	0.0223*
5	Mother working in the industry	32	1.3125	19	0.4211	0.0350*
6	Scholarship or other funding opportunities in Degree	33	1.9697	19	1.3158	0.0368*
7	Father taking you to work	33	1.4546	19	0.7368	0.0548
8	Mentoring program at school	33	1.4242	19	0.7895	0.1873
9	Father working in the industry	33	1.3030	19	0.8947	0.2239
10	A high school advisor/counselor	33	2.2121	19	1.8947	0.3149
11	TV or Magazine ads	33	2.4849	19	2.2105	0.3595
12	Career opportunities after graduation	32	1.2500	19	1.1579	0.4585
13	Internship(s)	33	1.0909	19	1.0526	0.7595
14	Previous non-internship work experience in the industry	33	1.3333	18	1.3889	0.8057
15	A college advisor/counselor	33	1.7273	19	1.78947	0.8119
16	Field trips to job sites	33	1.5152	19	1.4737	0.9444

** $p < 0.05$; ** $p < 0.01$*

**** M<3: Positive Influence; M=3: No Influence; M>3: Negative Influence*

The researcher next explored whether the differences found above in the factors for selecting an undergraduate CM degree program reflect a difference in the influence

of the factor or whether there was a difference in the participant's exposure to the factor. For this, the data was filtered utilizing pairwise deletion, the Not Applicable responses were not factored into the mean values, and the nonparametric Wilcoxon (Mann-Whitney) test was run. One factor was significant at the 99% confidence level ($p < 0.01$) and that was community service. This indicates that non-transfer students (M=1.7059) were more influenced than transfer students (M=2.3125) by community service opportunities when selecting the CM degree.

Three factors were significant at the 95% confidence level ($p < 0.05$). Scholarship or other funding opportunities was a stronger positive influence for non-transfer students (M=1.5625) than transfer students (M=2.1667) having a mother working in the industry was a stronger positive influence for non-transfer students (M=1.6000) than transfer students (M=2.6250), and having a mother take them to work was a stronger positive influence for transfer students (M=1.6000) than non-transfer students (M=2.5882) in their decision to select a CM degree. Two factors, a female role model (not parent) and a male role model (not parent) were no longer significant. This indicates that once introduced to the factor, there is no difference in the level of influence for transfer students as compared to non-transfer students. Table 8 presents the results from the Wilcoxon (Mann-Whitney) tests.

Table 8: Filtered Rank Order for Difference in Influence of Factors between Transfer and Non-Transfer Students for Selecting a CM Degree

	Transfer		Non-Transfer		
Variable	*n*	M ***	*n*	M ***	*p*
Community Service	32	2.3125	17	1.7059	0.0058**
Scholarship or other funding opportunities in Degree	30	2.1667	16	1.5625	0.0388*
Mother working in the Industry	16	2.6250	5	1.6000	0.0249*
Mother taking you to Work	17	2.5882	5	1.6000	0.0295*
Female Role Model, Not Parent	23	2.4783	6	1.8333	0.0637
Male Role Model, Not Parent	26	2.0000	18	1.7778	0.3662

** $p < 0.05$;** $p < 0.01$*

**** M<3: Positive Influence; M=3: No Influence; M>3: Negative Influence*

4.3.3.2 Factors for Remaining in a CM Undergraduate Degree Program: Transfer vs. Non-Transfer Students

Research Question 3 was further analyzed by testing if there was a difference between transfer students and non-transfer students on their decision to remain in a CM degree program. The Wilcoxon (Mann-Whitney) test for nonparametric statistics was completed to determine if there was a difference in the means between the transfer and non-transfer students. There were four factors found to be significant. Faculty members of your gender and workshops and seminars were significant with 99% confidence ($p < 0.01$). Mentoring and individual involvement in construction-related research were significant with 95% confidence ($p < 0.05$). Table 9 presents data on the differences. The means reflected in Table 9 include those that responded with Not Applicable.

Table 9: Rank Order for Difference in Influence of Factors between Transfer and Non-Transfer Students for Remaining in a CM Degree

		Transfer		Non-Transfer		
Rank	Factor	*n*	M ***	*n*	M ***	*p*
1	Faculty members of your gender	33	2.3030	19	1.4211	0.0032**
2	Workshops and Seminars	32	2.0625	19	1.2105	0.0073**
3	Mentoring	33	1.7576	19	0.9474	0.0120*
4	Individual involvement in construction-related research	32	1.7813	19	0.8947	0.0165*
5	Scholarships and Fellowships	33	1.6667	19	1.2105	0.0666
6	Non-Internship construction work experience after enrolling in college	32	1.5000	19	0.9474	0.0893
7	Students of your gender in the program	33	2.0909	19	1.7895	0.2046
8	Hands on experience in construction lab classes	32	1.3750	19	1.1579	0.2156
9	Involvement in construction related student organizations	33	1.6970	19	1.4211	0.2529
10	Tutoring	33	1.9091	19	1.4737	0.3470
11	Community of construction students/ classmates	33	1.3333	19	1.2105	0.3791
12	Courses based on mathematical analysis (e.g. structures, estimating)	33	2.1818	19	2.0000	0.4655
13	Internship after enrolling in the construction related degree	33	0.9697	19	1.0526	0.7370
14	Academic advising	33	1.8485	19	1.9474	0.7555
15	In-classroom innovation in construction classes(use of videos, gadgets, etc.)	33	1.6364	19	1.6842	0.8169

** $p < 0.05$; ** $p < 0.01$*

**** M<3: Positive Influence; M=3: No Influence; M>3: Negative Influence*

The researcher next explored whether the differences found above reflect a difference in the influence of the factor to remain in a CM degree program or whether there was a difference in the participants exposure to the factor, i.e. whether they

answered not applicable or indicated some level of influence. For this, the data was filtered utilizing pairwise deletion, the Not Applicable responses were not factored into the mean values, and the nonparametric Wilcoxon (Mann-Whitney) test was run. Two factors were significant at the 99% confidence level ($p < 0.01$); faculty members of your gender and mentoring. This indicates that non-transfer students (M=1.6875) had a stronger positive influence than transfer students (M=2.4516) by female faculty members when deciding to remain in the CM degree program. Non-transfer students (M=1.3846) also had a stronger positive influence by mentoring than transfer students (M=2.1482).

One factor was significant with 95% confidence ($p < 0.05$); individual involvement in construction-related research was a stronger positive influence for non-transfer students (M=1.5455) than transfer students (M=2.28) in their decision to remain in a CM degree program. The factor workshops and seminars was no longer significant. This indicates that once introduced to the factor there is no difference in the level of influence for transfer students as compared to non-transfer students. Table 10 presents the results from the Wilcoxon (Mann-Whitney) tests.

Table 10: Filtered Rank Order for Difference in Influence of Factors between Transfer and Non-Transfer Students for Remaining in a CM Degree

	Transfer		Non-Transfer		
Variable	*n*	M	*n*	M	*p*
Faculty members of your gender	31	2.4516	16	1.6875	0.0048**
Mentoring	27	2.1482	13	1.3846	0.0083**
Individual involvement in construction-related research	25	2.2800	11	1.5455	0.0339*
Workshops and Seminars	29	2.2759	13	1.7692	0.0587

** p < 0.05; ** p < 0.01*

**** M<3: Positive Influence; M=3: No Influence; M>3: Negative Influence*

4.3.3.3 Conclusion

In the selection of a CM degree program, non-transfer students had a stronger positive influence by community service, scholarship or other funding opportunities, mother working in the industry, and mother taking you to work. In the female's decision to remain in the CM degree program, non-transfer students had a stronger positive influence by faculty members of their gender, mentoring, and individual involvement in construction-related research. It is interesting to note that all of the factors are significant where the non-transfer students have a stronger positive influence by the factor in their decision. There is concern that this is due to the smaller sample of non-transfer students.

5. CONCLUSIONS AND RECOMMENDATIONS

This section will be covered in five (5) sections. First, a restatement of the problem; second, the limitations faced in the study; third, conclusions based on the data gathered; fourth, recommendations for undergraduate CM programs; and fifth, recommendations for future research.

5.1 Restatement of the Problem

This study served to identify and analyze the factors that most positively influence a female's selection of an undergraduate degree in CM as well as those factors which retain them in the degree program.

A literature review identified a number of influences which encourage females to select a career in construction. Those influences include: androgynous gender role socialization (Moore, 2006); strong family ties (Bennett, et al. 1999; Moore, 2006); strong connection to their fathers (Moore, 2006);a working mother (Bennett et al., 1999; Davey & Stoppard, 1993; Moore, 2006); having a parent take them to work (Fielden et al., 2000); self-efficacy (Moore, 2006); interest and aptitude for science and mathematics (Moore, 2006); role models (Bennett, et al. 1999; Moore, 2006); mentors (Lopez del Porto et al., 2011; Menches & Abraham, 2007; Moore, 2006; Moore & Gloeckner, 2007; Shane et al., 2012); significant others (Moore, 2006); merely increasing awareness of program (Yates, 2013); high school teachers and counselors (Lopez del Porto et al., 2011, Yates, 2013); female role model (Bennett et al., 1999; Fielden et al., 2001; Gale,

1994; Menches & Abraham, 2007; Moore, 2006); internships or site visits (Fielden et al., 2000; Menches & Abraham, 2007); work experience (Bennett et al., 1999; Fielden et al. 2000; Gale, 1994; Menches & Abraham, 2007); targeted female recruiting and outreach (Lopez del Porto et al., 2011; Tsui, 2009); female faculty (Moore, 2006; Lopez del Porto et al., 2011; Sewalk & Nietfield, 2013; Shane et al., 2012); female support/social group (Lopez del Porto et al., 2011; Moore, 2006; Sewalk & Nietfield, 2013; Shane et al., 2012); countering negative gender stereotypes (Lopez del Porto et al., 2011); and job opportunities and security (Gale, 1994).

Once a female has selected a CM undergraduate degree program, the literature uncovers several factors which are key in being able to retain those women in the program. Those include: social integration through activities, networking and organizations (Moore, 2006; Shane et al., 2012); job site visits (Shane et al., 2012); be honest about the challenging culture women face (Moore & Gloeckner, 2007); develop a mentoring program (Moore & Gloeckner, 2007; Shane et al., 2012); and incorporate internships or other work experience into the program (Moore & Gloeckner, 2007).

5.2 Limitations

Limitations were faced in this study. The survey relies on self-report data. Leedy and Ormond (2013) caution that asking for one's opinion on certain factors in a survey might be jaded by recent events and not truly reflect their opinion. It is possible that participants perceived that something influenced them but it did not truly have an influence. The study also only looks at women at one point in time (i.e. enrolled in an

undergraduate degree program in Spring 2014). There might be a unique circumstance that encouraged entrance into the CM program during this four-year period they were enrolled in school. In addition, CM curriculum is continually evolving which could have an impact of female's perceived influences and perception. This research does not look at whether these factors are consistent across the years; it provides data on one snapshot in time.

There were limitations faced in utilizing an online survey for select participants. Gliner et al. (2009) identify that online surveys are limited because participants may begin the survey but are not motivated to complete the survey. Also noted is the concern that participants need to have access to a computer (Gliner et al., 2009). This was not a limitation of this survey as the participants were undergraduate students where the majority, if not all, have access to a computer and a university provided e-mail address.

A limitation was faced in the fact that the majority of the survey results rely on scaled responses which are limited by the numerical response and no additional clarification is available as stated by Leedy and Ormrod (2013). This limitation was realized in the research with the specific question on the influence of internships in their selection of a CM degree. It was intended that this be internships that the respondent experienced prior to selecting the CM degree. However, it was realized that this may be interpreted by the respondent as the internship opportunities which are available to the student once they enter the CM degree program.

5.3 Conclusions

5.3.1 Conclusions for Research Question 1: Which factors most influence students' decision to select Construction Management as an undergraduate degree?

The factors identified through a review of literature which influence females' selection of a CM undergraduate degree program all received an overall positive influence when the individual was exposed to the factor. The strongest factor of positive influence for participants in this study was the career opportunities in the construction industry. There were 47 participants who responded that this was highly positive or slightly positive; this represents 94% of those who responded with some level of positive influence. This was supported further in the analysis of the open ended question as to what other factors influenced the participants' selection of a CM degree. Five individuals responded that it was because of job prospects that they decided to pursue a degree in CM and four individuals indicated that their decision was because of the salary they would receive upon graduation.

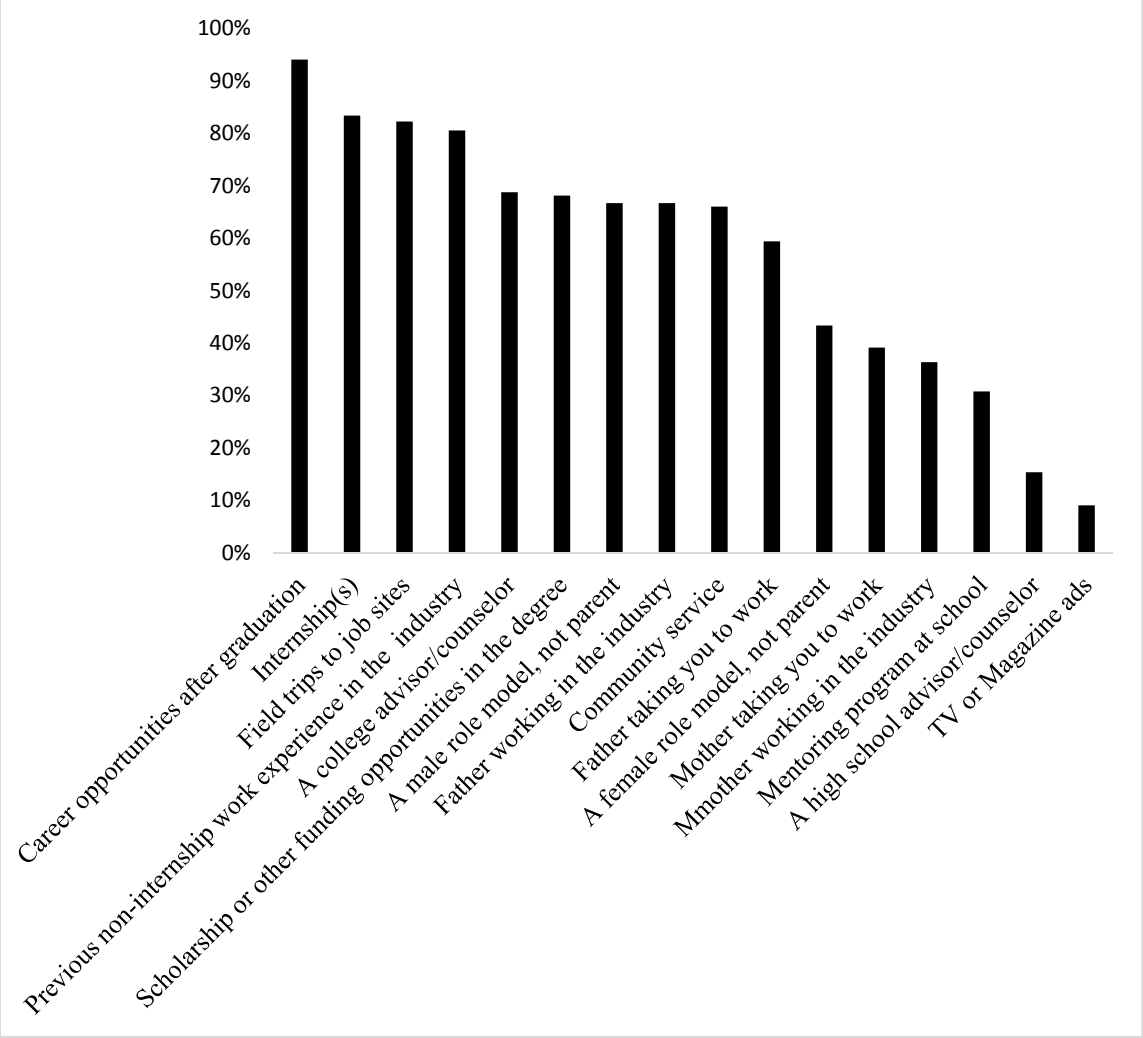
Given that career opportunities are the strongest positive influence on a female's decision to enter a CM program, these opportunities should be made aware to all females. Universities should market the tremendous potential that a career in construction holds to high school females and undecided degree candidates at their university. This can be accomplished by disseminating information at career fairs, through construction camps hosted by the university, and through high school and college counselors/advisors. Students in this study reported they were not aware of the wide variety of opportunities even once they had selected the CM degree program; this

was not something they learned of until they were already enrolled in the program. Therefore, it would be advantageous to not only convey the salary one can earn in the construction industry but also the fact that it is not merely trade work; there are many professional avenues related to the construction industry.

The second strongest positive factor was internships with 83.33% of the individuals who reported some level of influence rating it as either highly positive or slightly positive. The research intended this factor to mean internships that the student had completed prior to entering the CM degree program. It was identified after completion of the survey that some students might have interpreted this as internship opportunities once they enter the CM degree. Internships are important because they aid in describing what CM is about and demonstrates to students that it is not just hard labor. Through internships, students gain exposure to the business aspects and the complexities within the industry which was conveyed as a positive perception change for participants in the survey. Although universities cannot allocate resources to provide internships to students not enrolled in the university, they can certainly partner with high schools, the community, and the industry to host job shadow days or weeks. This would allow for the initial introduction to the industry and could encourage females to pursue further exposure to the industry.

There were a total of ten factors which received over a 50% positive response from individuals who indicated some level of influence. Those factors are: career opportunities after graduation; field trips to job sites; internship(s); previous non-internship work experience in the industry; a college advisor/counselor; community service; scholarship or other funding opportunities in the degree; male role model, not parent; father working in the industry; and father taking you to work. The field trips to job sites, and non-internship work experience play into the discussion earlier on internships. Universities could leverage their relationship with companies to offer job shadowing days or site visits to high school students. Universities could also sponsor a take your daughter to work day with construction companies so that females would gain hands-on exposure to the industry. Figure 22 reflects the percentage of participants who responded positively to each of the factors.

Figure 22: Percent Positive Responses to Factors in Selecting CM



Three factors believed to have an influence on a females decision to enter CM, or a non-traditional career field, were not applicable to over half of the respondents in the actual sample. Those factors were having a mother working in the industry (58.49%), a mother taking you to work (56.60%), and a mentoring program at school (51.85%). These three factors also rated near the bottom on the amount of influence with means close to 3.0 (*No Influence);* having a mother working in the industry (M=2.500), a

mother taking you to work (M=2.4783), and a mentoring program at school (M=2.5769). This indicates that the factor is not that influential in the decision-making process, even when introduced. At the same time, these three factors each received one highly negative response to the influence of the factor. This could reflect an isolated personal experience which is not representative of the population and therefore skews the mean value.

In regard to mentoring programs, two individuals noted that mentorship programs could positively influence a female's decision to select a CM degree in the open-ended question. One of the students reported the mentorship program she was involved in was a highly positive influence and the other reported she was not involved in a mentorship program. Given the disconnect between what literature states and this study's findings as far as the positive influence of mentorship programs, it would be worth looking into the structure of current mentorship programs. With a restructuring of the programs, they might become more positively influential if they meet the demands of the students participating.

Yates (2003) identified that simply increasing the awareness of the CM program to females could result in an increase in enrollment. Out of the 52 students who reported a transfer status, 27 (51.92%) transferred into the CM program at their current university. Through the analysis of the open-ended questions, a number of these students were not aware of the program. One reported, "I don't think people know the major exists" and another stated that programs should implement "high school outreach/awareness programs so kids know CM even exists." There were four participants who stated high school outreach could positively increase a student's

selection of a CM degree, four who reported that increasing awareness of the program could help, and there were two who reported that programs needed to provide facts about the industry. It is apparent that increasing the awareness of the program is key to increasing female enrollment in undergraduate CM degree programs.

One of the least influential factors was television or magazine ads (M=2.909, SD=0.5202). For this factor, 86.36% of those reporting some level of influence indicated this was no influence. Therefore, it would not be of the best use for universities to utilize television or magazine ads to market their CM program to females.

The least influential factor was a high school advisor/counselor (M=2.9231, SD=0.7028). For the high school advisor/counselor, 74.36% of the participants who reported some level of influence stated that it was not an influence on their selection of an undergraduate CM degree program. It is interesting to note that 61.11% of the sample reported some level of positive influence of their college counselor. This potentially indicates a lack in the effectiveness of high school counselors as the students do see the value of having a person in that role. This is consistent with research completed by Bilbo, Lavy, and Waseem (2009). Their study found that high school counselors received no training in regard to construction education and they had limited or poor knowledge of the industry. This resulted in the counselors not conveying information about opportunities within the construction industry to students. Given that participants in the survey suggest high school outreach as a potential way to increase enrollment in the program, working with the counselors would be an avenue to pursue.

5.3.2 Conclusions for Research Question 2: Which factors most influence students' decision to remain in a Construction Management undergraduate degree program?

The factors identified through a review of literature which influence females' decision to remain in a CM undergraduate degree program all received an overall positive influence when the individual was exposed to the factor. The strongest factor of influence for participants in this study was having an internship after enrolling in the construction related degree. There were 41 participants who responded that this was highly positive or slightly positive or 93.18% of those who responded that it was influential. The overwhelming positive response of this factor indicates that it should be an area of focus for universities. Universities should require internships for students and provide the resources necessary for students to be able to find an internship.

The second was community of construction students/classmates with 94.23% of the individuals who reported some level of influence responding that it was either highly positive or slightly positive. Survey participants indicated that student organizations (both for women and those in general), group projects, and the environment were factors for their decision to remain in the program. This further supports this idea in that working with classmates is at the foundation of each of these factors. Universities should expend resources on forming and supporting student organizations and sponsoring social and community service events for the students.

Within the courses themselves, females are positively influenced by the hands-on experience in construction lab classes and in-classroom innovation. Students also mentioned they liked the practicality of the coursework and that CM programs should

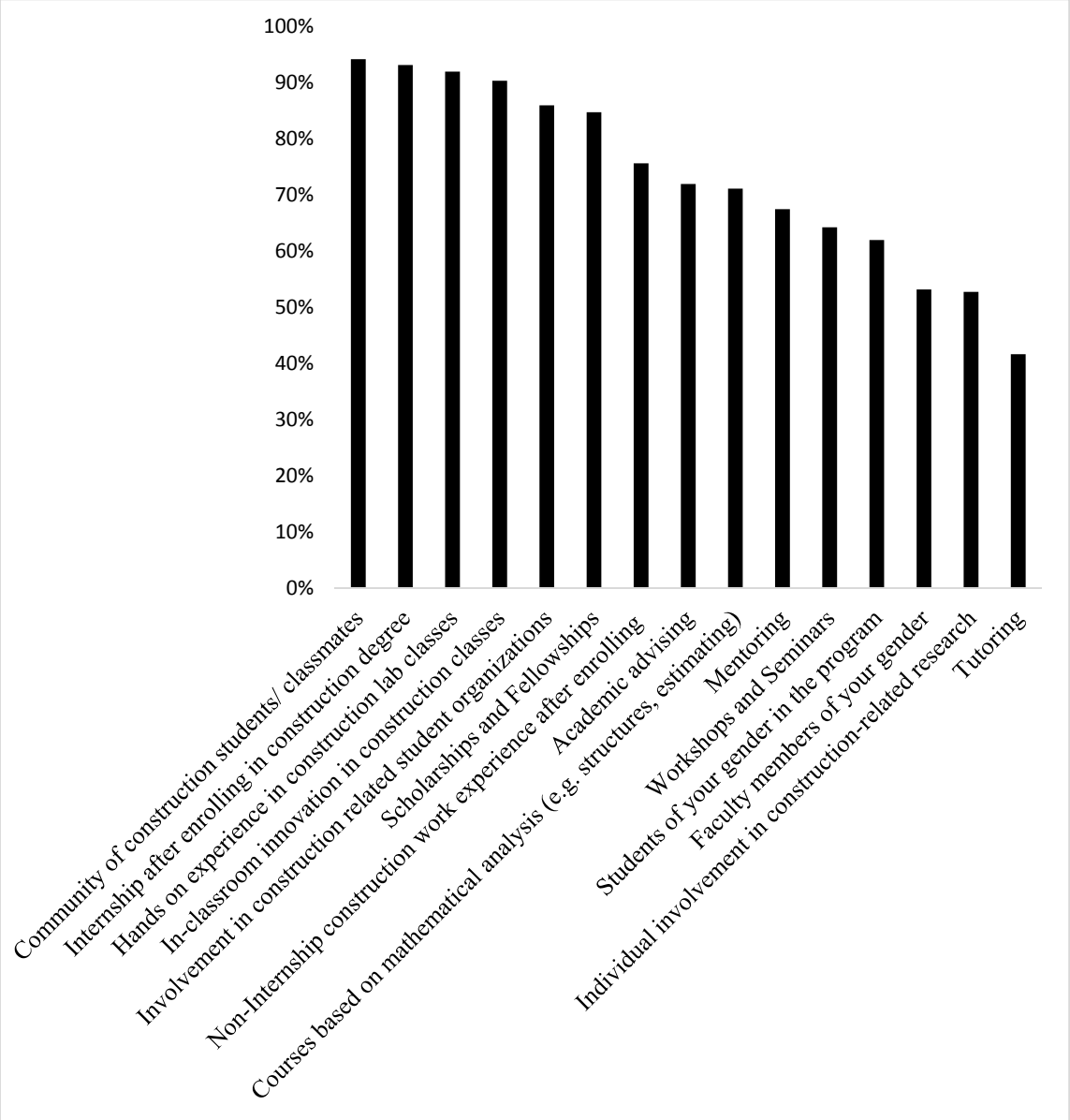
further that and offer trade related courses. This indicates that the students benefit from the tangible courses and therefore should be a focus of what the university offers and how the classes are structured.

The majority of the sample reported a positive influence for all of the factors. Tutoring (41.67%) was the only factor which had less than a 50% positive response. Tutoring does not appear to have a great influence and therefore universities should not allocate a significant amount of resources to this. Figure 23 reflects the percentage of participants who responded positively to each of the factors.

There were not any factors in which the majority (over 50%) of the students reported as not applicable. The highest factors were tutoring (32.08%), individual involvement in construction-related research (30.77%), non-internship construction work experience after enrolling in college (28.85%), and mentoring (24.53%). It is interesting to note that mentoring was identified again in retention as being not applicable. There are fewer students who have not had exposure once they have entered the CM program (24.53% versus 51.85%) which is encouraging as students must be receiving mentorship once they enter a CM degree program. Mentoring also became a stronger positive influence in a female's decision to remain in a CM degree program (M=1.9000 versus M=2.5769). The reason for this cannot be determined in this study. It might be that mentoring programs in the student's previous program (transfer student) were not meeting their needs and the mentoring program in the CM program was more effective. This might also be that students did not participate in mentoring programs during their

freshman and sophomore years of college but were introduced to them as Junior and Senior students.

Figure 23: Percent Positive Responses to Factors in Remaining in CM



In the open ended question on what other factors influenced the decision to remain in a CM degree program, job prospects was the most common response. This was not found in existing literature to be a factor for remaining in the degree program. Given that it was such a strong positive influence for attracting students, universities should reinforce these opportunities in classes, guest lectures, and career fairs. There were six participants who reported that it was the interesting coursework and two students reported that it was because the coursework was practical and relevant to what their job after college would entail. Two students suggested more trade related coursework be provided. Although coursework based on mathematical analysis (M=2.1154, SD=1.06) did not appear to be one of the stronger positive influences in a female's decision to remain in a CM degree program, the construction coursework and hands-on, practical learning are strong positive influences as to why students remain in the program.

Students also mentioned the professors in the program as a positive influence on their decision to remain in the program. Two students specifically mentioned that professors played a role in their decision to remain and two students stated that keeping professors happy and that faculty's interest in students was a positive influence in their decision to remain in the CM degree program. This study did not show that it was specifically female faculty members which influenced their decision as the literature had shown but rather it appears that having supportive, engaged faculty was positively influential.

One encouraging finding in this study was that female's perception of the construction industry was changed for the better. The industry's image (Arditi & Balci, 2009; Fielden, et al., 2000); male dominated culture (Fielden et al., 2000; Fielden et al., 2001; Menches & Abraham, 2007; Dainty et al., 2000); work environment (Bennett et al., 1999, Fielden, et al., 2000, Menches & Abraham, 2007); sexist attitudes (Fielden, et al., 2000, Sewalk & Nietfeld, 2013); and gender stereotyping (Knight et al., 2011) have long been deterrents for women entering, and then remaining, in the construction industry. A majority of the participants in this research study responded that their perception of the industry changed for the better once entering their undergraduate CM degree program. Respondents reported they gained a better understanding of the industry, that their perception was more positive, that the industry was more sophisticated, more complex, and more enjoyable than they had previously perceived. This research indicates that there are misconceptions about the industry and CM programs should be involved in disseminating facts about the industry as a way to attract and retain students in the program.

5.3.3 Conclusions for Research Question 3: Is there a difference in the factors which influence a transfer student compared to a student who went directly into a four-year Construction Management degree program?

5.3.3.1 Selecting a CM Degree Program

There were four factors that, when introduced had a stronger positive influence on non-transfer students than on transfer students. Those factors were community

service (p=0.0058), mother working in industry (p=0.0249), mother taking you to work (p=0.0395), and scholarship or other funding opportunities (p=0.0388). Given that these four factors are a stronger positive influence on non-transfer students, they should be introduced to students in high school, prior to entering college. Therefore, colleges could promote community service activities to high school students and publicize scholarship and funding opportunities. In response to having a mother take their child to work and having a mother working in the industry, colleges could market to women in the industry and encourage them to take their daughter to work. Colleges could host a construction day on campus which provided information on the program as well as gives some hands-on experience for what an individual in the program learns.

5.3.3.2 Remaining in a CM Degree Program

Three factors, once introduced, had a stronger positive influence on non-transfer students than on transfer students. Those factors were female faculty members (p=0.0048), mentoring (p=0.0083), and individual involvement in construction-related research (p=0.0339). Given that female faculty members are a stronger positive influence on non-transfer students, faculty should be more involved in the recruitment practices of the university. This was also identified by Lopez del Porto et al. (2011) as a way to increase female enrollment. Mentorship and individual involvement in construction-related research were also a stronger positive influence on non-transfer students. Programs could be created whereby an alliance between the university and

local high school students could provide mentorship and research opportunities for high school students.

5.4 Recommendations for Collegiate Programs

The first step for collegiate programs is to increase the awareness of the undergraduate CM degree program so potential students know the program exists when selecting a major. This awareness may be created in a variety of ways. First, college construction programs could get involved with STEM organizations at high schools to help introduce the program. Many high schools also have a Future Business Leaders of America (FBLA) Association or a similar business/entrepreneurial student organization. Creating an alliance with this organization could prove to be beneficial as these are females who might have never considered a career in construction. As this study has found, they might be attracted to the industry when introduced to the business aspects of the industry as well as introduced to the vast career opportunities. Another avenue would be to align the program with the community service organization on campus and highlight the hands-on experiences in the construction industry by helping with Habitat for Humanity or similar built environment service organizations. This study did not find high school counselors to be that influential in a female's decision to enter a CM degree however, leveraging this alliance and helping counselors understand the degree could prove tremendously beneficial as counselors have access to the students on a daily basis.

Once this awareness is generated, this research shows that colleges should focus on emphasizing the career opportunities in the construction industry as well as the

internship opportunities. Marketing the career opportunities and salary potential would be easy to convey to students, either in a classroom setting, at a career fair, or through the high school counselors. Although colleges cannot offer internships to high school students, they could host job shadowing days through their industry relations office which could provide additional insight into the industry.

In order to retain students in the program, colleges should first ensure students have access to internship opportunities. This could first be accomplished by requiring students to have an internship while enrolled at the university. In order to assist students in obtaining these internship opportunities, the CM department should focus on improving relationships with local, regional, and national construction firms so they can host career fairs with companies interested and willing to hire interns.

In addition, colleges should encourage the community of students by having student organizations, both women-focused and gender-neutral. These organizations should be supported by the department and have an advisor from the department willing to assist students develop and sustain the organization. The community of students could be enhanced with the department hosting social events, field trips, tailgates, or similar events.

5.5 Recommendations for Future Research

There are endless opportunities for future research related to this topic. First, given that this study can only be generalized to ASU, Auburn, CSU, Purdue, and TAMU it would be of interest to conduct a broader study which would include universities of all

sizes. It would also be of interest to compare men and women to see if the factors are different. This could play a large role in determining how programs market themselves to students. If the same factors attract men and women, there is a potential that the factors would not increase the ratio of women to men as both enrollment numbers would increase. Given that increasing awareness of the program was identified as a concern in this study, future research could identify the best way to increase awareness of the CM degree program to women. It would also be of interest to learn if there is a certain personality type or traits inherent to women who choose to pursue a CM degree.

Although literature reveals that mentorship programs (Lopez del Porto et al., 2011; Menches & Abraham, 2007; Moore, 2006; Moore & Gloeckner, 2007; Shane et al., 2012) and high school advisors/counselors (Lopez del Porto et al., 2011, Yates, 2013) have a positive influence, this study does not indicate that the positive influence is that strong. Further research on how to successfully implement mentorship programs could prove to be beneficial.

REFERENCES

About PWC. (2013). In *National Association of Professional Women in Construction.* Retrieved October 20, 2013 from http://www.pwcusa.org/v2/about.php?chapter=USA1.

Alberta Innovation and Advanced Education. (n.d.). *A Workforce Strategy for Alberta's Construction Industry*. Retrieved from http://eae.alberta.ca/documents/WIA/WIA-BETW_construction_strategy.pdf.

Amaratunga, R., Haigh, R., Shanmugam, M., Lee, A., and Elvitigalage, G. (2006). Construction industry and women: A review of the barriers. In *Proceedings of the 3rd International SCRI Research Symposium.*

Arditi, D., & Balci, G. (2009). Managerial competencies of female and male construction managers. *Journal of Construction Engineering & Management,* 135(11), 1275-1278.

Bennett, J.F., Davidson, M.J., and Galeand, A.W. (1999). Women in construction: a comparative investigation into the expectations and experiences of female and male construction undergraduates and employees. *Women In Management Review*, 14(7), 273 – 292.

Bilbo, D., Lavy, S., and Waseem, M. (2009). Guidance Counselor's Knowledge and Perceptions of Careers in the Construction Industry. *The American Institute of Constructors*, 33(2), 11-17.

Bureau of Labor Statistics (BLS). (2014). *Employed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity*. Retrieved from http://www.bls.gov/cps/cpsaat11.htm.

Dainty, A.R.J., Bagilole, B.M. & Neale, R.H. (2000). A grounded theory of women's career underachievement in large UK construction companies. *Construction Management and Economics*, 18(1), 239-250.

Davey, F. H., & Stoppard, J. M. (1993). Some factors affecting the occupational expectations of female adolescents. *Journal of Vocational Behavior,* 43, 235-250.

Department of Labor, Women's Bureau. (2009). *Quick Facts on Nontraditional Occupations for Women.* Retrieved from http://www.dol.gov/wb/factsheets/nontra2008.htm#.UJvbO9ePzWI.

Fielden, S. L., Davidson, M. J., Gale, A. W., and Davey, C. L. (2000). Women in construction: The untapped resource. *Construction Management & Economics,* 18(1), 113-121.

Fielden, S. L., Davidson, M. J., Gale, A. W., and Davey, C. L. (2001). Women, equality and construction. Journal of Management Development, 20(4), 293-305.

Fox, M. F., Sonnert, G., & Nikiforova, I. (2011). Programs for Undergraduate Women in Science and Engineering Issues, Problems, and Solutions. *Gender & Society,* 25(5), 589-615.

Gale, A. (1994). Women in Non-traditional Occupations: The Construction Industry. *Women In Management Review,* 9(2), 3-14.

Gliner, J.A, Morgan, G.A., & Leech, N.L. (2009). *Research Methods in Applied Settings: An Integrated Approach to Design and Analysis, Second Edition.* New York, NY: Routledge/Taylor and Francis Group, LLC.

Greed, C. (1997). Cultural change in construction. In: Stephenson, P (Ed.), *13th Annual ARCOM Conference: Vol. 1. Association of Researchers in Construction Management* (pp. 11-21).

Knight, D. B., Mappen, E. F., & Knight, S. L. (2011). A review of the literature on increasing the representation of women undergraduates in STEM disciplines through civic engagement pedagogies. *Science Education and Civic Engagement,* 3(1), 36-47.

Leedy, P., & Ormrod, J.E. (2013). Practical Research Planning and Design. Boston: Pearson.

Lopez del Puerto, C., Guggemos, A. A., & Shane, J. (2011). Exploration of Strategies for Attracting and Retaining Female Construction Management Students. *Proceedings of the 47th ASC Annual International Conference.*

Menches, C. L., & Abraham, D. M. (2007). Women in Construction—Tapping the untapped resource to meet future demands. *Journal of Construction Engineering & Management,* 133(9), 701-707.

Milgram, D. (2011). How to Recruit Women and Girls to the Science, Technology, Engineering, and Math (STEM) Classroom. *Technology and Engineering Teacher*, 71(3), 4-11.

Moore, J.D. (2006). Women in Construction Management: Creating a Theory of Career Choice and Development. (Doctoral Dissertation). Retrieved from ProQuest Dissertations and Theses.

Moore, J.D. & Gloeckner, G.W. (2007). A Theory of Women's Career Choice in Construction Management: Recommendations for Academia. *International Journal of Construction Education and Research*, 3, 123-139.

National Association of Women in Construction (NAWIC) Facts. (2012). In *National Association of Women in Construction*. Retrieved October 20, 2013, from http://www.nawic.org/images/nawic/documents/brochures/factsheet.pdf.

Rast, J. C. (2009, May/June). Advancing Women in the Engineering and Construction Industry. *Profiles in Diversity Journal*, 45.

Sewalk, S. & Nietfeld, K. (2013). Barriers Preventing Women from Enrolling in Construction Management Programs. International Journal of Construction Education and Research, 9(4), 239-255.

Shane, J., Lopez Del Puerto, C., Strong, K, Mauro, K., & Wiley-Jones, R. (2012). Retaining Women Students in a Construction Engineering Undergraduate Program by Balancing Integration and Identity in Student Communities. International Journal of Construction Education and Research, 8(3), 171-185.

Tsui, L. (2007). Effective Strategies to Increase Diversity in STEM Fields: A Review of the Research Literature. Journal of Negro Education, 76(4), 555-581.

Tsui, L. (2009). Recruiting Females into Male Dominated Programs: Effective Strategies and Approaches. *Journal of College Admission*, Spring 2009, 8-13.

Yates, J. (2013). Engineering careers case study: K–12 recruitment initiative. *Leadership and Management in Engineering*, 13(1), 3-10.

APPENDIX A

SURVEY

Factors for Selecting Construction Related Degree Survey

Please fill in the circle which corresponds to your desired response.

1 Gender ○ Male ○ Female

2 What is your student classification? Freshman ○ Sophomore ○ Junior ○ Senior ○

3 Which University do you attend? _____

4 How would you classify your family's socioeconomic status while growing up? Upper Class ○ Upper-Middle ○ Middle Class ○ Lower-Middle ○ Lower Class ○

5 What is your major? _____

6 Do you plan to change your major? ○ Yes ○ No

If yes, please specify to what: _____

7 For each of the following items please indicate how they impacted **SELECTION OF YOUR MAJOR:**
Check N/A if you were not aware of or have not participated in the items.

		N/A	Highly Positive	Slightly Positive	No Influence	Slightly Negative	Highly Negative
a	Internship(s)	○	○	○	○	○	○
b	Field trips to job sites	○	○	○	○	○	○
c	Previous non-internship work experience in the industry	○	○	○	○	○	○
d	Community service	○	○	○	○	○	○
e	TV or Magazine ads	○	○	○	○	○	○
f	Scholarship or other funding opportunities in the degree	○	○	○	○	○	○
g	Your father working in the industry	○	○	○	○	○	○
	Your mother working in the industry	○	○	○	○	○	○
h	Your father taking you to work	○	○	○	○	○	○
	Your mother taking you to work	○	○	○	○	○	○
i	A male role model not your parent	○	○	○	○	○	○
j	A female role model, not your parent	○	○	○	○	○	○
k	A high school advisor/counselor	○	○	○	○	○	○
l	A college advisor/counselor	○	○	○	○	○	○
m	Mentoring program at school Please specify the name of the mentoring program: _____	○	○	○	○	○	○
n	Career opportunities after graduation	○	○	○	○	○	○

8 What other factors influenced you to select your degree?

_____

_____

9 What other programs could positively influence students to select your degree program? Any ideas or suggestions?

_____

_____

Answer the following only if you are enrolled in a construction related degree program. Other majors can turn in survey.

10 Please indicate how the following items have affected your decision to **REMAIN IN THE CONSTRUCTION RELATED PROGRAM:**
Check N/A if you are not aware of or have not participated in what is being mentioned in the subquestion.

		N/A	Highly positive	Slightly Positive	No Influence	Slightly Negative	Highly Negative
a	Internship after enrolling in the construction related degree	○	○	○	○	○	○
b	Non-Internship construction work experience after enrolling in college	○	○	○	○	○	○
c	In-classroom innovation in construction classes(use of videos, gadgets etc)	○	○	○	○	○	○
d	Mentoring	○	○	○	○	○	○
e	Tutoring	○	○	○	○	○	○
f	Workshops and Seminars	○	○	○	○	○	○
g	Scholarships and Fellowships	○	○	○	○	○	○
h	Individual involvement in construction-related research	○	○	○	○	○	○
i	Faculty members of your gender	○	○	○	○	○	○
j	Students of your gender in the program	○	○	○	○	○	○
k	Involvement in construction related student organizations	○	○	○	○	○	○
l	Hands on experience in construction lab classes	○	○	○	○	○	○
m	Community of construction students/ classmates	○	○	○	○	○	○
n	Academic advising	○	○	○	○	○	○
o	Courses based on mathematical analysis (e.g. structures, estimating)	○	○	○	○	○	○

IRB NUMBER: IRB2014-0029
IRB APPROVAL DATE: 02/17/2014
IRB EXPIRATION DATE: 02/15/2015

11 What other factors influenced your decision to remain in the construction related degree program?

12 What other programs could positively influence students' decision to remain in your degree program? Any ideas or suggestions?

13 Has your perception of the construction industry changed after entering the program? If yes, how and why?

14 Do you anticipate working in the construction industry after obtaining your undergraduate degree?

○ Yes ○ No

15 If you answered 'Yes' to Question 14, please answer the following subquestions?

a What type of position do you hope to have upon graduation?

○ Field ○ Office

b Which sector do you plan to work in?

○ Residential
○ Industrial
○ Commercial
○ Infrastructure

16 If you answered 'No' to Question 14, please explain why?

17 Did you **transfer** into the Construction related degree program?

○ Yes, from another four-year university
○ Yes, from a two-year university
○ Yes, from another program at my current university
○ No

18 If a transfer student, are there other factors which influenced your decision to transfer into your degree program?

IRB NUMBER: IRB2014-0029
IRB APPROVAL DATE: 02/17/2014
IRB EXPIRATION DATE: 02/15/2015

APPENDIX B

IRB APPROVAL LETTERS

DIVISION OF RESEARCH

Research Compliance and Biosafety

TEXAS A&M UNIVERSITY

DATE: February 17, 2014

MEMORANDUM

TO: Ben Bigelow
TAMU - College Of Architecture - Construction Science

FROM: Human Subjects Protection Program
Institutional Review Board

SUBJECT: Expedited Approval

Study Number: IRB2014-0029

Title: THE MOST EFFECTIVE FACTORS INFLUENCING A STUDENT'S DECISION TO ENTER AND REMAIN IN AN UNDERGRADUATE CONSTRUCTION MANAGEMENT PROGRAM WITH AN EMPHASIS ON FEMALE STUDENTS

Approval Date:

Continuing Review Due: 01/15/2015

Expiration Date: 02/15/2015

Documents Reviewed and Approved:

Title	Version Number	Version Date	Outcome
Recruitment email_V2	Version 1.0	01/05/2014	Approved
Recruitment Script (verbal)	Version 1.0	01/27/2014	Approved
Ritter_Research Proposal 2013.01.10	Version 1.0	01/10/2014	Approved
Thesis Proposal_Minna Mathew_Revised	Version 1.0	01/10/2014	Approved
APPENDIX A_Survey	Version 1.0	01/10/2014	Approved
letter of support_csu	Version 1.0	01/10/2014	Approved
irb letter of support_purdue executed	Version 1.0	01/10/2014	Approved
irb letter of support_auburn executed	Version 1.0	01/10/2014	Approved
irb letter of support_asu executed	Version 1.0	01/10/2014	Approved
Consent-information Sheet	Version 1.2	01/10/2014	Approved

Document of Consent: Waiver approved under 45 CFR 46.117 (c) 1 or 2/ 21 CFR 56.109 (c)1

Provisions: Will need to submit official letter from Colorado IRB before conducting study there.

This research project has been approved. As principal investigator, you assume the following responsibilities:

1. **Continuing Review:** The protocol must be renewed by the expiration date in order to continue with the research project. A Continuing Review application along with required documents must be submitted by

750 Agronomy Road, Suite 2701
1186 TAMU
College Station, TX 77843-1186
Tel. 979.458.1467 Fax. 979.862.3176
http://rcb.tamu.edu

the continuing review deadline. Failure to do so may result in processing delays, study termination, and/or loss of funding.

2. **Completion Report:** Upon completion of the research project (including data analysis and final written papers), a Completion Report must be submitted to the IRB.
3. **Unanticipated Problems and Adverse Events:** Unanticipated problems and adverse events must be reported to the IRB immediately.
4. **Reports of Potential Non-compliance:** Potential non-compliance, including deviations from protocol and violations, must be reported to the IRB office immediately.
5. **Amendments:** Changes to the protocol must be requested by submitting an Amendment to the IRB for review. The Amendment must be approved by the IRB before being implemented.
6. **Consent Forms:** When using a consent form or information sheet, you must use the IRB stamped approved version. Please log into iRIS to download your stamped approved version of the consenting instruments. If you are unable to locate the stamped version in iRIS, please contact the office.
7. **Audit:** Your protocol may be subject to audit by the Human Subjects Post Approval Monitor. During the life of the study please review and document study progress using the PI self-assessment found on the RCB website as a method of preparation for the potential audit. Investigators are responsible for maintaining complete and accurate study records and making them available for inspection. Investigators are encouraged to request a pre-initiation site visit with the Post Approval Monitor. These visits are designed to help ensure that all necessary documents are approved and in order prior to initiating the study and to help investigators maintain compliance.
8. **Recruitment**: All approved recruitment materials will be stamped electronically by the HSPP staff and available for download from iRIS. These IRB-stamped approved documents from iRIS must be used for recruitment. For materials that are distributed to potential participants electronically and for which you can only feasibly use the approved text rather than the stamped document, the study's IRB Protocol number, approval date, and expiration dates must be included in the following format: TAMU IRB#20XX-XXXX Approved: XX/XX/XXXX Expiration Date: XX/XX/XXXX.

1. **FERPA and PPRA:** Investigators conducting research with students must have appropriate approvals from the FERPA administrator at the institution where the research will be conducted in accordance with the Family Education Rights and Privacy Act (FERPA). The Protection of Pupil Rights Amendment (PPRA) protects the rights of parents in students ensuring that written parental consent is required for participation in surveys, analysis, or evaluation that ask questions falling into categories of protected information.
2. **Food:** Any use of food in the conduct of human subjects research must follow Texas A&M University Standard Administrative Procedure 24.01.01.M4.02.
3. **Payments:** Any use of payments to human subjects must follow Texas A&M University Standard Administrative Procedure 21.01.99.M0.03.

This electronic document provides notification of the review results by the Institutional Review Board.

DIVISION OF RESEARCH

Research Compliance and Biosafety

TEXAS A&M UNIVERSITY

DATE: 02/21/2014

MEMORANDUM

TO: Ben Bigelow
TAMU - College Of Architecture - Construction Science

FROM: Human Subjects Protection Program
Institutional Review Board

SUBJECT: Study Miscellaneous Form

Protocol Number: IRB2014-0029

Title: THE MOST EFFECTIVE FACTORS INFLUENCING A STUDENT'S DECISION TO ENTER AND REMAIN IN AN UNDERGRADUATE CONSTRUCTION MANAGEMENT PROGRAM WITH AN EMPHASIS ON FEMALE STUDENTS

Review Type: Process Administratively

Description of Submission: Site Authorization for Colorado State.

This research project has been approved. As principal investigator, you assume the following responsibilities:

1. **Continuing Review:** The protocol must be renewed by the expiration date in order to continue with the research project. A Continuing Review application along with required documents must be submitted by the continuing review deadline. Failure to do so may result in processing delays, study termination, and/or loss of funding.
2. **Completion Report:** Upon completion of the research project (including data analysis and final written papers), a Completion Report must be submitted to the IRB.
3. **Unanticipated Problems and Adverse Events:** Unanticipated problems and adverse events must be reported to the IRB immediately.
4. **Reports of Potential Non-compliance:** Potential non-compliance, including deviations from protocol and violations, must be reported to the IRB office immediately.
5. **Amendments:** Changes to the protocol must be requested by submitting an Amendment to the IRB for review. The Amendment must be approved by the IRB before being implemented.
6. **Consent Forms:** When using a consent form or information sheet, you must use the IRB stamped approved version. Please log into iRIS to download your stamped approved version of the consenting instruments. If you are unable to locate the stamped version in iRIS, please contact the office.
7. **Audit:** Your protocol may be subject to audit by the Human Subjects Post Approval Monitor. During the life of the study please review and document study progress using the PI self-assessment found on the RCB website as a method of preparation for the potential audit. Investigators are responsible for maintaining complete and accurate study records and making them available for inspection. Investigators are encouraged to request a pre-initiation site visit with the Post Approval Monitor. These visits are designed to help ensure that all necessary documents are approved and in order prior to initiating the study and to help investigators maintain compliance.
8. **Recruitment:** All approved recruitment materials will be stamped electronically by the HSPP staff and available for download from iRIS. These IRB-stamped approved documents from iRIS must be used for recruitment. For materials that are distributed to potential participants electronically and for which you can only feasibly use the approved text rather than the stamped document, the study's IRB Protocol number, approval date, and expiration dates must be included in the following format: TAMU IRB#20XX-XXXX Approved: XX/XX/XXXX Expiration Date: XX/XX/XXXX.

750 Agronomy Road, Suite 2701
1186 TAMU
College Station, TX 77843-1186

Tel. 979.458.1467 Fax. 979.862.3176
http://rcb.tamu.edu

9. **FERPA and PPRA:** Investigators conducting research with students must have appropriate approvals from the FERPA administrator at the institution where the research will be conducted in accordance with the Family Education Rights and Privacy Act (FERPA). The Protection of Pupil Rights Amendment (PPRA) protects the rights of parents in students ensuring that written parental consent is required for participation in surveys, analysis, or evaluation that ask questions falling into categories of protected information.
10. **Food:** Any use of food in the conduct of human subjects research must follow Texas A&M University Standard Administrative Procedure 24.01.01.M4.02.
11. **Payments:** Any use of payments to human subjects must follow Texas A&M University Standard Administrative Procedure 21.01.99.M0.03.

This electronic document provides notification of the review results by the Institutional Review Board.

ARIZONA STATE UNIVERSITY

December 18, 2013

Texas A&M University
Division of Research
Research Compliance
750 Agronomy Road, Suite 2701
TAMU 1186
College Station, Texas 77843-1186

Attention: Aline Lovings

RE: Letter of Support for Research at Texas A&M University

Dear Ms. Lovings:

We are aware that a research team composed of Ben Bigelow (Assistant Professor), Lisa Ritter (graduate student), and Minna Mathew (graduate student) in the Department of Construction Management at Texas A&M University (TAMU) is conducting a research study entitled: Most Effective Factors in Attracting and Retaining Women in Undergraduate Construction Management Programs. 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 Del E Webb School of Construction at Arizona State University.

I request that the research team at TAMU keep any student information confidential in the research results or publications. The research team at TAMU 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 TAMU IRB approval document(s) before any data collection will commence.

Sincerely,

Allan D. Chasey, PhD, PE, LEED AP
Program Chair
Sundt Professor of Alternative Delivery and Sustainable Development

Ira A. Fulton Schools of Engineering
School of Sustainable Engineering and the Built Environment
Del E. Webb School of Construction

PO Box 870204, Tempe, AZ 85287-0204
(480) 965-3615 or (408) 965-3616 Fax: (480) 965-1769
dewsc@asu.edu
http://construction.asu.edu

IRB NUMBER: IRB2014-0029
IRB APPROVAL DATE: 02/17/2014
IRB EXPIRATION DATE: 02/15/2015

AUBURN
UNIVERSITY

COLLEGE OF ARCHITECTURE,
DESIGN & CONSTRUCTION
MCWHORTER SCHOOL OF BUILDING SCIENCE

December 19, 2013

Texas A&M University
Division of Research
Research Compliance
750 Agronomy Road, Suite 2701
TAMU 1186
College Station, Texas 77843-1186
Attention: Aline Lovings

RE: Letter of Support for Research at Texas A&M University

Dear Ms. Lovings:

We are aware that a research team composed of Ben Bigelow (Assistant Professor), Lisa Ritter (graduate student), and Minna Mathew (graduate student) in the Department of Construction Management at Texas A&M University (TAMU), are conducting a research study entitled: Most Effective Factors in Attracting and Retaining Women in Undergraduate Construction Management Programs. 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 to our students in the Bachelor of Science in Building Science program at Auburn University.

I request that the research team at TAMU keep any student information confidential in the research results or publications. The research team at TAMU 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 TAMU IRB approval document(s) before any data collection will commence.

Sincerely,

Richard Burt
Professor and School Head, Auburn University

118 M. MILLER GORRIE CENTER
AUBURN, AL 36849-5315

TELEPHONE:
334-844-4518

FAX:
334-844-5386

www.cadc.auburn.edu/bsci
www.auburn.edu

IRB NUMBER: IRB2014-0029
IRB APPROVAL DATE: 02/17/2014
IRB EXPIRATION DATE: 02/15/2015

Colorado State University

Department of Construction Management
1584 Campus Delivery
Fort Collins, Colorado 80523-1584
Phone: (970) 491-7353
FAX: (970) 491-2473
www.cm.cahs.colostate.edu

January 5, 2014

Texas A&M University
Division of Research
Research Compliance
750 Agronomy Road, Suite 2701
TAMU 1186
College Station, Texas 77843-1186
Attention: Aline Lovings

RE: Letter of Support for Research at Texas A&M University

Dear Ms. Lovings:

We are aware that a research team composed of Ben Bigelow (Assistant Professor), Lisa Ritter (graduate student), and Minna Mathew (graduate student) in the Department of Construction Management at Texas A&M University (TAMU), are conducting a research study entitled: Most Effective Factors in Attracting and Retaining Women in Undergraduate Construction Management Programs. 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 Management at Colorado State University.

I request that the research team at TAMU keep any student information confidential in the research results or publications. The research team at TAMU 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 TAMU IRB approval document(s) before any data collection will commence.

Sincerely,

Mostafa Khattab, Ph.D.
Department Head

IRB NUMBER: IRB2014-0029
IRB APPROVAL DATE: 02/17/2014
IRB EXPIRATION DATE: 02/15/2015

PURDUE
UNIVERSITY

COLLEGE OF TECHNOLOGY
Department of Building Construction Management

December 18, 2013

Texas A&M University
Division of Research
Research Compliance
750 Agronomy Road, Suite 2701
TAMU 1186
College Station, Texas 77843-1186
Attention: Aline Lovings

RE: Letter of Support for Research at Texas A&M University

Dear Ms. Lovings:

We are aware that a research team composed of Ben Bigelow (Assistant Professor), Lisa Ritter (graduate student), and Minna Mathew (graduate student) in the Department of Construction Management at Texas A&M University (TAMU), are conducting a research study entitled: Most Effective Factors in Attracting and Retaining Women in Undergraduate Construction Management Programs. 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 Building Construction Management at Purdue University.

I request that the research team at TAMU keep any student information confidential in the research results or publications. The research team at TAMU 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 TAMU IRB approval document(s) before any data collection will commence.

Sincerely,

Bryan J. Hubbard, Ph.D.
Department Head, Associate Professor
Department of Building Construction Management
Purdue University

Knoy Hall of Technology, Room 453 ■ 401 N. Grant Street ■ West Lafayette, IN 47907-2021
(765) 494-2459 ■ Fax: (765) 496-2246 ■ www.tech.purdue.edu/BCM

IRB NUMBER: IRB2014-0029
IRB APPROVAL DATE: 02/17/2014
IRB EXPIRATION DATE: 02/15/2015

APPENDIX C

INFORMED CONSENT

TEXAS A&M UNIVERSITY HUMAN SUBJECTS PROTECTION PROGRAM
INFORMATION SHEET

MOST EFFECTIVE FACTORS INFLUENCING A STUDENT'S DECISION TO ENTER AND REMAIN IN AN UNDERGRADUATE CONSTRUCTION MANAGEMENT PROGRAM

You are invited to take part in a research study being conducted by Lisa Ritter and Minna Mathew, researchers from Texas A&M University. The purpose of the study is to identify the most effective factors influencing a student's decision to enter and remain in an undergraduate construction management program.

Please complete the following short questionnaire regarding the impact various factors had on your decision to enter and remain in the Construction Management program. It should take no longer than 10 minutes of your time. Although your response is of utmost importance to us, participation in this survey is entirely voluntary.

Please do not enter your name or contact details on the questionnaire, so information provided by you remains confidential. Information about you will be kept confidential to the extent permitted or required by law. People who have access to your information include the Principal Investigator and research study personnel. Completion and return of the survey/questionnaire indicates permission to use the data in the study.

Representatives of regulatory agencies such as the Office of Human Research Protections (OHRP) and entities such as the Texas A&M University Human Subjects Protection Program may access your records to make sure the study is being run correctly and that information is collected properly.

We truly appreciate your willingness to participate in this survey. We would also like to contact you in future for related research. If you would like to be contacted, please provide your e-mail address on the blank note card provided. In return for your willingness to help us in our research, we will be distributing 3 Amazon.com gift cards valued at $10 each electronically to randomly selected participants who provide their email addresses. We assure you that your email address will not be linked to your answers in any way.

Should you have any questions or comments regarding this survey, please contact us at (979)587-9651 or e-mail us at lisa_marie_r@neo.tamu.edu or minmat7@neo.tamu.edu. For questions about your rights as a research participant; or if you have questions, complaints, or concerns about the research, you may call the Texas A&M University Human Subjects Protection Program office at 1.855.795.8636 or irb@tamu.edu.

Sincerely,

Lisa Ritter
Graduate Student
M.S. Construction Management
Texas A&M University

Minna Mathew
Graduate Student
M.S. Construction Management
Texas A&M University

IRB NUMBER: IRB2014-0029
IRB APPROVAL DATE: 02/17/2014
IRB EXPIRATION DATE: 02/15/2015

APPENDIX D

VERBAL RECRUITMENT SCRIPT

Verbal Recruitment Script

Good Morning/Afternoon!

I am here to invite you to participate in a study entitled *The Most Effective Factors Influencing a Student's Decision To Enter and Remain In An Undergraduate Construction Management (CM) Program.* We would love to hear from CM students like you how the factors we identified in our research impacted your choice to enter and remain in your program.

This study is being conducted in collaboration between Texas A & M University, Colorado State University, Purdue University, Auburn University, Arizona State University and National Association of Women in Construction (NAWIC).

Construction and design students at these institutions have been selected to participate in this study by completing a voluntary survey which will take approximately 10 minutes. 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 Texas A & M University, Colorado State University, Purdue University, Auburn University, Arizona State University and National Association of Women in Construction (NAWIC). The intent of the researchers is to publish the survey results as part of a thesis.

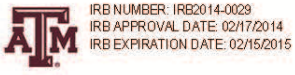
You have been provided with an information sheet, a survey questionnaire and a blank note card. You can find more information about the survey on the information sheet. There are no known risks associated with this survey and the survey responses are anonymous. The survey does NOT ask for your name and your names will NOT be linked to your data.

We truly appreciate your willingness to participate in this survey. We would also like to contact you in future for related research. If you would like to be contacted, please provide your e-mail address on the blank note card provided. In return for your willingness to help us in our research, we will be distributing 3 Amazon.com gift cards valued at $10 each electronically to randomly selected participants who provide their email addresses. We assure you that your email address will not be linked to your answers in any way.

Once completed, please return all documents to me.

Are there any questions?

Co- PI



APPENDIX E

ELECTRONIC-MAIL RECRUITMENT SCRIPT

To: minna.mathew@yahoo.in, lisamarieritter@gmail.com

BCC: [recipient addresses]

Subject: Research Participation Invitation: Women in Construction Management

Email Content:

Hello!

We, Lisa Ritter and Minna Mathew, are graduate students in Construction Management at Texas A&M University. We are conducting a research study about *The Most Effective Factors Influencing a Female's Decision to Enter and Remain in an Undergraduate Construction Management (CM) Program.*

We would love to hear from female CM students like you how the factors we identified in our research impacted your choice to enter and remain in your program. Would you be willing to take 10 minutes to fill out the survey in the link below? Your responses will be confidential and there is no way for us to know who filled out a survey.

We thank you in advance for your valuable time and effort! As a token of appreciation, Amazon.com gift cards valued at $10 each will be distributed electronically to randomly selected participants. If you are interested in participating in the gift card draw, please provide your email address when asked in the survey. The email address may be used to contact you for future research on the topic. However, it will not be linked to the data provided by you in any way.

If you choose to participate, please click on 'I ACCEPT' below to begin the survey.

CLICK HERE FOR SURVEY

If you have questions about the survey, please feel free to email us at lisa_marie_r@neo.tamu.edu or minmat7@neo.tamu.edu.

Thank you,

Lisa Ritter
Graduate Student
Department of Construction Science
Texas A&M University
lisa_marie_r@neo.tamu.edu

Minna Mathew
Graduate Student
Department of Construction Science
Texas A&M University
minmat7@neo.tamu.edu

APPENDIX F

FACTORS IN SELECTING CM DEGREE PROGRAM

Figure F.1: Influence of Field Trips to Job Sites

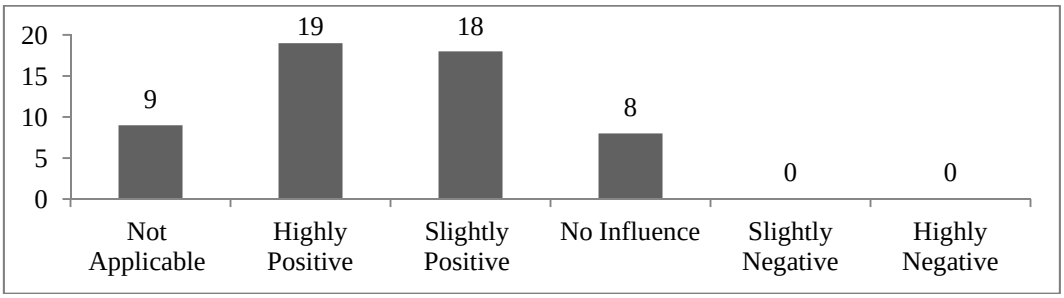


Figure F.2: Influence of Previous Non-Internship Work Experience in the Industry

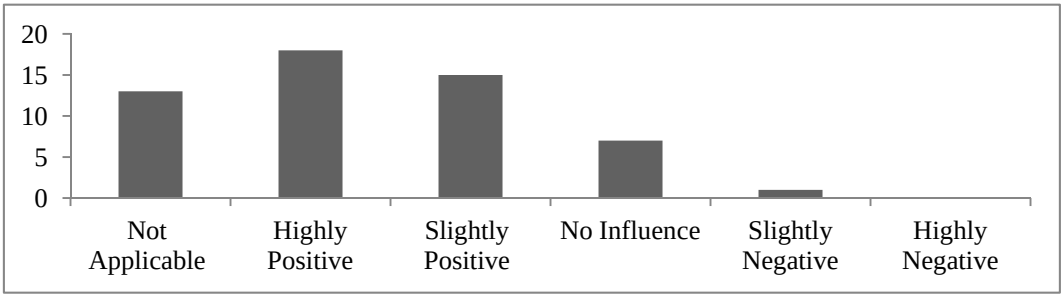


Figure F.3: Influence of Father Working in the Industry

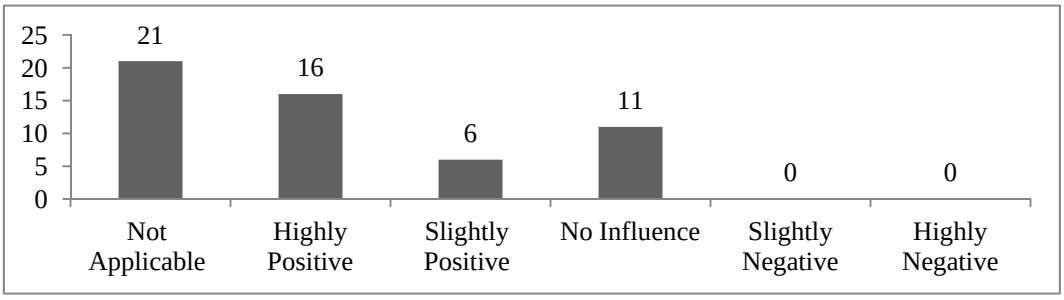


Figure F.4: Influence of Father Taking You to Work

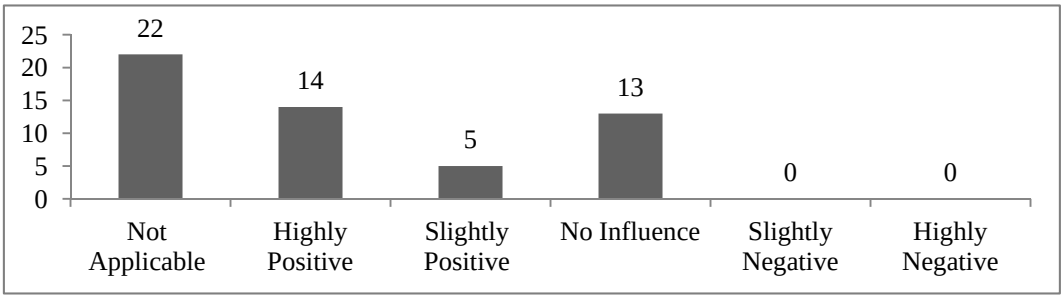


Figure F.5: Influence of a Male Role Model, Not Parent

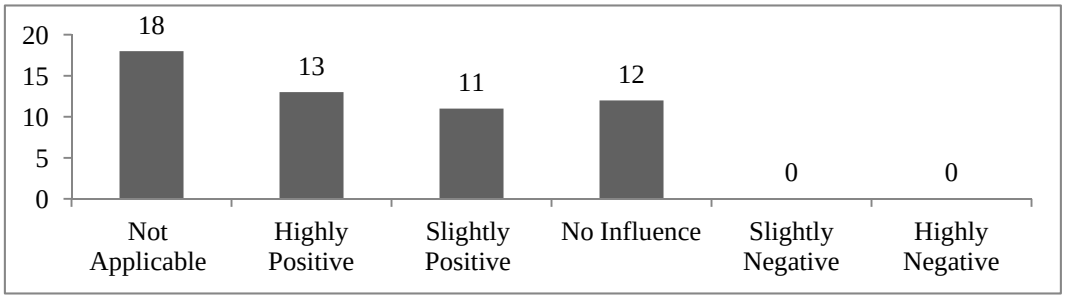


Figure F.6: Influence of a College Advisor/Counselor

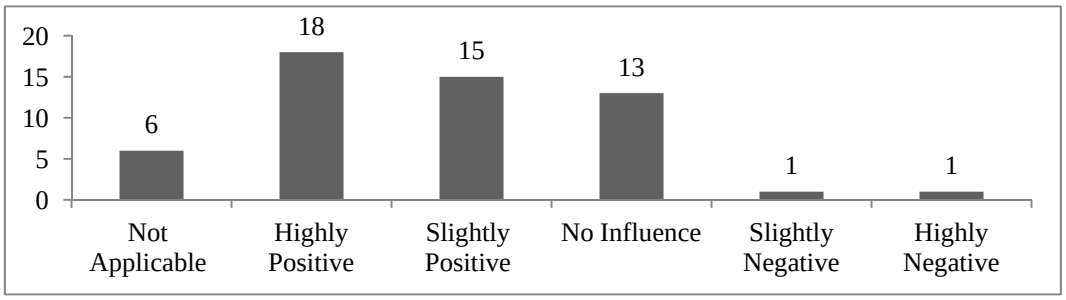


Figure F.7: Influence of Scholarship or other Funding Opportunities

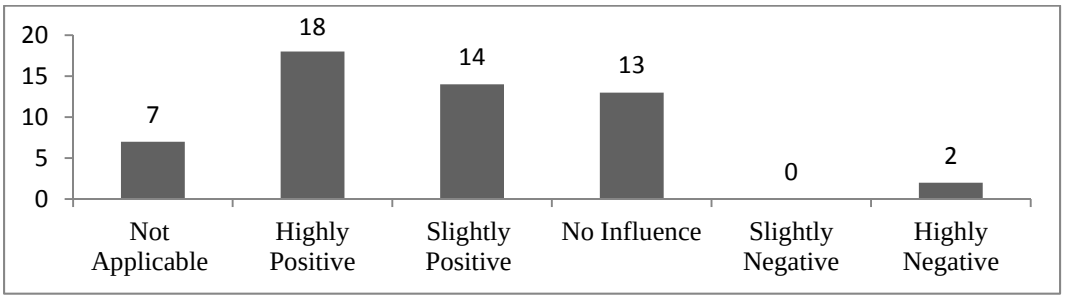


Figure F.8: Influence of Community Service

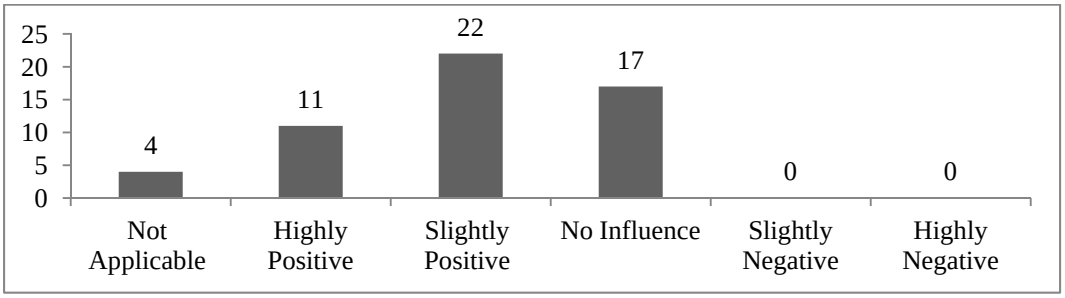


Figure F.9: Influence of a Female Role Model, Not Parent

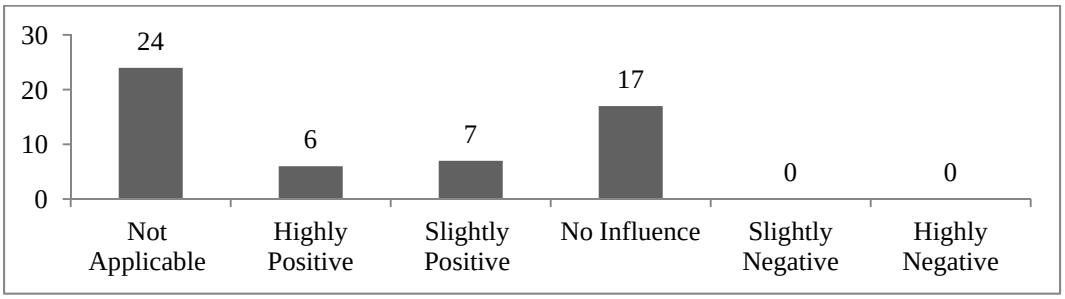


Figure F.10: Influence of Mother Taking You to Work

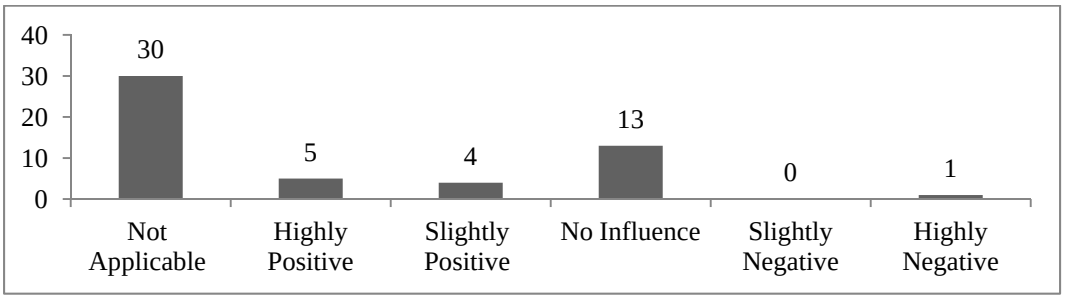


Figure F.11: Influence of Mother Working in the Industry

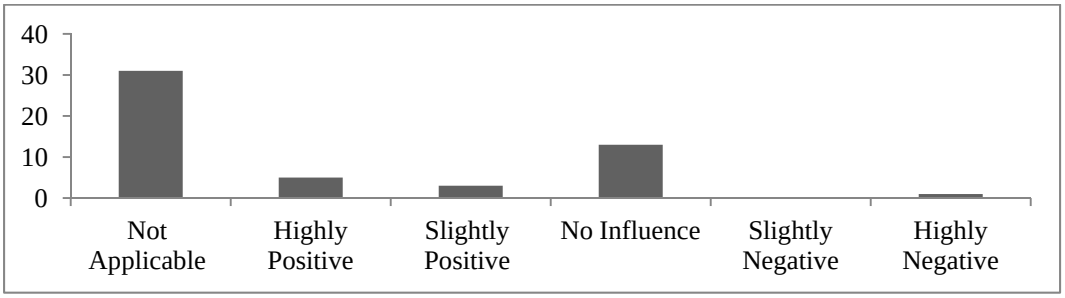


Figure F.12: Influence of Mentoring Program at School

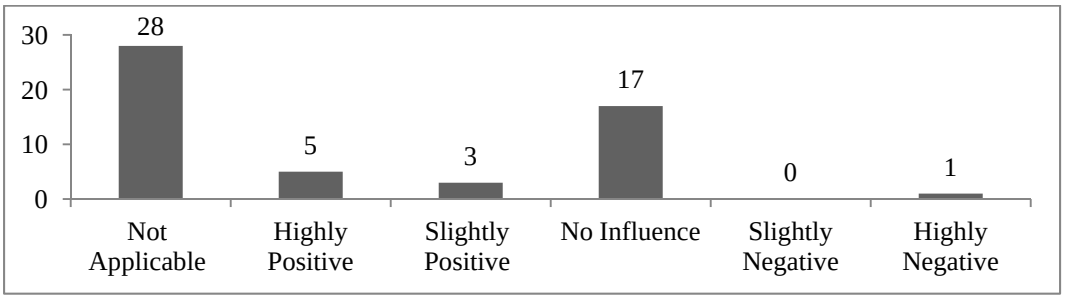


Figure F.13: Influence of TV or Magazine Ads

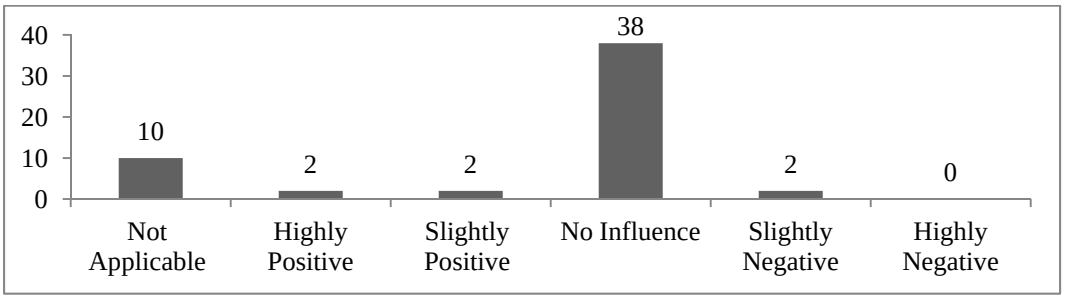
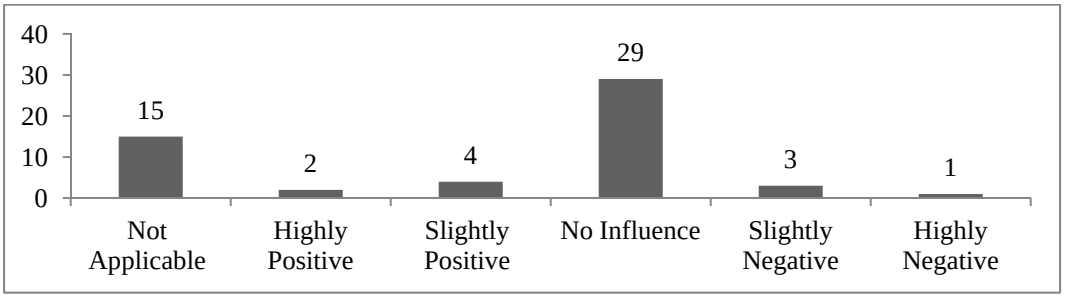


Figure F.14: Influence of High School Advisor/Counselor



APPENDIX G

WHAT OTHER FACTORS INFLUENCED YOU TO SELECT YOUR DEGREE?

1	Job placement rate following graduation as well as salary range.
2	A recruitment officer came and talked to one of my classes about the program, and I followed up with her to get more information. I started as Chemical Engineering. After talking with her, a student in the program, and the CIM advisor, I was hooked to change to CM.
3	It's a great combination of technical experience and business savvy.
4	Knowing that the construction industry is predominantly male, I wanted to get into the industry even more so that it will slowly but surely create more equality for the future generations.
5	It was mostly my volunteer involvement with habitat for humanity and with my church group to build houses. I enjoyed this kind of work and could see myself working on larger scale projects. / I also was interested in being an architect, but my father brought to my attention what an architect actually does versus what a contractor does. My perception of an architect was that they build buildings, not that they solely design concepts for buildings.
6	Salary
7	The stability of the construction industry as it continues to grow, as well as the opportunities for women to maintain an occupation in the field.
8	I liked the business aspect of Building Science, which is not present in an Architecture degree (what I was originally pursuing).
9	Taking an introductory course called "History and Introduction to Construction" helped me realize that the construction industry was something I was very interested in.
10	After being discouraged in Architecture my college advisor suggest Building Science which was more Math/Science oriented than the Arts of Architecture.
11	It is an exciting industry with lots of opportunity. It is just a specified business degree.
12	Money, a high salary
13	I've always enjoyed the built environment. Working in the industry only solidified my desire to pursue this major.
14	Visiting and shadowing project managers in the industry
15	High school shop and CAD classes
16	Environment of classes and the teachers
17	I wanted to be an architect but didn't want to go for a 5 year undergrad
18	My passion to help others

19	All were listed above. Family in industry, community service, seeing my Dad work
20	The fact that I understand construction and have a passion for it.
21	I was not meeting the pre-reqs of engineering so I became a CM major. Never looking back!
22	Purdue's program offers specializations in certain fields. My father is an electrician and I grew up helping him a lot. I wanted to go in the direction of electrical construction.
23	Learning I was more of a hands on learner than a theoretical learned which helped me decide to switch from Construction Engineering and Management to Building Construction Management.
24	Family in engineering.
25	Opportunities
26	Other students' positive remarks.
27	My skill set for the degree.
28	Hands on work with equipment/real life examples
29	Knowledge of the major from my previous one (Architecture_
30	I wanted to be an architect but after doing an internship with a subcontractor I loved it so much that I decided to change majors.
31	The fact that it is unique and interesting. It is a broad major with a lot of job opportunities. Not boring.
32	Interior design/interest in building process
33	I started out in architecture and it was the worst, so I switched.
34	Passion for math, art and business.
35	A good job market.
36	Previous knowledge of field
37	I switched from engineering, so the similarities and potential pay

APPENDIX H

WHAT OTHER PROGRAMS COULD POSITIVELY INFLUENCE STUDENTS TO SELECT / YOUR DEGREE PROGRAM? ANY IDEAS OR SUGGESTIONS?

1	For women entering their first years of college and do not know exactly what program they want to study, I think really having a mentorship program like Advancing Women In Construction (AWIC) will create a support system and also let the students physically see all the successful women in the industry and hear their inspiring stories.
2	I think the media plays a role. Not specifically in advertisements but in the shows themselves. HGTV and DIY network are starting to have more shows involving female project managers (think rehab addict). These shows portray the women construction manager in a positive light.
3	I think that the co-op program is the most influential for this degree. Getting hands on experience triumphs anything that can be taught in the classroom and really gives a lot of in-sight as to what working in the construction industry entails.
4	Don't know what "programs" mean
5	Wood shop
6	WIC
7	Bring year one for CM back
8	High school outreach/awareness programs so kids know CM even exists
9	Show them how much fun this is! I didn't know a CM major existed until Sophomore year.
10	Dawn Lamb on our BCM department staff is very driven towards recruitment. She attends many high school career fairs. Visiting high schools is huge in my opinion, because most people don't know that construction management is a career path and all the great things about it.
11	Construction Engineering and Management
12	Construction related outreach programs for high school students
13	Better representation of what construction science is. A lot of people just think you become a laborer.
14	Women's organization within Construction Science
15	Volunteer and mentor programs
16	Working with AutoCAD

17	Internships! It's nice to be able to see how things really work on the job site/office.
18	An informational - not many people know what Construction Science is all about.
19	Publicity; I don't think people know the major exists.
20	High school BIM courses or wood shop courses
21	Job opportunities after graduation
22	Women societies, outreach at high schools lie, I did not even know Construction Science existed.

APPENDIX I

FACTORS IN REMAINING IN CM DEGREE PROGRAM

Figure I.1: Influence of Hands on Experience in Construction Lab Classes

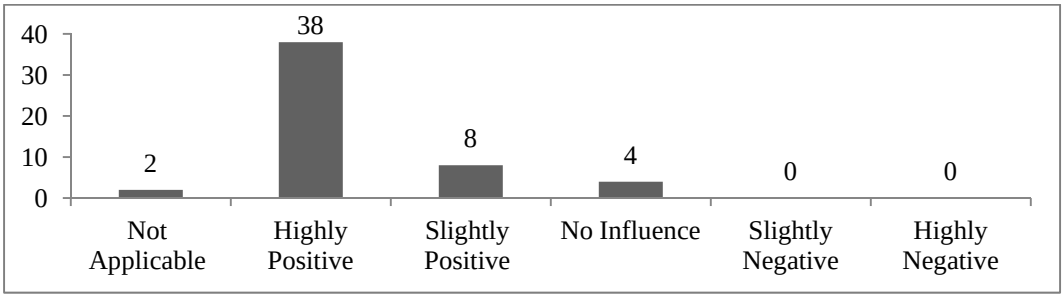


Figure I.2: Influence of In-classroom innovation in construction classes (use of videos, gadgets, etc.)

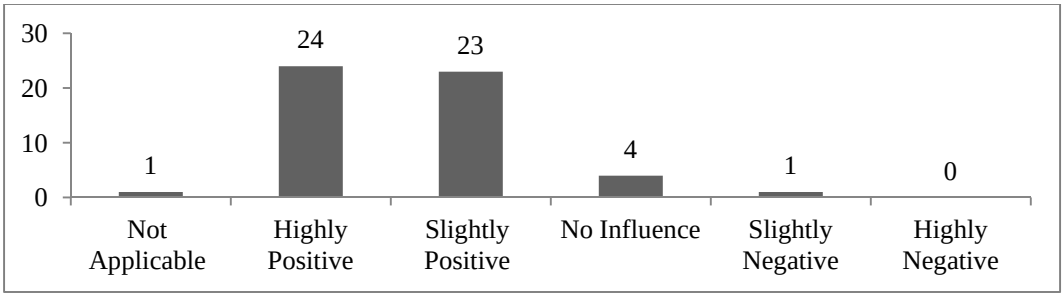


Figure I.3: Influence of Involvement in construction related student organizations

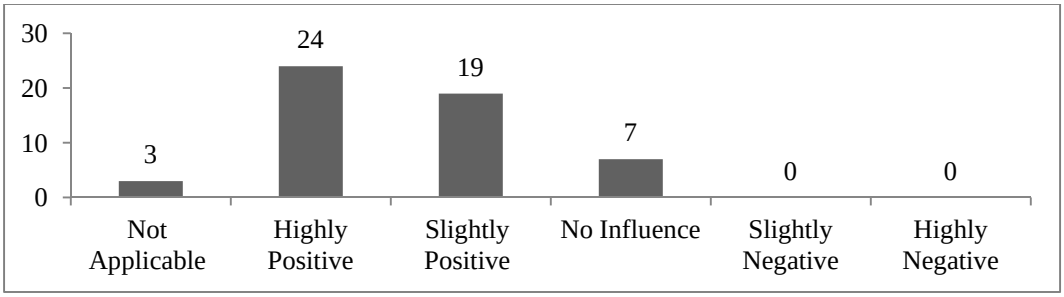


Figure I.4: Influence of Scholarships and Fellowships

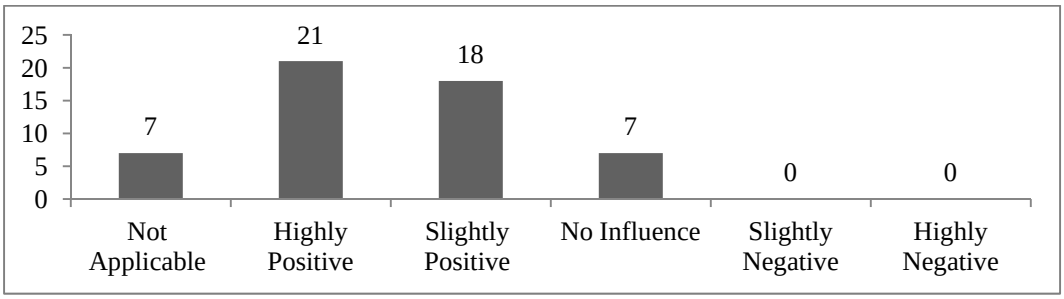


Figure I.5: Influence of Non-Internship construction work experience after enrolling in college

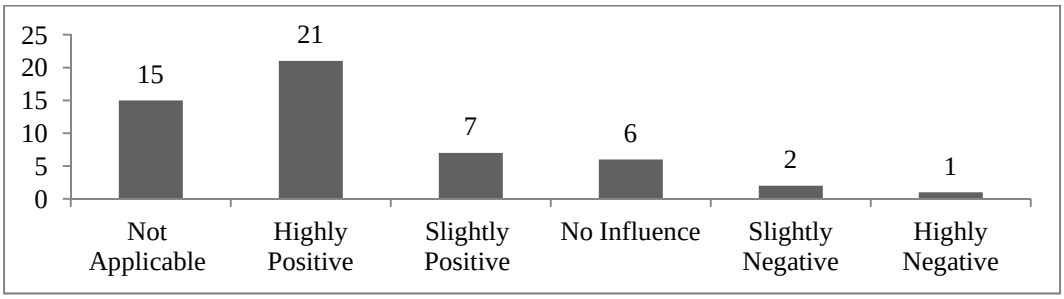


Figure I.6: Influence of Mentoring

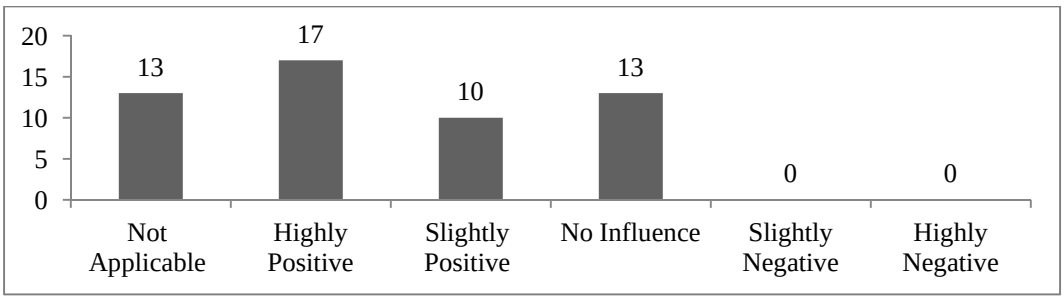


Figure I.7: Influence of Academic Advising

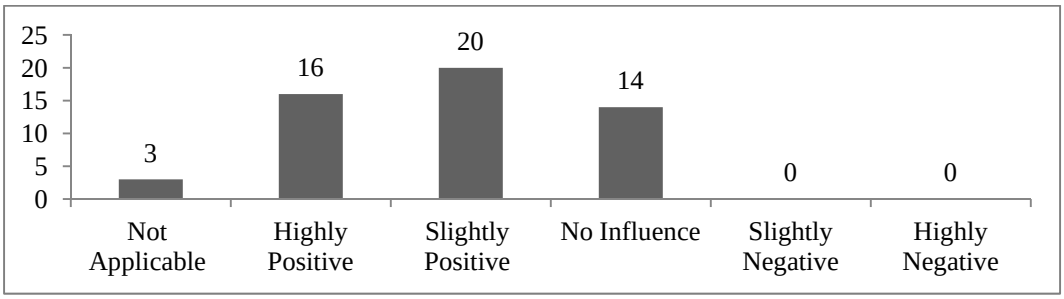


Figure I.8: Influence of Individual involvement in construction-related research

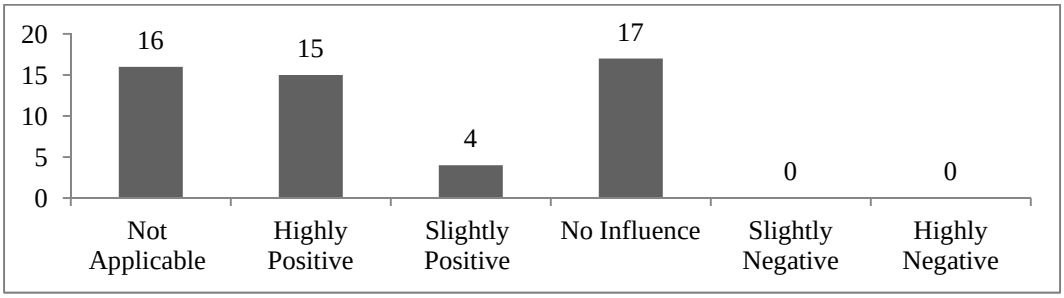


Figure I.9: Influence of Students of your gender in the program

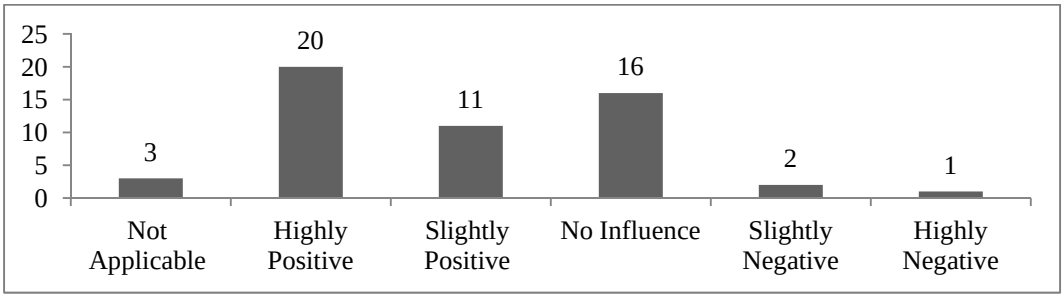


Figure I.10: Influence of Courses based on mathematical analysis (e.g. structures, estimating)

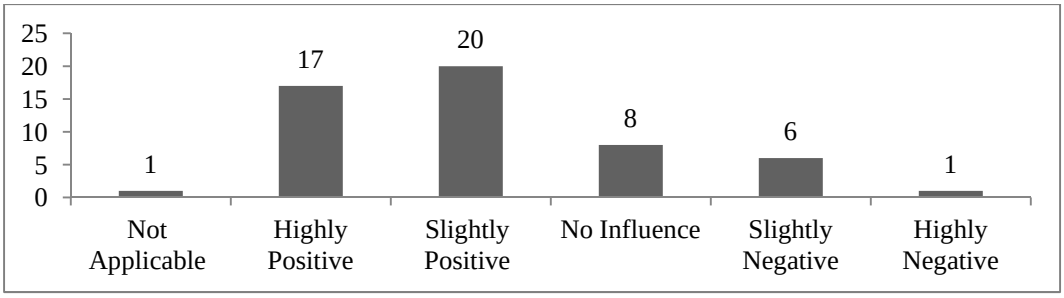


Figure I.11: Influence of Workshops and Seminars

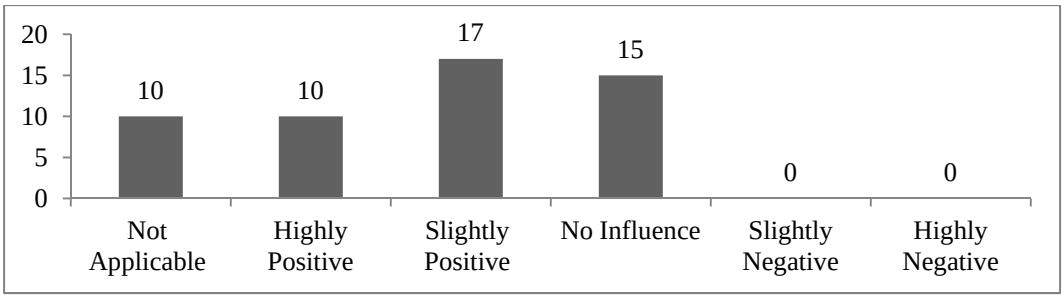


Figure I.12: Influence of Faculty Members of your Gender

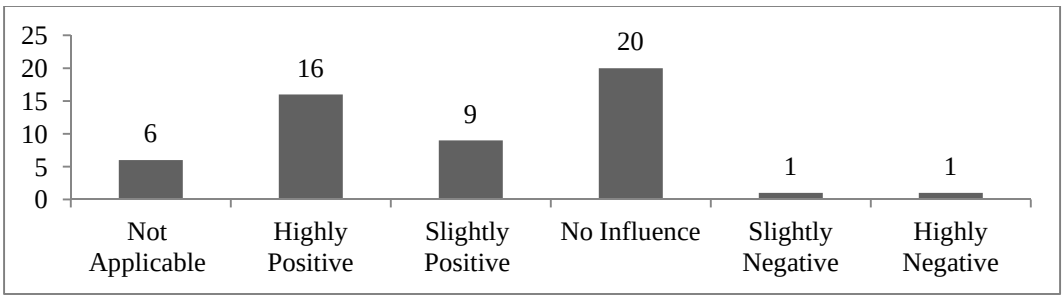
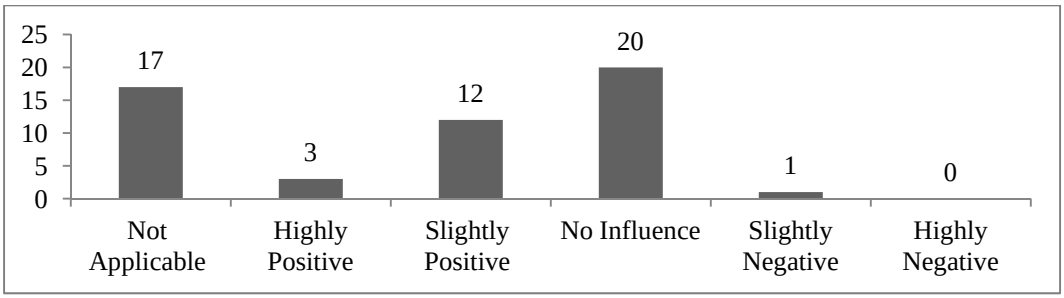


Figure I.13: Influence of Tutoring



APPENDIX J

WHAT OTHER FACTORS INFLUENCED YOUR DECISION TO REMAIN IN THE CONSTRUCTION RELATED DEGREE PROGRAM?

1	I'm the president of the American Concrete Institute student chapter at ASU, and I love all of the activities and outreach and industry connections. My concrete focused classes keep me really involved, and I love learning about it. There's always companies in our building looking for interns and full time, so it's nice knowing students with this degree is desired.
2	There are many job opportunities and the industry is always around the school willing to hire.
3	The job market. I also found the courses interesting.
4	Cumulative cost of tuition would be greater had I changed my major
5	I really enjoy all of my classes
6	The network of people in the construction industry and the advances in technology that have developed over the past few years.
7	Once I got into the Building Science program, I realized how much I would really enjoy working in this field. I like that when you are working hard on a project to get something built, you get to visually see your progress. I like that it is a field that requires a lot of cooperation and people skills, so people in this field make this a priority. I like that all my classes I'm enrolled in at Auburn are very relevant to knowledge I will need out in the field, which I have already had the opportunity to see and apply at my Co-Op job.
8	As I continued through the program I began to understand the coursework more and more and realized that the construction industry is something that I am very passionate about.
9	Really enjoyed Construction Management because you aren't stuck at a desk all day like and engineer and get to have a lot of time in the field as well.
10	I knew I would have a stable job
11	the opportunities
12	The positive environment
13	I like it a lot
14	Career opportunities
15	I just love construction. I've never wanted to be anywhere else.
16	That I enjoy what I'm learning. I have also had a lot of support from friends and family.

17	The professors all care and respect privacy and honesty. They always joke with you outside of class.
18	Courses offered
19	The fact that the economy in this industry is looking much better than it did four years ago. The starting salary averages are great. I love it, because I have finally found something that I am good at and makes me happy.
20	A major factor to remain in the program is because of the environment.
21	The need for more women in the industry.
22	My skill set was well suited.
23	Close/small classes that make the degree a little community and you know everyone.
24	Good pay after graduation. Also, see a project that started with an idea coming to life is awesome!
25	When classes offer real world scenarios and treat you like it is the real world. When you can apply what you learned.
26	I enjoyed the classes, projects, and my internship.
27	Good grades
28	Great professor, great hire rate out of school
29	The good networking/industry relations
30	Money
31	My interest in the program/construction
32	I want to graduate on time and truly enjoy professionals in my industry.

APPENDIX K

WHAT OTHER PROGRAMS COULD POSITIVELY INFLUENCE STUDENTS' DECISION / TO REMAIN IN YOUR DEGREE PROGRAM? ANY IDEAS OR SUGGESTIONS?

1	I personally would like more trade related hands on classes like wood working or metals.
2	Involvement in more community service
3	Staying involved in construction related student organizations.
4	The Co-op program
5	Shop classes/more labs
6	WIC
7	More of a BIM program
8	Official mentoring
9	More estimating
10	Bonding that is non-construction related to bond with fellow students.
11	NAHB, BCM Career Fair, Habitat for Humanity
12	Participation in student competitions is a great way to gain great experience and really set yourself apart from your classmates. Many times that these competitions, companies spoil the teams and the networking opportunities are great. Also, these competitions are a lot of fun.
13	Research
14	Women's Organization
15	Volunteering.
16	Hands on/group projects
17	Keep professors happy
18	Money, opportunity
19	Faculty interest in students
20	Competition groups, gender organizations, outreach

APPENDIX L

HAS YOUR PERCEPTION OF THE CONSTRUCTION INDUSTRY CHANGED AFTER / ENTERING THE PROGRAM? IF YES, HOW AND WHY?

1	No. I've already worked in the industry
2	No
3	No
4	No
5	No
6	No
7	No
8	No.
9	No
10	No.
11	No
12	No.
13	Not really. I have been around the industry since I was little.
14	Yes, I've seen first hand on the field the experiences that can take place in construction. It is not just about the technical side of construction, but rather the business side too.
15	Yes, because I grew up around "hometown" construction, like building decks and patching roofs. I now realize how much there is too it and all of the safety concerns surrounding the industry.
16	Yes. I had no idea what the industry was like going into the program. During my internship/work, I have learned that is a very complex, competitive, and progressive industry. I am always learning something new and that is what fascinates me. There are so many pieces in the puzzle and I enjoy trying to find all of them.
17	Yes, once you are in the program and you are involved in organizations and activities you see how much is really going on it just adds to your motivation of wanting to get out there and start working!

18	Definitely. When I entered the program I did not know what I was getting myself in to. I didn't realize the structure of industry. I didn't realize that there were office jobs available in construction, and my perception of construction workers were mostly the tradesmen or laborers you see on the jobsite.
19	It is completely different than what we learn in school. Nothing is ever a "text book scenario".
20	I was surprised there aren't more women, minorities, or young people currently in the construction industry.
21	It's more complicated than I thought it was, but there are also many more opportunities for technological advancement than I thought.
22	I'm more aware of the separate fields and careers within the construction industry.
23	Yes, I never thought about the development and business that goes into construction. I only thought about the actual labor that happens in construction and classified the entire idea of it as this single entity.
24	Yes! I didn't know hardly anything about the industry. It changed because of my increase in education over time, and the way that my perception changed was that I realized what all must go into not only building a specific project, but managing it as well. I now have a much better understanding of how important it is to have good communication and time management skills.
25	I thought it would be very high strung, stressful and daunting, but meeting people from industry and experiencing it somewhat has showed me that it is actually very enjoyable
26	It has changed in the sense that I wasn't aware of how certain systems worked and I have a better appreciate and a better understanding of the construction industry since entering the program.
27	Yes - Most people, including myself before I entered the program, assume that when you are in construction you are a laborer or a superintendent. Learning all the ins and outs of how to actually manage a jobsite/construction company changed my perspective entirely. / Also after receiving real life experience during my co-op I learned of how many women are already in this industry and varying roles which encouraged me that I could move up the ladder as much as any other person in this industry.
28	Yes, I want to look at other options like real estate, finance or even BIM and computer technology, as opposed to 100% construction and field engineering.
29	Yes. I realized how male dominant it was.
30	Yes. It is even better than I imagined.
31	Yes. Being a woman in construction is more complicated than I originally thought.

32	Yes! I didn't know there was a major for CM and it is exactly what I want to do!
33	Yes. Never considered the management side of construction. Appreciate that the construction industry is hands on, there is a field and office option, all types of construction projects whether residential or commercial, small scale or large, the people are hard working whether a laborer or part of the contracting team, etc...
34	Yes, there is more work and stress involved.
35	Yes. I have learned that it is a lot more than building house, which is what my first impression of it was before I came to Purdue. The people are great and everyone wants to see you succeed. That's why I love the Purdue BCM staff. Each instructor wants to do everything they can he help each student succeed. I think the staff here at Purdue has really helped build and keep my enthusiasm and passion for this industry.
36	The internship program has changed my perception of the industry a lot. I enjoy the work however I have found that the risks and returns are not as great as expected.
37	Yes. I was exposed to the endless amount of opportunities.
38	The industry has many different areas - estimating, project management, etc.
39	Yes; better understanding of the industry.
40	More sexism here than in industry - very disappointing.
41	Yes
42	Yes. It is way more complex than I thought.
43	Yes. At first I thought construction was stoic and traditional always. But companies are trying to more innovative and change more and more.
44	Yes. I learned more than I thought I would and I really enjoyed the classes.
45	Yes. I thought it would be very difficult being a women in the industry and it is more welcoming than I thought.
46	Yes. It is better and more sophisticated.
47	Yes. I knew little to none about the industry prior to college
48	Become more positive as a whole.
49	Yes. It is much more white collar than I thought.
50	Yes. There is a lot of work behind the scenes.