

The Development of a Construction Management Summer Program for Young Females – A Case Study

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Previous studies have shown that the benefits of women-only programming are significant and far-reaching. Women-only spaces are desirable for them to be more comfortable to express themselves, encouraging them to take more risks, and develop their self-confidence. Girls and young women can also benefit from having women leaders as role models. Thus, the Department of Construction Management received funding to support a 4-5-day summer institute to educate female high school students about professional careers in the construction industry, and to empower them to seek careers in male-typical fields. The Department felt this initiative was well-aligned with its current recruitment efforts, particularly because while the overall percentage of students' diversity in CM (Construction Management) is increasing, the percentage of female students has not noticeably increased in the last several years. The study showed a great positive impact across the participants' increased awareness of CM as a career and an industry along with the contribution of the program to their personal development. The study also identified some of the major barriers for their continuing education and provided an example of a structured CM awareness program along with its specific benefits/impacts of such initiatives.

Key Words: Recruitment, Women in Construction, minorities, education

Introduction

Although the construction industry has been mostly a male-dominated sector, women employment has almost doubled from 5% in 2002 to 9.1% in 2016, and continues to grow (BLS, 2017a). Meanwhile, the construction industry also has one of the lowest gender pay gaps, with women earning on average 93.4% what men make, compared to the national average of 82.1% (BLS, 2017b). As the construction industry flourishes, the demand for the construction workforce increases and significant employment opportunities become more available to minorities and women in the construction industry. Those opportunities are not only represented in the construction trades, but also in the leadership roles that often require higher education “college” degrees towards a career path in construction management. Many universities and college programs offer undergraduate and graduate degrees in construction management and/or construction engineering. However, there is a noticeable lack of women studying construction management to take on such opportunities in the construction industry (Bigelow, Bilbo, Ritter, Mathew, & Elliott, 2016).

The success of CM programs should also encourage a continuous and growing effort to establish more awareness about construction management to underrepresented groups. For instance, summer programs could be not only for women, but for all high school students in general, to expose a diverse group of young people to CM as a career and correct any misconceptions they may have about the field. Unfortunately, most high school students have only a vague perception of the construction industry and specifically CM higher education and the career opportunities that come with such an education (Clarke and Boyd, 2011). Therefore, more CM career awareness initiatives are of the utmost importance and can reap valuable benefits for the different stakeholders invested in such initiatives; CM programs attracting more students, the construction industry finding more skilled workforce, and promoting student's personal and professional development. Therefore, the main goal of this case study is to assess the effectiveness of the summer program. The study focuses on the perceptions of the participants related to the learning experience and the change of perception of the enrollees after the “Women in CM Summer Institute” WICMSI experience.

Background

Women in Construction Education

Several organizations aimed at exposing young women to non-traditional career paths have reported significant positive impacts. One of the many examples was the “Girls Exploring Science, Technology, Engineering, and Math” (GESTEM) program. This one-day career exposition for 6th and 7th grade girls in the Denver metro area reported that after attending the event workshops, 76% of participants were inspired to pursue a career in STEM, 74% wanted to take more STEM courses at school, and 79% learned about careers they had never heard of before (SWE, 2016). There have been many successful efforts in attracting young women and minorities into STEM fields (UC, 2017; Yilmaz, Ren, Custer, and Coleman, 2010; Elam, Donham and Solomon, 2012) while very few programs expose young women to construction management as a viable educational opportunity (Guana, 2017).

At Colorado State University (CSU), while the overall percentage of diverse students in the CM (Construction Management) department is increasing, there is a noticeable lack of women studying CM, represented by a mere 7% of CM students. Faculty and staff have observed that women in the CM major tend to be high achieving students; women hold 25% of all CM student leadership positions, about 22% of available spots on competition teams, 17% of the available seats in the competitive CM Cares Leadership Course, and have an average GPA of 3.21. Thus, an increase in women in the CM Major and the perspectives they bring would greatly benefit both the quality of the CM Program and the industry as a whole. Despite their small numbers, the construction industry can be a great place for women to work. While women make up a small percentage of the CM Department, career placement rates and starting salaries tend to be equal between genders. In Fall 2018, 97% of seniors had accepted a full-time position prior to graduation at an average starting base salary of \$67,500.

Studies have shown that the benefits of women-only programming are significant and far-reaching. A 2006 report by the Women’s Resource Center found that in women-only spaces, women are “more comfortable to express themselves and articulate their needs, less constrained and intimidated when not exposed to the “male gaze”, and that “women-only leadership ensures women’s needs are met, and women-only services deliver better outcomes than mixed spaces”. Additionally, a 2007 study found that “girls and young women were enthusiastic about having time away from boys, and benefitted from having women leaders as role models.” Similarly, “single-sex spaces encouraged girls to take more risks, express themselves, and develop their self-confidence” (YWCA, 2005). Upon these observations, the CM department at Colorado State university partnered with the CSU Access Center and the ten Alliance Partnership High Schools and initiated the “Women in Construction Summer Camp” (WICMSI). This 5-day summer institute for young women entering grades 9 to 12 sought to educate these young women about professional careers in the construction industry and empower them to seek careers in male-typical fields. The first two years of the WICMSI served as a case study for this initiative, which focused on exposing these young female students to, and helping them understand, the different opportunities and career paths available to young women in the construction industry. This study explores the effectiveness of such a program to help young women understand the different opportunities and career paths within the construction industry. The hypothesis and research question for this study is culminated in the prospect of these programs to help young women understand the different opportunities and career paths within the construction industry. The following sections will detail the researched outcome and assessments of the program objectives.

Program Description and Objectives

The 2017 Women in Construction Management Summer Institute hosted 16 young women on campus from June 7-10, 2017. Seven participants attend one of three Alliance Partnership high schools, and nine participants attend another high school in Colorado. Six participants identify as Hispanic/Latina, and ten identify as Caucasian/White. Seven participants had previous construction experience through a Geometry in Construction Course at Loveland High School, and nine had little to no prior construction experience. In 2018, the Women in Construction Management Summer Institute hosted 23 young women on campus from June 5th – 9th, 2018, a one-day expansion from our Inaugural 2017 Institute. Eight participants came from three different Alliance Partnership high schools, and one participant came all the way from Virginia. Fifteen participants identify as Hispanic/Latina, and seven identify as Caucasian/White. One participant had previous construction experience through a Geometry in Construction course at Loveland High School. The sampling size and population was a sample of opportunity for the targeted population. The sample size was limited to the enrollment capability of the program (20 in 2017, and 25 in 2018).

Targeted recruitment was utilized to achieve the desired population of young women (grades 9-12) in collaboration with CSU's Alliance partnership.

Throughout the week, the participants attended a wide variety of workshops facilitated by other female Construction Management alumni, including material properties and testing, scheduling, estimating, sustainability, 3D modeling, and mixed reality software. They also participated in several construction activities such as wiring and pouring concrete lamps, and creating either coat hooks or bookends from industrial pipe fittings. The participants attended a site tour of the Ginger and Baker revitalization in Old Town, and culminated the week with a volunteer day with Habitat for Humanity. In the evenings, participants spent time with CSU student mentors, and on their last evening, they attended a dinner and panel discussion with 12 female professions representing engineering, architecture, and construction careers.

Participants were asked to take an intake and exit survey to assess the success of the program's goals which include the following:

- to educate young women about career opportunities in construction,
- to empower young women to pursue a career in construction,
- to encourage young women to go to college after high school, and
- to generally build their confidence.

Participants were also asked to provide feedback after each class session, to improve programming for future years.

Methods

To achieve the goals of this study, a quantitative methodology using a survey instrument was used. The surveys were developed and approved by IRB (Institutional Review Board). Two different surveys were conducted as a pre and post WICMSI learning experience. The main focus of the surveys was to determine and measure the learning experience and the change of perception of the enrollees after the WICMSI experience. The Pre-program survey questionnaire was mainly designed to measure: (1) the students' current aspirations in pursuing different levels of education (e.g. vocational school, associate's degree, higher education, etc.); (2) If they desire to pursue a career in construction management; and (3) the level of knowledge and perceptions of construction management as a career option and a college degree. The Post-program survey questionnaire was designed to measure the post-program experience change with the addition of the following measures: (1) personal skills developed through the WICMSI program; (2) the overall WICMSI experience; and (3) the students' perceived barriers for continuing education beyond high school. The overall research process of the study involved the following steps: (1) developing the survey instruments; (2) conducting pre-test for instrument validation; (3) distributing the survey questionnaire; (4) collecting data to examine the aforementioned research/program objectives; and (5) analyzing the collected data. Eight of the eleven pre-study questions were repeated on the post-study to analyze the difference of the participants' perception. The data was analyzed using a quantitative descriptive data analysis using frequency charts as shown in the results section.

Results – Case Study Assessment

During the two years, 33 out of 38 participants have responded and completed (with no omissions) the pre and post program surveys (86.8% response rate). The research results are categorized by objective assessment. The first objective "*to educate young women about career opportunities in construction*" was measured by different Likert scale questions as shown in Figure 1 and comparative Pre- and Post-program survey questions as shown in Figure 2. Specifically, Figure 1 shows that most of the participants are in agreement with the value of the program in learning about the different CM career opportunities, the various roles of women in construction and the educational opportunities in the CM field. Figure 2 shows that the participants' perceived knowledge of CM (on a scale of 1 to 10) has increased almost twofold after participating in the WICMSI program.

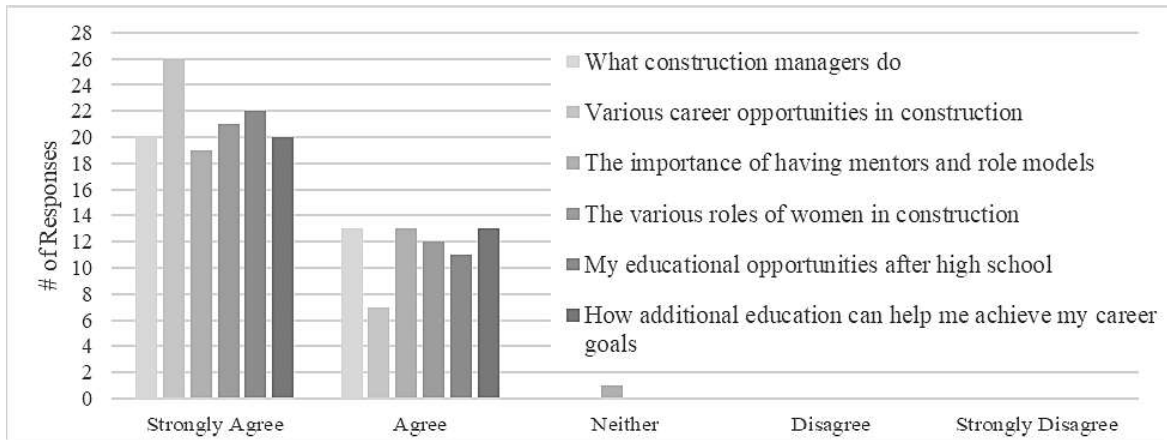


Figure 1. Responses to “During my participation in this program, I learned a great deal about...”

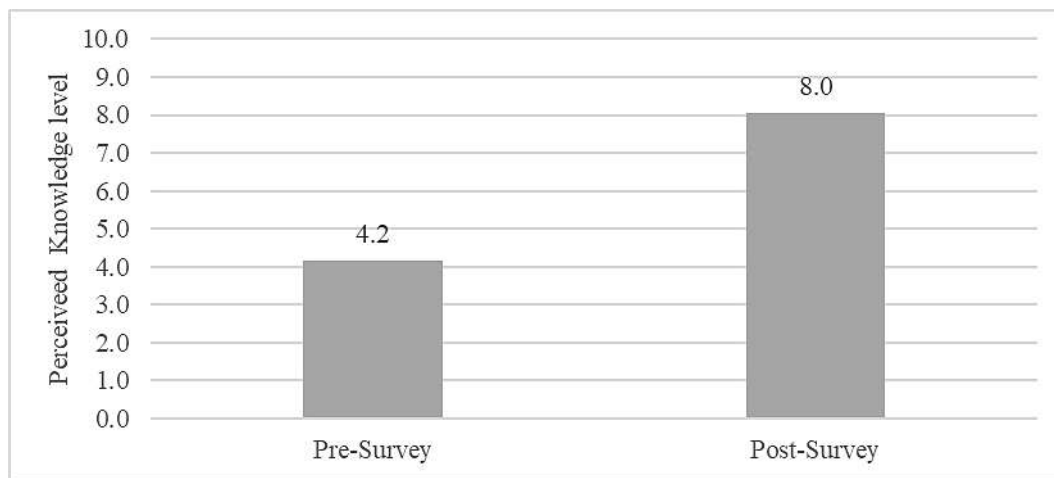


Figure. 2 Comparison of CM knowledge (pre and post-survey)

The second objective “to empower young women to pursue a career in construction” was measured by comparative Pre- and Post-program question, to which the results are shown in Figure 3. The results in Figure 3 indicate the participants’ change of perception after the WICMSI experience and the pivot towards considering a CM career as part of their future.

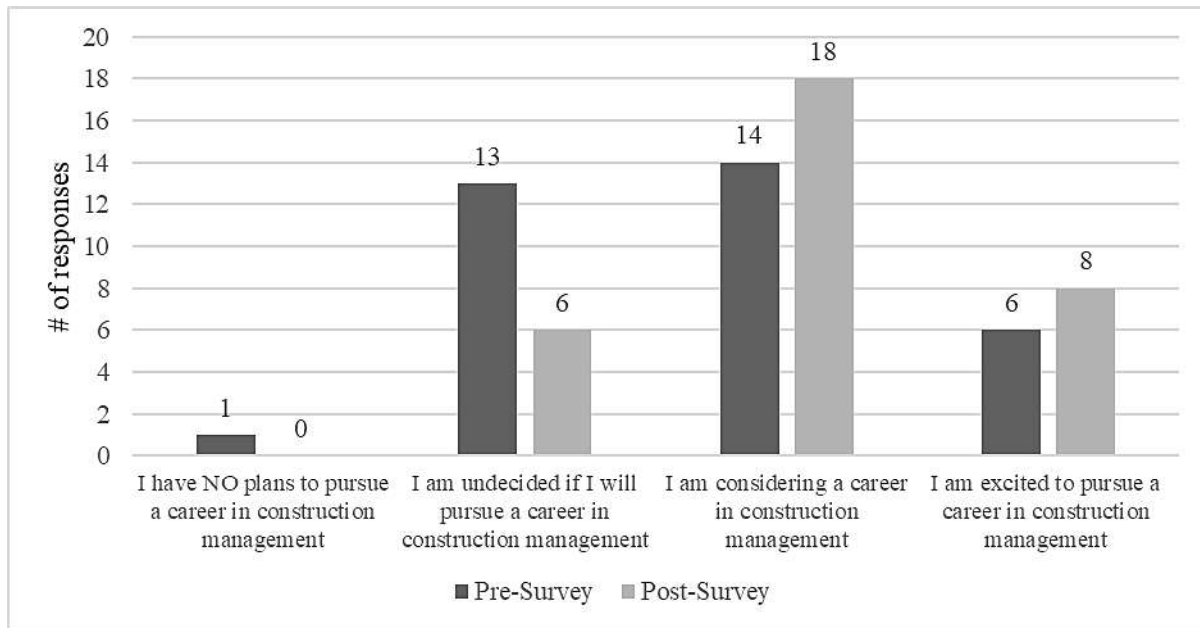


Figure 3. Comparison of Considering CM career (Pre- vs. post-survey)

The third objective “to encourage young women to go to college after high school” was measured by a simple descriptive statistic represented in Figure 4. Particularly, Figure 4 shows the majority of the program participants having an aspiration and desire to continue their education after high school and pursuing a higher education “College” degree.

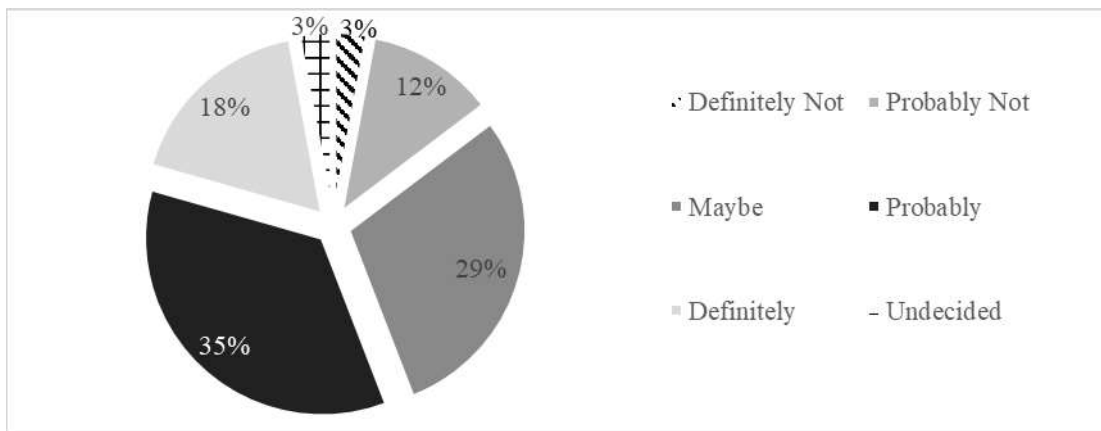


Figure 4. Participants (n=34) responses to “I plan to go to CSU”

In addition to the main program objectives, the participants also provided several assessments about how the WICMSI program contributed to their personal development (skills) and the barriers to pursuing their education beyond high school. The results for these assessments are shown in Figures 5 and 6, respectively.

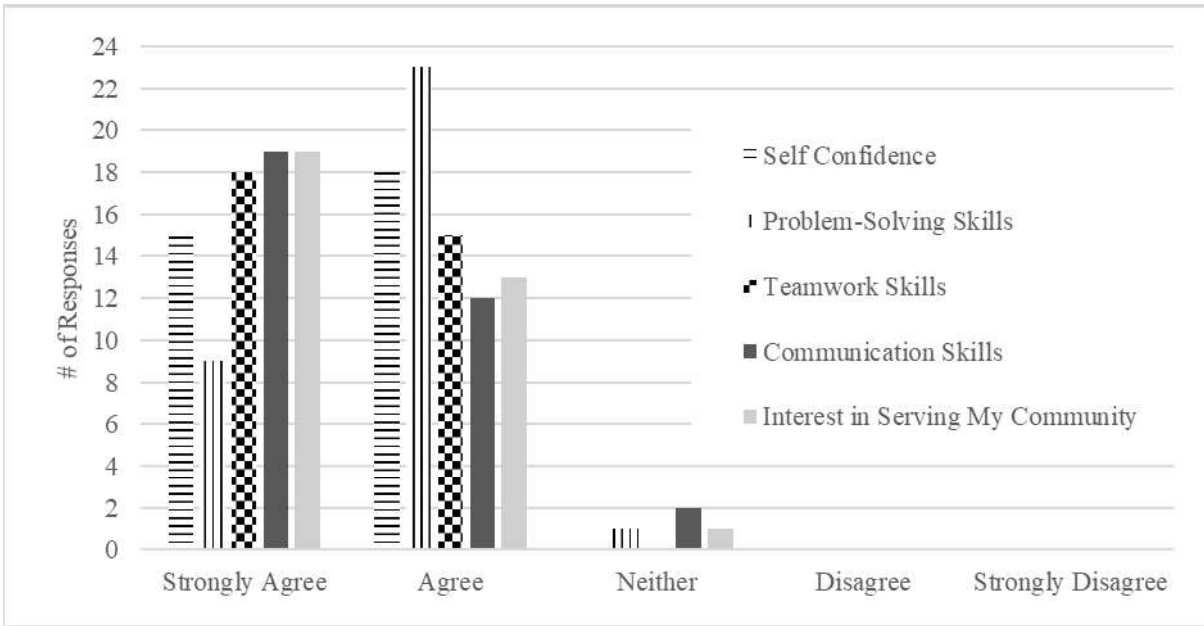


Figure 5. Participants (n=33) responses to “Because of my participation in this program, I have gained...”

Figure 5 shows that the overwhelming majority of the participants think that the WICMSI program has positively contributed to their self-confidence, and increased their problem-solving, teamwork and communication skills, and peaked their interest in serving their communities. Figure 6 shows that the cost of continuing education is perceived as the forefront barrier to the participant’s continuing education followed by a little concern about high school grades and the lack of college preparatory courses in high school.

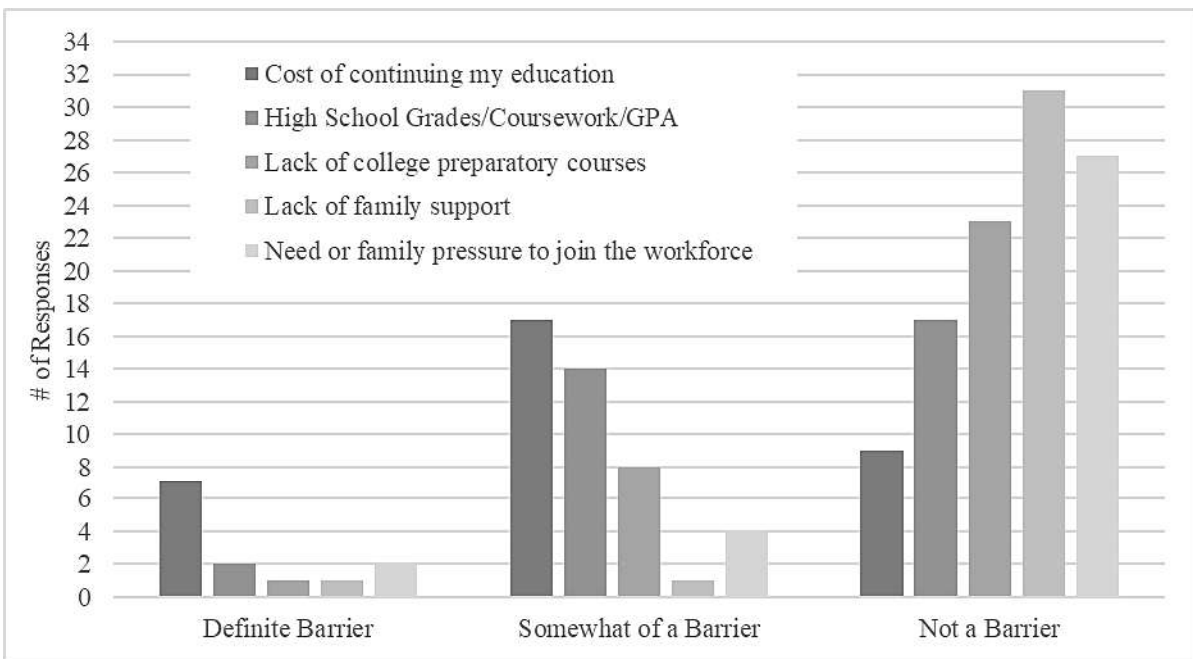


Figure 6. Perceived Barriers for Continuing Education

In addition, based on other program evaluation questions, below are some of the results from the exit survey:

- 100% of participants enjoyed the WCM Institute, would recommend this program to others, agreed they gained self-confidence, agreed that construction is a great field for women, and felt more informed about leadership roles for women
- 86% of participants agreed that they want to pursue a career in construction management (the other 14% were neutral, none disagreed)
- 76% of participants indicated that it is important to offer this camp as an all-female experience
- 67% of participants indicated the all-female aspect was a factor in their decision to apply to the institute

Many participants even indicated a desire to participate in the Institute again next summer as a “junior mentor.” Participants also provided very positive feedback in the comments section of the post-survey such as:

- “This helped me to see what opportunities I have to choose from and don't let anything stop you!”
- “It is extremely empowering and really teaches a lot about the industry.”
- “This has opened my eyes to consider this field more for my future, and also my skills have grown.”
- “I would love to be a part of this program in any way next year. I loved everything about it.”
- “Females get better self-esteem and feel more confident to go take a career in construction management.”
- “At the beginning of camp, [being all-female] didn't seem as important, but after some time, the amazing mentors and inspiring women we met changed my opinion. It is important for girls to meet inspirational women and be exposed to a positive, all girl experience.”

Conclusion and Future Research

The aim of this research was to present a case study of a newly adopted program that exposes young female students to the different opportunities and career paths in the construction industry and empowers them to pursue such careers. In addition, the study assessed the success of such programs and the benefits and impact of the program on the targeted population. The study confirmed the plethora of benefits of the program implementation and showed its effect as a learning experience that can change young student's perceptions in addition to contributing to their personal development and skills. Although the sample size is not a base for generalization, the case study itself serves as a basis for future research and a model for different programs willing to pursue similar initiatives.

Another expected observation was the perceived barriers for the students including the cost of education and the lack of preparatory courses. One is a financial barrier while the other is an educational shortcoming, which would benefit from the different schools/programs and the industry providing more scholarship opportunities in order to attract more capable and interested students and help overcome such barriers. In addition, more involvement with high schools is required to promote and help develop such courses that prepare and inform students for potential CM higher education choices. This paper introduced an example of a structured CM awareness program and identified the specific benefits/impacts of such initiative; however, the authors' future goal is to increase the sample size and explore the different initiatives from other CM programs and different schools within the architecture, engineering, and construction community. Future research can also include replicating the study for other minority populations in the construction industry and pursuing the different solutions to the perceived barriers.

References

- Bigelow, B. F., Bilbo, D., Ritter, L., Mathew, M., & Elliott, J. W. (2016). An evaluation of factors for retaining female students in construction management programs. *International Journal of Construction Education and Research*, 12(1), 18-36.
- BLS (2017, a). Annual Averages, Employed persons by detailed industry, sex, race, and Hispanic or Latino ethnicity. Bureau Labor of Statistics. <https://www.bls.gov/cps/cpsaat18.pdf>
- BLS (2017, b). Women in the Labor Force: A Databook, Bureau Labor of Statistics. <https://www.bls.gov/cps/cpsaat18.pdf>

Clarke, S., and Boyd, B. (2011). Youths’ Perceptions of the Construction Industry: An Analysis at the Elementary, Middle, and High School Levels. ASC 47th Annual International Conference Proceedings, Omaha, NE.

Elam, M., Donham B., and Solomon, S. (2012). An Engineering Summer Program for Underrepresented Students from Rural School Districts, Journal of STEM Education, 13, 2.

Guana, S. (2017). Creating a Mentoring Program for Members of the Cal Poly Women in Construction Club. ASC 53rd Annual International Conference Proceedings, Seattle, WA.

SWE, (2016). Society of Women Engineers. <http://www.swe-rms.org/gestem.html>

The confidence gap: <https://www.theatlantic.com/magazine/archive/2014/05/the-confidence-gap/359815/Women’s Resource Center 2007 Annual Report: https://thewomensresourcecentre.org.uk/wp-content/uploads/whywomenonly.pdf>

UC, (2017); University of Cincinnati: Women in Engineering & Applied Science Summer Camp. http://ceas.uc.edu/future_students/Activities/Summer_Camps/women_in_engineeringandappliedsciencesummercamp.html

Yilmaz, M., Ren, J., Custer, S., and Coleman, J. (2010). Hands-On Summer Camp to Attract K-12 Students to Engineering Fields, IEEE Transactions On Education, 53, 1.

YWCA (2005) Single-Sex Youth Work: a systematic review of research into the advantages and disadvantages of providing informal education to women in single-sex environments. Unpublished.

Appendix – Sample of the Post-test questions

**Women in Construction Management Summer Institute
June 5th- 9th 2018
Program Evaluation (Post-Survey)**

Participant Name: _____ Date: _____

1. Please select the **one** response that best represents how you feel **AFTER** participating in the WCM Summer Institute:
 - I have NO plans to pursue a career in construction management
 - I am undecided if I will pursue a career in construction management
 - I am considering a career in construction management
 - I am excited to pursue a career in construction management

2. For each of the following statements regarding your plans **AFTER** high school, please mark an **X** in the box that best represents your level of agreement. **Since my participation in the WCM Summer Institute.:**

	Definitely Not	Probably Not	Maybe	Probably	Definitely	Undecided
I plan to go to XXX						
I plan to go to a 4-year college (Bachelor’s Degree)						
I plan to go to a community college (Associate’s Degree)						
I plan to go to a trade school, apprenticeship program, or technical college (Certificate)						
I plan to join the workforce after high school; I will not pursue additional education at this time						

3. Place an “X” at the position along the line that best reflects your current level of knowledge about construction management **after participating in the Summer Institute.** (0 = no knowledge, 10 = know a lot about construction)

