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Female Construction Professionals' Exposure to Construction Industry as Adolescents

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This study investigates the impact of adolescent exposure to the construction industry on the career choices of female construction professionals. Despite women comprising only about 10% of the construction workforce, understanding the factors influencing their career decisions is crucial. The research highlights the significance of early exposure to STEM careers, noting that knowledge and experiences during middle and high school can shape future career paths. Utilizing narrative inquiry, the study collected data through a series of interviews. Participants were selected via a questionnaire distributed to members of the National Association of Women in Construction (NAWIC), ensuring a diverse pool. Seven female participants were interviewed in-depth. The interviews revealed a common theme of limited connection to the construction industry during adolescence. Most participants were initially guided towards engineering due to their proficiency in math and science, transitioning to construction management later in life. The study underscores the importance of providing young women with opportunities to explore construction careers, suggesting that increased exposure and mentorship could enhance female representation in the industry. Recommendations for educators and construction professionals include active listening, connecting students with industry programs, and engaging more female mentors to inspire the next generation of women in construction.

Keywords: female, women, construction education, career

Introduction

Females represent a disproportionately small portion of the construction industry, roughly 1 in 10 (U. S. Bureau of Labor Statistics, 2020). Understanding why females choose an education or career in construction management is fundamental to addressing this disparity. Much research exists regarding the importance of career exposure to STEM careers during adolescence. Blotnicky, Franz-Odendaal, French, and Joy. (2018) found that in a study of 7th and 9th grade students, those students who had knowledge about STEM careers were more likely to pursue a career in STEM after high school. Liu and Schumm (2018) and Jones, Taylor, and Forrester (2011), found that influences outside of school, including family and experiences impacted future career decisions of middle school students. In regards to the construction industry, the current body of research related to women in construction management is limited and does not focus on middle and high school experiences.

Existing research focuses on the recruitment and retention of females into the construction industry (Oo, Feng and Teck-Heng, 2019) or post-high school construction management educational programs

(Bigelow, Bilbo, Mathew, Ritter, and Elliott (2015); Bigelow, Bilbo, Ritter, Mathew, and Elliott (2016); Carnemolla and Galea, 2021; Oo and Zhang, 2018; Sewalk and Nietfeld, 2013). Although this research does not directly align with this study, there are aspects of this research that have an influence. Although these studies do not focus on adolescent experiences, they do speak to some of the factors influencing females in selecting their career in construction. Factors of influence identified by females in these studies include interest in construction careers (Bigelow et al., 2015; Bigelow et al., 2016; Oo, Feng, and Teck-Heng, 2019; Oo and Zhang, 2018), a community within the construction management program (Bigelow et al. 2016), and connection to other women in the program (Sewalk & Nietfeld, 2013) or the greater construction industry (Carnemolla and Galea, 2021).

Methodology

Narrative inquiry was selected for the qualitative method of this study, utilizing a series of interviews for data collection. The selection was based on narrative inquiry not being “intended to be generalizable to populations, but rather highlights the particularities and process of experience” (Josselson and Hammock, 2021, p. 10). Because the population included in the study is a minority group within a predominantly white, male workforce, narrative inquiry provides the opportunity for the stories of these individuals to be heard.

To conduct a successful narrative inquiry study, the researcher must develop a rapport with the interviewee. Andrews (2012) found that “the sense that people’s abilities to think and talk about the events, as well as the overall meaning, in their lives are most developed when they are on their own-or rather on their own with me, the researcher” (pp. 5-6). This is only possible when a trusting relationship has been established between the researcher and the participant.

The selection of participants was done using a questionnaire that was distributed to members of the National Association of Women in Construction (NAWIC) who hold a bachelor’s degree in construction management or a related degree. The distribution to the NAWIC membership was coordinated through the NAWIC membership coordinator, who distributed the questionnaire via the NAWIC listserv. This group was selected for the distribution of the questionnaire because it is the largest organization focused on women in construction (About NAWIC, n.d.). The questionnaire included questions to provide information necessary for identifying a diverse group of interview participants. Within the questionnaire, which had been distributed using Qualtrics survey software, the following information were requested: age, ethnicity, race, gender, type of employment, confirmation of construction management-related higher education, their parents’ highest level of education, their perceived socio-economic status in adolescence, and whether they would be interested in participating in a follow-up interview.

Ethnicity, race, and other demographic information was included in the questionnaire to select a diverse participant pool for the interview. The 51 responses were narrowed to a selection of seven female participants, with three non-white participants, from a variety of ages and demographic backgrounds. The selected participants were invited to participate in a scheduled interview with follow-up interviews. Additionally, each of the selected participants was given the option of selecting a pseudonym. All participants opted to use their real names. Table 1, shows the demographic information for each interview participant.

Table 1. Participant Information

Name	How old are you?	Which race or ethnicity best describes you?	In your adolescent years, how would you describe your family's economic status?	What is the highest level of education one or both of your parents achieved?
Riki	65+ years old	Other	Average	High school graduate
Tara	45-54 years old	White	Average	4-year degree
Karli	45-54 years old	White	Somewhat below average	High school graduate
Ashley	35-44 years old	White	Average	4-year degree
Amy	25-34 years old	Asian	Somewhat below average	High school graduate
Tessa	25-34 years old	White	Average	Professional degree
Marissa	18-24 years old	Other	Somewhat above average	Less than high school

The interview process included an initial 60-90 minute semi-structured interview with each participant. Interviews were held via Zoom and recorded for transcription purposes. The standard questions asked of all participants included the following:

1. What is your current career?
2. How did you decide to pursue a career in construction management?
3. Where did you go to college or other further education? Share your experiences.
4. Where did you grow up? Share your experiences.
5. Who was a significant influence on your life in middle school or high school?
6. What influenced your educational decisions?
7. What influenced your career decisions?
8. What event or experience most impacted your educational or career decisions?

After the completion of all initial interviews, second interviews were scheduled with all participants. These interviews were 30-60 minutes and included follow-up questions related to the answers provided in the initial interview. Once all interviews were completed, the transcripts were analyzed and coded for themes.

Results

Several themes emerged in the analysis of the interviews. Those included role model relationships being casual in nature, high school role models providing life advice, college role models providing career advice, cultural challenges of immigrant participants in identifying a role model, gendered advice being generational, and minimal exposure or connection to the construction industry during adolescence.

Of these themes, the most dominant among all participants was the minimal exposure or connection to the construction industry during adolescence. The participants all described how they either did not know or desire a career in the construction industry during their adolescent years. Several participants were guided toward engineering primarily due to their high math and science proficiency and changed their path either during college or immediately after college graduation. For the remainder, the

construction industry became a career opportunity much later in life. Engineering was the recommended career option for Karli, Tessa, Marissa, and Amy. Karli recalled this experience:

And I remember my math teacher said to me, which I was very good at math and he said, man, have you ever considered being a mechanical engineer, which I had never even heard of, but that like stuck with me and then people keep asking what you're gonna do. And I just kept answering that.

Karli took her education in mechanical engineering and began a career after college working for a mechanical subcontractor.

Similar experiences were identified by Tessa and Amy. Both made the switch to construction during their college years. Tessa recalls the moment she realized construction might be right for her:

It was my like intro to engineering course, freshman year actually. And we had a Friday seminar and every week they'd bring in like the department heads and they present to us and whatever Ray (college professor) said, I was like, that's it. I'm in.

For Amy, the connection to the construction industry was through her love of buildings, "just going to cities like Chicago, New York. Just seeing all those, you know, the downtown area with all tall buildings." This connection led her to a degree in architectural engineering and a career post-graduation in construction management."

Positive exposure to the construction industry was only strongly identified by Tara. She had the opportunity to take career and technical education (CTE) courses in drafting and electrical installation during high school. Although this experience did not guide her to a career in construction management, she did choose to pursue a career in architecture. She shares this experience:

I took a couple of drafting classes. I took blueprint reading and I took electricity. So, I was the only girl or only one of maybe two girls in the classes. But, you know, one thing which, you know, every time I read stuff about, you know, women in the industry, my teachers for the classes I took in high school related to, you know, construction never told me I couldn't be an architect.

In the reverse, a more negative exposure to the construction industry was identified by Marissa. Her dad and other family members worked as construction laborers. She shared that in her college years:

I always thought that like, it's cool to be in construction, but like, I feel like Hispanics can't also be at the top, you know, so I wanted to be the change for that.

The opportunity to impact the Hispanic community was not identified during her adolescence but during her college internship experiences.

All participants expressed regret that they did not have exposure to the construction industry in their adolescence which would have helped make their entry into a career in construction management easier.

Discussion

The identification of a lack of strong connection to the construction industry during adolescence and a desire to provide that connection to future generations is not unique to women in the construction industry. Taylor, Gilligan, and Sullivan (1995) identified this same desire in their research related to adolescent females,

The kind of intervention this suggests is not simply more career counseling or more career days in school, however beneficial these may be. It also suggests ongoing opportunities for connection with women who work in many different industries, in jobs that do not require a

college education as well as those that do. Learning from the experience of women with working-class and poor backgrounds, including those who have continued their education beyond high school or have entered professions dominated by the middle class, would also be invaluable. (p. 199)

Not showing young women that they can be a part of careers that are traditionally dominated by men only perpetuates the problem of increasing participation by women in these fields. For over 50 years, students have been asked to draw a scientist as part of the Draw a Scientist Test (DAST) (Chambers, 1983). In 2016, only 58% of girls in DAST studies identified a female scientist (*50 Years of Children Drawing Scientists*, n.d.). Providing experiences for adolescent females to see themselves in a career in the construction industry is necessary to increase the number of females pursuing careers in construction.

Recommendations for Educators

Throughout the interviews for this study, the participants openly shared their desires for exposure to the construction industry during middle and high school. From those comments, two recommendations for educators were identified, listening and connecting to the construction industry.

The first recommendation, listening, is simultaneously easy and difficult. Multiple participants indicated the need for someone to confide in during the difficult years of adolescence. Amy shared a need for “someone I could confide in and get advice. It would have been nice to have someone to talk to”. This desire for support, for someone to listen to their dreams and not dismiss them was also identified by Riki:

I think about those moments when my parents were saying no, you can't do that and ultimately, I proved them wrong. You know, I don't want a, a child, a 15-year-old child to feel like they have to prove their parents wrong. They just need to know that they can be whatever they want to be, do whatever they want to do.

The interview responses indicated that adults they were regularly in connection with had influence over their career and education decisions. School is the one place where adolescents spend the majority of their time, so creating an environment within the school that allows students to connect with adults in a safe, positive manner is valuable. Gilligan (2014), stated, “Active listening means asking, how might I call forth a voice that is held in silence” (p. 104). As educators, we can take this simple, but challenging, step to connect with our female students.

The second recommendation, connecting to the construction industry, comes after the listening has been established. Many existing programs provide education to young people about the construction industry. These include the ACE (Architecture, Construction, Engineering) Mentor program (ACE Mentor Program, n.d.), where students are connected to a mentor from the construction industry, the NAWIC Education Foundation K-12 programs (NEF, n.d.), which provide educational programs that can be implemented by educators or construction professionals in the classroom, or any of the multitude of corporate and non-profit programs that exist in communities across the United States. A list of national and Kansas/Missouri programs can be found in the Appendix. The participants in this study shared their connection to these different programs and the joy they experienced from connecting with female students. Tara shared that she volunteers with the ACE Mentor Program (ACE Mentor Program, n.d.) and Camp NAWIC (NAWIC Kansas City, n.d.). She reflected that those types of experiences would have been beneficial when she was taking drafting classes in high school:

I wish I would have had this as a kid just to understand, you know, all that was out there. Because we never had anybody come into our drafting classes to talk to us. No professionals, which is kind of a shame.

For educators to successfully implement these recommendations, they need the support of construction industry professionals, particularly female professionals.

Recommendations for Construction Professionals

Throughout the construction industry, many different programs for providing mentors or educational programs to adolescents exist. The challenge lies in connecting those programs to schools. To address this challenge, two recommendations are proposed for the construction industry: consolidation of resources, and engaging more female professionals.

The first recommendation is to develop a centralized internet resource to consolidate all of the many construction education and mentoring programs that already exist. For an industry that relies heavily on networking, the implementation of these types of programs is disjointed. Each industry organization has developed a program targeted towards adolescents, focusing on different aspects. For educators to connect with these programs requires the educator to either already know about the program or for a construction professional to connect with the school directly. By creating a centralized website, educators can easily identify the programs that are available in their area.

The second recommendation is to engage more female construction professionals in these education programs. For several of the participants of this study, their experience with educational programs or mentoring programs in adolescence resulted in exposure to only male professionals. Tara participated in an Architectural Institute of America (AIA) mentoring program and was partnered with a male architect, but in reflecting on her experience felt it would have been a better fit if she had a female mentor. The desire to be involved in these programs as construction professionals was noted by multiple participants of this study. Tessa's firm organizes a competition for K-12 students where the students are challenged to solve real-world problems (Burns & McDonnell, n.d.). She enjoyed her experience in the program and stated, "I loved helping out with that and I, wanted to be involved in the outreach that we do". One of the challenges is that these programs have champions and those individuals may not be the correct fit for the student participants. Expanding who is involved in these programs will allow students to see the diversity within the construction industry.

Conclusion

In conclusion, this study highlights the critical need for early exposure to the construction industry for young women, emphasizing that such exposure can significantly influence their career choices. The narrative inquiry method revealed that many female construction professionals lacked connection to the industry during their adolescence, often being steered towards engineering due to their strengths in math and science. This gap underscores the importance of targeted educational programs and mentorship opportunities that can introduce young women to construction careers early on. By actively listening to students and connecting them with industry professionals, particularly female mentors, educators and industry leaders can help bridge this gap. Implementing these recommendations can foster a more inclusive and diverse construction workforce, ultimately benefiting the industry as a whole.

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Appendix

Below is a list of National and Kansas/Missouri area construction education resources and programs. This list is comprised of resources either revealed during participant interviews or within the literature review for this study. Programs similar to the ones identified from Kansas and Missouri exist in communities across the United States but were not included in this appendix.

ACE Mentor Program: Architecture, Construction, Engineering

- Website: <https://www.acementor.org/>
- The free after-school program connects high school students with experts in the architecture, construction, and engineering career fields (ACE Mentor Program, n.d.).
- The program reaches 1500 schools and over 10,000 students annually (ACE Mentor Program, n.d.).

Architecture & Construction (CTE Career Cluster)

- Website: <https://www.ksde.org/Agency/Division-of-Learning-Services/Career-Standards-and-Assessment-Services/Content-Area-A-E/Architecture-Construction-CTE-Career-Cluster>
- State of Kansas Education Department curriculum standards for high schools providing an Architecture and Construction Pathway.

Associated General Contractors (AGC) - Build-up Programs – State Level Programs (Kansas program described below)

- Website: <https://buildupks.com/>
- A program connecting Kansas high school students to trade school, community college, and 4-year college programs focused on the construction industry (Build Up Kansas, n.d.).
- The program provides financial support for skilled trade instructors in high schools across the state of Kansas (Build Up Kansas, n.d.).

Burns & McDonnell Battle of the Brains

- Website: <https://www.botbkc.com/>
- A K-12 STEM competition hosted by Burns & McDonnell. Students compete to earn grants for their school's STEM education programs by creating exhibit concepts for Science City in Kansas City, MO (Burns & McDonnell, n.d.).
- Over 30,000 students from 55 different school districts have participated in the program (Burns & McDonnell, n.d.).

Camp NAWIC – Construction Camp for High School Girls

- Website: <http://www.kcnawic.org/camp-nawic.html>
- A free hands-on summer day camp where girls learn basic skills of carpentry, welding, and electrical wiring. Camp includes a field trip, demonstrations, and interactions with construction industry professionals (NAWIC Kansas City, n.d.)

Construction Industry Education Foundation (CIEF)

- Website: <https://www.cie.foundation/high-school-programs.html>
- High school programs connecting students to the construction industry (CIEF, n.d.)
- CREATE Mentoring Program connects students to construction industry professionals through a simulated real-world project (CIEF, n.d.).
- CREATE Summer Camp provides a six-day camp for students interested in careers in construction, engineering, and architecture (CIEF, n.d.).
- Design Build Competition is a team-based competition where students design and construct a small structure based on the competition criteria (CIEF, n.d.).

Kansas State University/U.S.D. 383 Summer STEM / Virtual STEAM Camps

- Website: www.k-state.edu/stem-career-education
- Summer camp opportunities for grades 5-8 focused on a variety of STEM/STEAM related topics.
- STEAM Virtual camps are available to students across the U.S. STEM topics vary by summer and cover a variety of STEM fields related to degrees offered at Kansas State University (College of Education, 2022).
- In-person summer day camps for students in the Manhattan, KS area. Construction industry specific sessions include tree house architecture, drafting, and tiny house design. Sessions are co-taught with U.S.D. 383 teachers and Kansas State University faculty (U.S.D. 383, n.d.)

National Association of Women in Construction Educational Foundation (NEF)

- Website: <https://nef-edu.org/>
- Provide educational opportunities to promote the construction industry (NEF, n.d.)
- Five self-paced certification courses covering construction management topics designed for adults pursuing a career in construction management.
- The Block Kids building competition for K-6 students. The program reached over 2,400 students in 48 cities across the U.S. Students are challenged to create something construction-related using building blocks and other materials.
- The Design Drafting competition for middle and high school students. The program provides a design problem for students who are asked to create design documents for.

National Center for Construction Education and Research (NCCER)

- Website: <https://www.nccer.org/>
- A not-for-profit foundation that supports craft training for the construction industry (NCCER, n.d.).
- Includes over 2,500 instructors providing over 23 million training modules in 2022.

National Institute for Construction Excellence – Kansas City

- Website: www.nice-kc.com
- Provide a variety of educational programs for high school students and educators related to the construction industry (NICE Kansas City, n.d.).
- The iBuild Showcase is an annual exposition for the Kansas City area to connect students to the construction industry through contractors, architects, engineers, and post-secondary education programs (NICE Kansas City, n.d.).
- The Institute for Shaping the Built Environment (ISBE) is a middle school curriculum that introduces students to sustainable design and construction and includes a design-build competition that is presented at the iBuild Showcase (NICE Kansas City, n.d.).