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## Pathways Women Take in Selecting a Major in Higher Education Construction Related Disciplines

Adam Bogedain, M.S. Joe Bishop, Ph.D. and Kasim Korkmaz, Ph.D.

Eastern Michigan University  
Ypsilanti, Michigan

This paper will discuss pathways women have experienced in selecting a major in higher education Science, Technology, Engineering, and Mathematics (STEM) related industries such as construction management. This study examines two current students and three alumni stories on the journey that led them to where they are today in their desired profession of construction management. Qualitative interview questions were asked of these women on how prior childhood and young adult experiences shaped their decisions and the obstacles they experienced in degree selection. The literature reviewed for this paper aimed to connect women seeking or currently participating in STEM careers to the experiences encountered by participants in this study. Three themes were built from the interviews: design-build, influences, belonging, and self-efficacy. It was found creativity in design and building interests as a child and as a young adult impacted degree selection. Influences from family, peers, teachers, counselors, and mentors were found to affect potential students' pathways. The study also found it essential that students need an authentic connection to belonging to the environment, and self-efficacy was needed.

**Key Words:** Higher Education, Gender, Construction Management, Engineering, STEM

### Introduction

Gender equality is a problem in construction management and engineering education, like many traditionally male-dominated related disciplines. This qualitative study examines factors that influenced the path in selecting a degree major for current female students and alumni from a construction management program at a Michigan university. The study explores pathways women may take that could be used to increase future female enrollment in construction management and engineering programs. Women are the dominant portion of enrollment in universities in general, except for construction management and engineering education, where men have a larger student population of 74.2%, compared to 25.8% of women based on our university construction management enrollment data. So, why is that? Does society not see construction and engineering as a track for women, or is it a lack of guidance starting in their younger pre-college years? Women have a significant connection to social aspects, creativity, and design while promoting a collaborative environment, as discussed by Du and Kolmos (2009) and the first author's experience in the

classroom. Francis and Prosser (2014) explore ideas for the narrow gender roles for women pursuing a construction-related education influences brought into career development by counselors who think that construction is not for women. Unless career counselors know the industry, the potential influencer of women seeking an educational journey typically has a male bias toward construction. The challenge is that the construction industry is so broad that many only see one side working in the field and neglect other potential paths. Akinlolu and Haupt (2021) investigated the lack of female representation in education and occupations to promote the construction major. It was found that there needs to be an encouragement of gender neutrality from successful women in the industry who can share their stories with the younger generation.

Debs and Kota (2021) discuss when females elect construction as an educational career path, belongingness is needed by peers and others in the classroom, with engagement as a connection. Ridgeway and Smith-Lovin (1999) found women can make natural connections in groups, making them an ideal collaborative element on a construction team. Career influences are critical. As Thevenin and Elliott (2018) explain, student enrollment in construction management is based on the following forces: family, peers, and mentors/role models. In addition, Charleston and Leon (2016) found that the influences of parents, teachers, mentors, counselors, and peers have a significant role in self-efficacy. Self-efficacy has been found to affect career choice and entry into a field. There is a need to understand the influence of future student career paths before college to show potential opportunities. Zölitz and Feld (2021) discussed that women choose different majors based on their primary influential gender makeup from their peers. Women with more male peers are more likely to select majors mainly based on growth and income potential, whereas women with more female peers choose areas that focus on their immediate interests. They found significant growth potential in the construction industry, so we must investigate the peer gender influence on the female experience.

## **Methodology**

What shapes the educational journey of women in higher education degree program selection? To assist in answering the question, qualitative semi-structured interviews were conducted. The reason for selecting the semi-structured interview format for the study can be explained according to Rabionet (2014) because of the powerful and flexible environment, which affords the ability to excavate the underlying meaning of the voice. Rabionet (2014) found a semi-structured interview process worked well in narrowing down areas of interest without running the risk of going off-topic, which an unstructured interview may produce. Using this method, you can hear the stories from general questions to start the conversation and ask follow-up questions for more information. The participants selected for this study were two current students working near or full-time in the industry and three alumni with various years employed in the construction industry. All the participants in the study currently work in the construction industry.

### *Participant Profiles.*

The profiles of the participants first included one student, the current president of the program student organization, and the other student, a past student group president, that are not in the investigators' courses. Since current students were included in the study, it should be noted that the investigator only teaches courses for first-year and second-year students, which the participants have already taken, so there is no conflict of interest. Secondly, the three highly active alumni selected are women graduates ranging from the following decades, the 1980s to the mid-2010s. For confidentiality, the participant names utilized pseudonyms for the study, as shown in Table 1.

Table 1

*Participant Profiles Table*

Pseudonyms	Status	Higher Education
Darline	Alumni	Graduated in the 1980s
Maryann	Alumni	Graduated in the 1990s
Stella	Alumni	Graduated in the 2010s
Katie	College Senior	2019 to present
Abigail	College Junior	2020 to present

*Study Logistics*

All five participants selected for the study were interviewed via Zoom during Fall 2022 to allow one hour for each participant to tell their story from childhood to college and any detours they may have taken along the way. The preparation that took place before initiating any interviews was first the application and approval to conduct interviews with participants from the Internal Review Board (IRB). Privacy protection is critical for IRB requirements, so no identifiable information was shared with participants, and participants accepted informed consent before interviews were conducted.

**Themes**

Three themes were constructed after conducting the interviews and showed a connection to the existing literature. The first theme, design-build, not to be confused with the project delivery method, established similar interests with participants. The second theme showed the influences women experience from childhood to higher education. The third theme illustrates self-efficacy, and belonging was a factor in all interviews.

*Design-Build*

Du and Kolmos (2009) realized that learned experience using multiple avenues for creative knowledge construction is critical to a Project-Based Learning (PBL) environment. Maryann found she could take interior design and construction, then join them, as she said, “marry the two and have a really cool career, I thought, this is what I want to do so, that was always in the back of my mind.” When Maryann was young, she had this idea in her head, and she said, “at fourteen years old, you know that it never left me so, even with all of the changes and stuff that you go through in young adulthood, I still ended up coming right back to where it started.”

Creativity is a cornerstone of the building process. Whether the people knew it or not, early childhood or high school careers were setting a path in motion at an elementary level. Some were building things independently, while others were designing and building collaboratively with their neighbor, family, or peers. The creativity that many utilized sometimes occurred indoors, but many times outdoors creates a connection to the construction field.

Du and Kolmos (2009) found there is a greater appreciation for projects when creativity makes dreams a reality. Stella didn’t have many vocational options for using creativity to build things in high school. Stella said, “the closest I could get to it was stagecraft, and I thought that’d be helpful because

it taught you how to use tools and everything.” Stella talks about when she first got to college and didn’t have a set pathway. Stella said:

I decided to go for an art degree with a bachelor of arts in furniture design concentration because I thought that was like building on a small scale; you had to design it, and build it, and draw it out, and all that, and it was fun!

As a child, Darline had a toy building system called Super City that was the precursor to Legos. Darline said, “I would build these skyscrapers. I had little buildings and roads and cars and trucks and construction equipment that I would put on my layouts.” Du and Kolmos (2009) found collaborative learning with peers as critical to working with other social groups. Darline also collaborated with a neighbor, and together they would build things. Darline said:

We built tree houses and gocarts and anything we would try to dream up, engineer if you will. (...) The gocarts were built out of broken-down pallets, and we felt like we were, for whatever reason, we were pretty cool! (...) We always just thought of how can we one-up this. How can we better this? Oh, there is an old tree. Let's make a swing!

Du and Kolmos (2009) found a connection to social aspects, creativity, and design while promoting a collaborative environment. Katie, when asked about her favorite childhood toys, she said, “that's pretty easy; my favorite toys growing up were Legos. I absolutely love to build and try and come up with new house designs. I would help my brother build cities out of the Legos.” Katie's love for Legos turned into a future occupation. Katie said, “Legos morphed into my love of wanting to know more about design.” In high school, Katie said she “ended up taking the construction trades class where you built a house from the ground up, and what wanted me to do that was again, was I knew I learned better hands-on.” Katie said her interest in construction started because “I originally wanted to go into interior design, so I thought it'd be fun to know what goes on behind the walls.”

When Katie started getting serious about earning a degree, she looked into her childhood interests. Katie said, “I decided I would start looking into a college that had interior design because that's the only thing I guess I thought of, and that's what I wanted to do since I was a little girl.” Katie did not stay in the interior design major and ran into her high school construction teacher, and then, while catching up, she expressed her concerns. Katie said, “I was trying interior design, but I'm not loving it. So, he encouraged me to try and do some type of management role.” When Katie looked at the curriculum at her current university, she said, “I saw that they had a construction management program. So, I was like, screw it. I'll just sign up for this. Get that piece of paper, and try and figure out how to do something with it!” Katie's zig-zag path between the creativity of design and building was not just her thoughts, other factors influenced her decisions.

### *Influences*

Influences when choosing a career path take many forms, positive or negative, from family, teachers, counselors, and peers. Parents and/or family were mentioned in the interviews numerous times when family support systems worked in favor of the women it was a help, but especially in Katie’s case when there was no family support for her interests, and she eventually looked to past teachers for influential mentoring. In addition to teachers as mentors, Saffie-Robertson (2020) argues mentoring programs are a valuable tool in the recruitment process for STEM disciplines, but the dilemma is the genders the programs aim to attract. STEM is a growing career path, but men are still the dominant gender in the industries. While counseling in high school and college is significant for some, the impact can vary. Darline had a nice counselor in high school, but he did not help her journey. By the

time she attended a university, she had found a counselor and a professor who took her in the direction that worked for her. On the opposing side, Maryann was taken on a significant detour by a high school counselor who extended her path to another college away from home and a program that did not fulfill her creative passion, and left the program her first year and went to a community college. It wasn't until after earning a business degree from the community college that she eventually found a home at another university.

Dickel and Eckardt (2021) examined from a social aspect and found no significant positive influence from parental models to go into a field aligning with parental influence. Their study related to some of the women interviewed for the study, who also saw parental influences not always positively impact life's journey. Some parents lead children down the path the parents had taken. Case in point, Katie talks about how the road to college was rough, where she said, "I never even wanted to go to college. It was nothing that interested me. But my family was encouraging me to go because they said I couldn't go anywhere in life without a degree."

Katie enjoyed the projects in her building trades class in high school since it was more about PBL, where she could excel, unlike traditional academics. Katie said:

I wasn't doing the best in the classes where they just told you to read a book and take a test. So I signed up for that class because I originally wanted to go into interior design, so I thought it'd be fun to know what goes on behind the walls. It piqued my interest even more in the construction world, specifically, how do I say it? I enjoyed the satisfaction of seeing a house and saying that I built it like I actually did that with my own two hands. I started liking that feeling of saying, I did that, kind of thing!

Katie grasped construction in high school but was looking for a career path to keep her family happy. With her childhood interest in interior design, Katie said, "I guess my mindset was kind of sad. I mean, I just wanted to get that piece of paper and get my family to kind of shut up about asking me to go to college and do something." After running into her old construction trades teacher, Katie found a construction management program at the university. Katie said:

I started realizing that this was probably my crowd. I was having fun, and I went to the first career fair in the fall and instantly got picked up by my company that I'm still currently with, and couldn't be any happier!

Before the shift to construction management, Katie saw her family as an obstacle in her career. Katie said, "my dad, some of my other family, and brothers just kept saying, that's a man's world, no, you don't want to do that. You're not going to fit in. They were definitely pushing me in the opposite direction." Katie later found positive influences when she said, "I think I just found the right teachers, the right encouragement, and the right company that made me love what I'm doing." For Katie, the family model for influence was not positive, although she found a positive impact that circled back to her high school teacher. A polar opposite of Katie, where her parents wanted her to go into healthcare or anything other than construction, Abigail started on a nursing track in high school and later connected to her family. Abigail noted, "I quickly decided I didn't want to do that field, and I've always liked the creativity of construction. I've always been around it. I love to watch everything go up. So my parents definitely had a big, big part!" Parents can be influential. Still, again, high school teachers and networking activities are also critical. Stella found positive influences, and she said, "my mom thought I'd always go into construction or something related to that. Then, in high school, it was my stagecraft teacher. He always encouraged us to get interested in keep trying things and try different techniques."

Edwin et al. (2019) found it is encouraged for students to have career development events to make choices on degree selections. Stella found construction events at the university influential. Stella said, “I attended other events for other majors, and I enjoyed that too. Just the networking and seeing what else is out there and realizing, you know, that's what I want or not want to do.” Edwin et al. (2019) saw it as encouraging for females from high schools to have career counselors. But that may not always work well since Maryann, when she was talking with her high school counselor, derailed her journey. Maryann said:

I initially came to the table wanting to go to the Detroit Art Institute. Her exact words were, I am not sending a girl from Marshall, Michigan, to Detroit, where she could probably get killed down there, to go to school at the institute. (...) if I had just stuck with my guns and not listened to my high school counselor. I think she sent me up for an immediate failure but not well-being. (...). She was being stereotypical of the area in general and not letting me pursue something I knew was a passion for me, and I said that many times.

Dalene (2022) found that many counselors need more resources to make better decisions for students selecting a major in college. Some counselors are taking steps to positively impact students by becoming involved in special training and focus group sessions to offer a better perspective for guiding students to a future career. When talking with Darline, there was not much insightful counseling in high school, but in college, that was different. Darline said, “my first semester, I talked with a counselor, and I don't know, I must have answered enough questions in the right way.” Darline was put in a construction bidding and scheduling class and liked it, but what did she do next semester? Darline said, “I guess I better go talk to somebody. That's when I went over to the construction department, and I talked to” a professor who led her journey in the program. Rottinghaus et al. (2018) explain counselors are challenged with students seeking STEM career fields that start with a knowledge gap on the part of the counselors. Career assessments that are specific to STEM occupations should also be included in the formula. Then there are the self-efficacy considerations career counselors must address when trying to put students on a path that best suits their needs by exploring student interests and needs while managing any external support systems needed for prerequisites in math and science fields that occupy many STEM degree options.

### *Belonging and Self-Efficacy*

Everyone needs to feel like they belong in their potential chosen field of study, where institutions need to create a level of self-efficacy to grant them the motivation so they can succeed. The women interviewed were mixed with their perception of belonging and self-efficacy. Katie said, “I was honestly a pretty quiet teenager. I was kind of scared to go out and explore new interests. So it was like a big step for me to try and do that construction trades class in high school.” Darline, the oldest participant, didn't see a problem with college or industry self-efficacy. True-Funk et al. (2021) found self-efficacy can either increase or decrease one's individual belief in their ability to accomplish tasks with the same capability as their peers. The diversity in many groups is stereotyped, and students are left without a sense of belonging. Edwin et al. (2019) found when high school females look to a STEM discipline, they may be discouraged by the significant male domination of the industries that creates a conflict in their aspirations. The problem exists with the K-12 to college path for degree selection with potential women students.

Kozan et al. (2017) discussed that students didn't realize the impact STEM majors can have on society, and it was seen as an eye-opening experience for students to visualize career planning as a significant consideration for their future. Once students are put into a project to collaborate in a

positive environment with peers, they can increase self-efficacy. Whereas Maryann felt included to be in the major, but there was always something there that differentiated the genders. The other three women interviewed didn't see a division between males and females and felt they were treated either well or great by their male peers. But, they all mention a slight comment that it was nice when other women were in the classroom.

Hamlet et al. (2021) express that the construction industry depends on fresh talent. A sense of belonging to the sector is vital for all genders, as they need to feel they are selecting a field they can identify with in their career aspirations. Darline looks back at her middle school career, and girls in some classes were divided from boys in the 1970s. Darline said, "I wanted to take wood shop, but that wasn't happening; you had to take home economics!" Darline had a bit more freedom in high school and was interested in drafting, then got involved in a drafting competition where she placed second in teacher-judged districts. But Darline decided to try for states that were professionally judged, but she felt like girls would not be accepted. Darline said, "I'm not going to put my first name on this drawing. I'm just going to use my initials because I felt like if they see I'm a girl, you know, I might not get anywhere. So that's what I did!"

Maryann discussed in her first construction class in the 1990s that she wanted to know all the tools and how they operated. Her professor later one night in the class said, "guys, you're more than welcome to stay. But if you're going to sit here and laugh at the girls, I don't want you in the room." Maryann later said, "I think it was three or four other females in the class into the lab, and we spent a good hour more just going over tools." When Maryann talked about what it felt like being a woman in the classroom, she said, "it always felt like the stigma was there, even though nobody ever addressed it in the room." Maryann continues the professors, "and everybody was fantastic with us." But, with a more detailed follow-up question, Maryann said, "I had several classes, and in the entire class, sometimes the guys kind of shy away from you, or they want to work with you for whatever reason." Maryann links some issues of the environment to parents. Maryann said, "I think a lot of that goes back to parents, too, because my dad was the first to tell me. You don't need to know how to use that; you will always have a man in your life!"

Stella discussed gender diversity in the classroom. She stated, "it didn't affect me choosing the program. But I do know whenever you walked into a class, and you saw another woman, you kind of got excited to be next to them. Hello, nice to meet you." Like Stella, Abigail said, "it's not really anything that affects me when I walk in the classroom. I don't really feel like, you know, bombarded when I walk in, and it's mostly males in there."

## Discussion

The women interviewed had creative and hands-on interests, whether during childhood, from designing and building with Legos or go-carts to activities during their high school years that led them to find a path in construction management. That path early on lent itself to the design-build theme all women have in common. While they have interests in building and designing using a creative approach, the other themes of influences, belonging, and self-efficacy are essential when selecting a lifelong career path where they can apply their interests. Influences were a significant consideration in the study that looked at the family, peers, teachers, and counselors. It was interesting that Katie was first influenced by her family to go to college because a degree in their mind is needed. Her family was all involved in healthcare and wanted her on that path. Katie said, "my father wanted me to try and do something in the medical field because he just always told me there's always going to be jobs." Still, she was interested in building things, so she elected interior design at first since that was a

childhood interest, then later evolved into construction management. As a result, Katie was influenced by her family to go to college, but she broke from what they wanted her to do for a degree. Abigail was on a track in high school to become a nurse but then found it was not for her, and her family was all involved in construction, so she went that route. Stella had complete support from her mom and figured she would eventually do something construction-related.

When influences are considered, counselors from high school and university are significant factors. While Darline's high school counselor was not much help, her college counselor was a considerable help. On the other hand, Maryann talked about her bad experience with her high school counselor. Maryann said, "she completely squashed my whole idea." When looking at self-efficacy and belonging for most women interviewed, there was no impact on their degree choice when asked. Deep down, Maryann later discussed a different point. Maryann said, "you always felt odd when you were in a classroom, especially if you were the only female." While this may be in the 1970s, we can't forget when Darline did not put her first name on a project for a competition in high school and used her initials, thinking her project would not get selected if they knew she was a girl! Belonging and self-efficacy from women discussed are in descending order of age; where the age decreases, the obstacles seem less pronounced. It may be based on changes in education and industry policies, but that is something for future study. This thought can be linked to Powell and Sang (2015), who illustrate the male dominance historically of the construction industry and suggest various viewpoints where some females, particularly older women, experience inequality that occurs in the industry, while younger women do not find as much traditional sexism apparent.

## Conclusion

The participants in the study took different paths in finding their careers. They all wanted to use their creative instincts to eventually find a home at a university and their current companies. Problems were found from social gender stereotypes, parental and counselor influences, and a lack of direction for the participants. Darline was the first to experience the path to careers of the group, but she couldn't participate in shop class and had to take home economics in middle school. All women concluded with a similar thought when recommending a major for young women: keep an open mind and ultimately follow your gut instinct. This study is phase one of a larger study with the limitations of a small sample of three alumni and two current students at one university. Future research of phase two will encompass a more extensive mixed-methods study, as an internal research grant was approved and is in recent development mode. Qualitative interviews are being conducted with more current students, alumni, higher education counselors/career development, K-12 counselors, and teachers. In addition, quantitative surveys are being sent to other alumni and affiliates of the institution's program.

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