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Why don't Australian female high school students choose construction as a career? A qualitative investigation into value beliefs about the construction industry

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Abstract

Background

The construction industry remains male dominated, despite the efforts of business and educational institutions to attract women into construction careers. Previous research has examined why female university students study construction management or engineering. To complement this knowledge, there is an opportunity to understand why so many Australian female high school students do not choose to pursue construction-related careers.

Purpose

Framed in motivational theory, the purpose of the study was to understand why Australian female high school students do not choose a construction-related career by answering the question: How do the value beliefs of female high school students contribute to a rejection of the construction sector as a career choice?

Design/ method

Applying a qualitative methodology, we report on semi-structured interviews with a sample of 15 Australian female high school students. Interview transcripts were inductively analyzed to reveal themes which were overlaid onto Eccles' Expectancy-Value Theory to deepen our understanding of the values expressed by students when discussing their reasons for not wanting a career in construction.

Results

Results revealed five themes: Lack of Awareness, Lack of Self-Alignment, Effect of Male Domination, Sector Esteem, and Parental, Teacher and Curriculum Influence.

Responses revealed the range of values contributing to the decision not to consider the construction industry.

Conclusion

The paper concludes by suggesting that to increase the participation of young women in the Australian construction industry, the sector should respond to the value beliefs held by female high school students. It should transform the perception of construction into one of a profession that is relevant, valuable and enjoyable for young women.

Keywords

Construction engineering, high school, female, gender, student perception, Expectancy Value Theory

Introduction

The lack of female representation in the construction industry worldwide continues to confound researchers, educators and industry alike. Global economic data imply there should be many opportunities for women to be gainfully employed in the sector. The global construction industry is expected to continue to grow over the coming decades, despite any slowing of growth from the Covid-19 pandemic (Royal Institution of Chartered Surveyors Economics, 2020). As one of the world's largest economic sectors, it employs a vast number of people in many skilled professions in many countries. It also faces a current skilled labor shortage, or it will in the not too distant future (Mohamed et al., 2017; Kim et al., 2020). Yet the sector is overwhelmingly male dominated throughout the world (Galea et al., 2020; Morello et al., 2018; Akinlolu & Haupt, 2019; Tunji-Olayeni et Al., 2017).

The reasons why women are so under-represented in construction, despite the economic and professional opportunities it presents, have not yet been fully answered even though much research has investigated the education, recruitment and retention of women in the sector (Bridges, 1980; Galea et al., 2015, 2020; Sang & Powell, 2012). Australia's construction sector is no different: construction, which is one of the nation's largest industries, is facing a looming labor market shortage. In fact, the construction sector in Australia is one of the most male dominated across the globe (Australian Government, 2018). There is growing evidence that this gender imbalance has required addressing since the last half of the twentieth century (Fielden et al., 2000; Wells, 1990; Bridges, 1980).

This study reports the findings from our exploratory research designed to explain the reasons behind the lack of women in early career roles specifically in construction management and engineering. It is intended to give further insight into more effective

recruitment strategies for tertiary education and the construction sector in general. Past research has demonstrated that a student's values play an important role in their choices either for or against a Science, Technology, Engineering and Math (STEM) career and that effective recruitment is dependent on personal identities aligning with sector identities (Matusovich et al. 2010). Specifically, this research asks the questions:

- How do female high school students articulate their value choices away from the construction industry
- How is this reflected as a misalignment of their identity and a construction industry identity?

Theoretical underpinning

The study applies a framework based on motivation theory, specifically Expectancy-Value Theory (EVT; Eccles, 2005), to interpret the findings of the research. This theory proposes that choices about engaging in activities, such as choosing a career direction, are shaped by competence and value beliefs (referred to as Task Value Beliefs). EVT is applied in this research as a means to explain the motivations behind high school students not choosing a career in construction. This theory has an established history of being applied to understand career choices (Eccles et al., 1999; Frome et al. 2008; Matusovich et al., 2010). Eccles's (2005) focus is on the individual's incentives for engaging in different tasks or activities based on the nature of the task and how well it aligns with personal values, goals and needs.

The contributions of Task Value Belief and how the values are articulated as illustrated in Figure 1 are based on the work of Eccles (2005) and Matusovich et al. (2010). While acknowledging that this theoretical research was developed over a decade ago using student data from the United States, applying this framework is a valuable way to view our

research for two reasons. First, this theory aligns well with the research questions and succinctly frames why a person may or may not want to progress in a certain career direction. Second, this paper contributes to a growing base of research which has applied EVT to examine career decision making in engineering and technology-related fields (Matusovich et al., 2010; Frome et al., 2008). Far less research has specifically focused on the construction industry, and this study is complementary to existing research on female high school students and trades (Struthers, 2016) and with female university students in construction management (Bigelow et al., 2018). The primary point of difference of this study is that it examines why female students are not choosing a male-dominated career in contrast to most of the research which examines why female students choose such a career. This article focuses on why young women reject the construction sector as a career choice in high school, while also acknowledging the under-representation of women at other career stages in this sector.

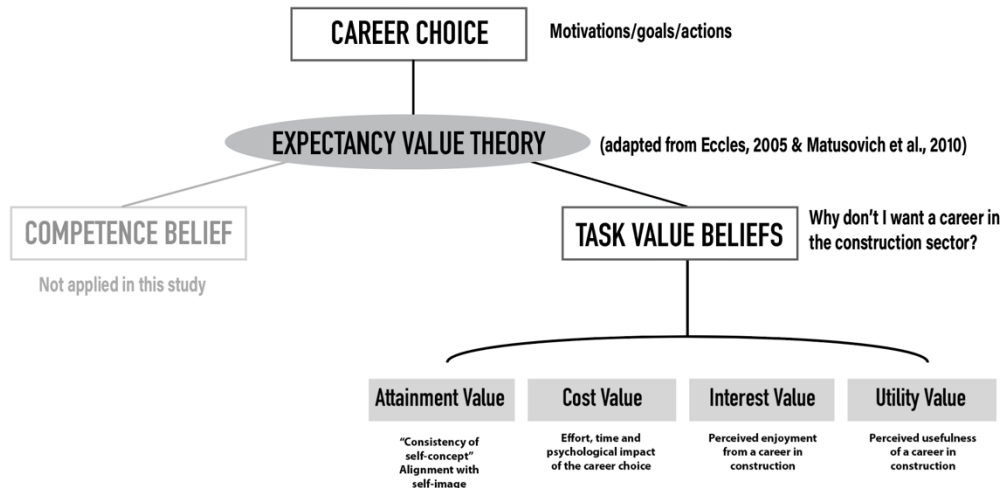


Figure 1: Understanding career choice through the lens of the Value Codes in the Expectancy Value Theory (adapted from Eccles, 2005 and Matusovich et al., 2010)

Gender imbalance in the current literature

The pronounced gender imbalance in the construction sector has warranted study across a range of fields since the 1990s (Gale, 1994; Agapiou, 2002; Gale & Davidson, 2006; Worrall et al., 2010) and across countries and continents. Women are underrepresented across all levels of skilled labor and professions, including leadership roles. More importantly, in Australia, this underrepresentation gap is becoming more pronounced -- falling from 17% in 2006 (Australian Bureau of Statistics, 2006) to 12% in 2019 (Australian Bureau of Statistics, 2019). The percentage of women in leadership roles is even smaller than across the sector as a whole: only 4.5% of construction CEOs in 2020 were women (Workplace Gender Equality Agency, 2020). Further, the construction sector is one of the worst performing in Australia in terms of pay inequality, with a gender pay gap of 26%, meaning that men in the sector earn on average \$A35,133 more than women, placing it third behind financial services and real estate in wage inequality (Workplace Gender Equality Agency, 2019b).

An examination of Australia's inability to address this alarming gender gap provides a useful case study for international researchers and organizations struggling with this issue. Women represent 12% of the construction workforce in Australia (Australian Bureau of Statistics, 2016), 11.5% in Canada (Statistics Canada, 2017), 9% in the USA (Bureau of Labour Statistics, 2016), 13% in Germany, 11.6% in the United Kingdom, 11.5% in Austria, 9.8% in France, 7% in the Netherlands, 6.4% in Italy, and 7.2% in Sweden (European Commission, 2017)

Australian research has examined how formal and informal organizational rules and practices can support or hinder gender equity in the construction sector (Galea et al., 2015, 2020). This research made clear recommendations for reforming the sector from within.

Understanding the compounding barriers to gender balance requires lenses to be focused both internally from within the sector and externally. It is this external lens that captures how the public perception of the sector could be contributing to these barriers, and there is growing evidence that attributes women's lack of interest in construction to the sector's image problem (Dainty et al., 2000; Fielden et al., 2000; Sewalk & Nietfeld, 2013).

The research conducted by Galea et al. (2015, 2018, 2020) also made recommendations for breaking down gendered structures and improve working conditions for both men and women working in the sector. While this highlights the importance of the sector to reflect inwards and support those who are already working in it, an additional approach to reforming the low numbers of females is to look at future workforce needs and how to attract more women into the sector. This paper addresses this research gap by providing evidence on young women's perceptions of what a career in the industry would be like.

Apart from Australian research exploring high school students' perceptions of trades (Struthers, 2016), research into the experiences and perceptions of high school students has tended to focus on the broader STEM related fields (Tan et al., 2013), particularly in relation to science (Archer et al., 2014; De Witt & Archer, 2015). University pathways into the construction sector are not considered in these publications. Previous research has explored what factors attract female students to construction courses at the university level by surveying female students already enrolled in a construction management course (Akinlolu & Haupt, 2019; Oo et al., 2018; Bigelow et al., 2015, 2016; Bigelow et al., 2018).

Understanding these pathways and what influences female students who have already chosen construction management training is valuable research. However, understanding why high numbers of young women are *not* choosing construction as a career with university training is

just as important as understanding the pathways of the smaller number of young women who *do* choose construction.

The career progression pipeline

Existing research frames what it calls “barriers to progression” as the main factor limiting women’s recruitment into STEM (Australian Academy of Science, 2019, p. 7) and construction careers (Moore, 2006). The “leaky pipeline” is a term used to describe the gradual loss of representation of women in male-dominated industries while moving up the career ladder and has been researched across other male-dominated sectors and subject areas including those in STEM (Watt et al., 2006, p. 643). This leaky pipeline is often explained as being the result of poor parental leave support, inflexible work practices, lack of progression opportunities for women, and stronger informal networks and access to career opportunities for men (Dainty, 1998; Galea et al., 2015; Galea, 2018; Galea et al., 2020; Lingard & Francis, 2005). In construction, although the pipeline is indeed leaky, there is another critical problem with attraction of women into careers. Only 23.23% of graduates from engineering, manufacturing and construction programmes are female (World Bank, 2017). This proportion of female students is even lower in the United States (7.29%; National Centre for Education Statistics, 2016). Yet in other built environment-related degrees such as architecture and landscape architecture, women’s enrollment is near parity (Workplace Gender Equality Agency, 2017).

In Australia, the gender disparity is greatest in engineering. Franzway et al. (2009) observed that while engineering companies acknowledge there is a pipeline problem, employees and managers do not seek to discover why women forgo careers in engineering. A decade later, Galea, Powell, Loosemore and Chappel (2018) found a similar culture of denial among company managers and leaders in the Australian construction sector.

Construction education and training

The gender imbalance in the construction sector has been explained by consistently low female enrollments in construction training and tertiary education courses which include building construction management degrees and civil and structural engineering. Between 2007 and 2017, women aged 18-64 years outnumbered men in their participation in education (studying for a qualification). When we examine those who had graduated from high school specifically, Australian Bureau of Statistics (2017) data report that more females than males were studying for qualification in 2017 (males 82% and females 86%), and when attainment of qualifications was analyzed, 13% more women than men had attained a bachelor's degree.

Since 1987, female students have outnumbered male students on university campuses (Department of Education and Training, 2014). This is the case in all disciplines and faculties, except for information technology, engineering, building and construction-related degrees, where male students consistently and significantly dominate student enrollments and completions (Workplace Gender Equality Agency, 2019a). Researchers have been exploring the reason behind this result, but investigations tend to focus on the female students who have already chosen a construction management degree – essentially young women who have already chosen a career in the sector. Research into the pathways of students into construction management training conducted by Bigelow et al. (2018) found that students of both genders identify with the construction sector's excellent career prospects as well as the opportunities for internships and industry experience. Other Australian research conducted by Oo et al. (2018) interviewed female construction management students at the University of New South Wales, Sydney, and found that the top reasons behind their consideration of the construction management course was having a family member in the sector or having an awareness of the career opportunities that the construction sector presents. In the United

States, female students in construction management programs were found to be influenced by their fathers, an awareness of construction career opportunities, internships and work experience (Bigelow, Bilbo, Matthew, Ritter, & Elliott, 2015).

Researching the reasons behind female students choosing construction management training is important for understanding what drives women into the industry. But so too is understanding the perceptions of young women who are yet to choose their university training. There is a need for more research examining female high school students' experiences and perceptions of the construction sector before they choose their university education and the reasons why they are perhaps not choosing construction as a career. Research investigating high school students' perceptions of the trades (construction, mining and energy) has been conducted by Struthers and Strachan (2019), who reported that gender segregation of the trades can be attributed to gendered assumptions about innate skillsets. The research also found that these assumptions are reinforced by parents, peers, teachers and employers.

In 2018, two Australian studies highlighted which job attributes were valued highest by young women. A study conducted by Baird et al. (2018), which both surveyed and interviewed participants, found that having a job with job security and one where the employee is treated with respect are the two top attributes valued by women aged 16 – 40 years old. In the same year, Fitzsimmons et al. (2018) surveyed 10,000 Australian students from single sex schools and found that young women and young men valued the same three job attributes, job security, enjoyment of tasks and applying their talents. Female participants did rate helping others more highly than male participants in the Fitzsimmons study. While self-confidence levels were found to be the same across genders, the students in the study had

fixed and gendered ideas of their career direction and choices. This is reflected in, for example, the gendered non-selection of STEM subjects by young women.

High schools in Australian and STEM education

Australian high schools (also referred to as secondary schools) are structured across six year levels (Year 7 through Year 12). Years 11 and 12 are considered Senior Years and are the final two matriculation years where students prepare to take their Higher School Certificate (HSC), which is awarded to students who successfully complete high school at the end of Year 12. From Year 12 the students often go on to tertiary education. Younger women are more likely to achieve tertiary education than men across all Organisation for Economic Co-operation and Development (OECD) countries (OECD, 2021). In Australia, demand for tertiary education has doubled over the past 30 years (Department of Education and Training, 2014). However, women's enrollment rates for construction engineering degrees have not followed this trend, and enrollment of women remains under parity in Australia and the United States (Workplace Gender Equality Agency, 2019a; National Centre for Education Statistics, 2016).

Analysis conducted by Murphy et al. (2019) found that over the past decade, the Australian government, like many other governments internationally, has sought to increase its STEM skilled workforce (Gough, 2015). It has invested in a number of STEM education strategies, recognising that STEM education is considered a key strategy for improving sustainable development goals (Fensham 2008), and the competitiveness, health and wellbeing of a population (Australian Industry Group, 2013, 2015). There is evidence that effective STEM education strategies influence the aspirations of students in relation to tertiary STEM study and career pursuits (van Tuijl & van der Molen, 2015). Despite the

range of STEM education initiatives being implemented in Australia, they are not translating to female high school students choosing a construction related degree.

Engagement strategies for high school students

Internationally the construction sector itself has recognized that one of the ways to rectify the under-representation of women is to engage directly with young women in high school in new ways. Many types of programs have been designed to engage and inspire young women to consider a career in construction, including presentations and engagement workshops with schools, industry partnerships which offer on-site experiences for young women, summer camps and female-only construction classes in high schools. These are listed in more detail in Table 1. It is unclear whether any of these programs have been evaluated to understand the extent to which these programs are effective at recruiting more young women.

Table 1: International initiatives for engaging female high school students with the construction industry

Program Title	Country	Activity/Strategy	Link
Construction Skills Queensland (CSQ) Construction Program Ipswich (Construction Skills Queensland, 2021)	Australia	Early Transition/Pre-Employment Program. CSQ funds a range of pre-employment programs for high school students to raise awareness of career options in construction.	https://www.csq.org.au/school-students-career-seekers/
Supporting and Linking Tradeswomen (SALT) (Supporting and Linking Tradeswomen, 2021)	Australia	Supporting and encouraging women in trades through school presentations, workshops and peer support programs.	https://saltaustralia.org.au/girls-in-trades-workshop-at-monaro-high-school/

Sector partnerships such as Monte Sant' Angelo Mercy College and Laing O'Rourke (Chenu, 2017)	Australia	Industry-school partnership	https://www.smh.com.au/national/stem-study-sees-gender-stereotyping-swapped-for-hard-hats-20171005-gyv14o.html
Multiplex Jump Start Program (Multiplex, 2021)	Australia	Mentoring	https://www.multiplex.global/news/jump-start-mentorship-program-launched-in-sydney-to-attract-more-females-to-construction/
Women in Construction Management Summer Institute (Colorado State University, 2021)	United States	Summer camp	https://www.chhs.colostate.edu/cm/programs-and-degrees/b-s-in-construction-management/women-in-construction-management-summer-institute/
Mentoring a Girl in Construction (MAGIC) camp in Washington (Mentoring a Girl in Construction, 2021)	United States	Mentoring	https://mentoringagirlinconstruction.org/
Build like a Girl (Rosselle, 2018)	United States	Industry partnership with hands-on experience on site.	https://www.autodesk.com/research/women-in-construction/
Girls only construction class (Iasevoli, 2018)	United States	All girls trade classes in schools.	https://hechingerreport.org/girls-only-trade-classes-are-spreading-and-upending-stereotypes/

Australia is a particularly interesting case to examine in terms of the gender representation of women in the construction industry because it has continued to experience very low participation by women despite multi-level investments by government and the sector itself. Recognizing the benefits of gender equality and equity, governments have

introduced laws and regulations affirming the legal case for gender equality and diversity. In Australia, the legal case for equality is underpinned by state and federal sex and age discrimination and harassment laws and parliamentary legislation (Sang & Powell, 2012). In 2011, the Australian government introduced paid parental leave, which includes pay for 18 weeks at the national minimum wage and 12 months of unpaid parental leave and guarantee of a job. Approximately 50% of employers supplement the government scheme with their own parental leave plan (Eurofound, 2017). Additionally, enshrined in the National Employment Standards is an individual's right to request flexible work (Pocock et al., 2013).

More recently, the Australian Federal Government refined its legislative requirements for companies with 100 employees or more, requiring them to report on both the nature and composition of gender in their workforce (Workplace Gender Equality Agency, 2012). These reporting requirements are backed by non-compulsory measures from the Australian Securities Exchange (ASX) that encourage publicly listed companies to disclose and report equality policies and gender targets (ASX, 2010). While these are non-compulsory, companies that fail to disclose and report on equality policies and gender targets must make public their reason for non-disclosure. Construction companies have introduced a range of policies including paid parental and care leave, affirmative action towards women in graduate recruitment, gender bias training for recruiters and management, women's support groups, flexible work arrangements, equality policies and gender diversity committees (Galea et al., 2015).

Methods

The aim of this research is to develop a deeper understanding of why young women in high school are not choosing construction as a career. Qualitative research methods were employed as the primary means for collecting and analyzing data to understand female high school students' perceptions of the construction sector. A qualitative approach was chosen for this research design because it enabled the researchers to focus on the way the participants interpret and make sense of their career and school experiences in the context of the construction sector. As a methodology, it also provides an opportunity to deepen our understanding of a given problem (gender imbalance) (Maxwell, 2013; Queiros et al., 2017). The study is designed to build new evidence that informs researchers across disciplines (construction engineering and management, education and gender) and begins to make sense of the international evidence base that reinforces the gender imbalances that exist in the construction sector. Most importantly, the study provides an opportunity to represent the voice of young women and hear their perspectives on their education and career pathways.

This qualitative approach involves in-depth, semi-structured interviews which enable the researchers to explore the deep meaning, inside view and initial causes that lie beneath the human behaviors and choices (Maxwell, 2013; Sechrest & Sidani, 1995) being tested in this research, specifically the perceptions of the construction industry by young women in high school. This research applies a general inductive approach for analyzing the data, whereby meaning and concepts are primarily derived from the accounts of participants in the research (Thomas, 2006; Neuman, 2006; Bryman, 2004,).

Following the initial inductive analysis of the interview data, the themes are mapped onto the four value codes of the Expectancy Value Theory to deepen an understanding of the values expressed by students when discussing why they do not want a career in construction.

Recruitment and sampling

Participant inclusion in this study was designed with the goal of creating a purposeful sample of female high school students who were not self-selecting because of a specific career interest in the construction industry. The researchers were aware that students may not self-select to participate if they felt that they had to be interested in a career in construction to participate. Therefore, the students were initially approached as part of a broader discussion on their career choices. During recruitment the female students were aware they were participating to discuss their career paths, but not specifically or solely their perceptions of the construction sector. All participants were, therefore, highly motivated to discuss their career choices and prospects and did not self-exclude if they did not identify with a construction career. This approach was critical to the recruitment of students who would not identify as wanting to discuss a career in construction and allowed for a rich exploration of the phenomenon of interest, namely perspectives of the construction industry (Smith & Shinebourne, 2012).

All participants met the following criteria:

- Female
- Attending an Australian high school
- In their final two years of high school (Year 11 or 12)

The students who were recruited attended a mix of single sex and co-educational schools. The participants self-selected based on an invitation to discuss career pathways. Two of the high schools were in Sydney, New South Wales (NSW), and one was located in Brisbane, Queensland. Ten participants attended a metropolitan NSW single-sex high school, three an NSW co-educational high school and two a Queensland co-educational high school. Recruitment was conducted in two waves of snowballing sampling whereby the first round of participants recommended another group of potential participants, increasing the final sample size to 15.

Research instrumentation

Participants were interviewed individually to explore their perspectives on

- How they value a good job/career
- What and who influence their decisions around course/career direction at school
- How powerful/present is parental influence, teacher and/or school influence
- Whether they have been told how to choose or avoid a certain career
- What do they know about the construction sector
- Can they see themselves in a construction sector role

The semi-structured interview protocol used for all interviews is provided in Table 2. Questions were designed to explore the participants' career aspirations and how these had been formed/influenced as well as their perceptions and biases of the construction sector as a potential career option. Questions also probed what participants felt were the qualities of a good job. The interview then moved specifically into questions about perceptions of the construction industry.

Informed consent was obtained before undertaking and recording interviews. The interviews ranged from 1 hour to 1 hour 20 minutes.

Table 2: Interview protocol outlining the semi-structured question format and related probe questions

<i>Question</i>	<i>Probes</i>
<i>What are the qualities of a good job?</i>	e.g., Salary, flexibility, fun, stability, creativity, community impact, helping people
<i>What do you want to do after school?</i>	What do you want to do after school? If they don't know, have they thought about it? How do they think they will make this decision (i.e., whom will they consult etc.?)
<i>How have you been guided or helped to make choices about subjects and careers?</i>	What career directions are you thinking about? Are subjects a decider for career directions while at school?
<i>Parents influence</i>	Do you talk about this with your parents? Are parental perceptions influencing girls' decisions around career path and construction jobs? What have your parents said about your career thoughts/directions?
<i>Teachers influence</i>	What kind of support does the school give you in career guidance? Have you talked about career with your teachers yet?
<i>Have you been told you SHOULD or SHOULD NOT do anything?</i>	Discuss
<i>Establish perceptions of the construction industry</i>	What do you think are the types of jobs available in the construction industry? And what do you think are the skills required? What subject choices do you think are necessary for a construction career? Are there any jobs you can see yourself in? Why? Why not? Who would be reluctant to consider a job in the construction industry? Discuss? (why – gender gap, interest, relevance, etc.).

Reporting of responses

All research reported here was conducted in accordance with international standards for ethical human research. The University of Technology Sydney (UTS) Human Research Ethics Committee approval number for the project is ETH 18-2656. To meet the

requirements in this ethics application, supporting quotes are attributed to a randomized participant number throughout the paper to protect participant identity while identifying whether the student attended a single sex or co-educational school.

Data analysis and the establishment of rigor throughout the inquiry

The analysis was conducted in two parts, with both stages providing important insights. We first conducted a reflexive thematic analysis of the interview data using an inductive approach to identify broad patterns of meaning linking back to the research question (Braun & Clark, 2019). We developed themes in an organic and iterative way which resulted in the generation of five themes. This phase was then followed by a deductive approach, where we mapped the themes and data to the framework of Expectancy Value Theory Codes. By mapping to these codes, data could be contextualized within the realm of career choice, perceptions of a specific career direction and self-image. Doing so enabled the construction industry to be viewed through the lens of young women actively discussing reasons behind their career directions.

The interviews were conducted either in person on school grounds or over the phone. In both scenarios, field notes were taken by the interviewer to assist with data analysis (Marshall & Rossman, 2014). Following the completion of the interviews, the recordings were transcribed verbatim. Transcriptions were read several times to identify categories and sub-categories (Kellam & Cirell, 2018). We then mapped and visualized the emerging themes, and the transcripts were coded to describe and summarize factors related to the construction industry. Each transcript was read, focusing on understanding the overall content. Then, guided by both research aims we generated the themes and sub-themes found in the data (Braun & Clarke, 2019). An iterative process developed by which we re-read the transcripts, discussed them, took notes and then revised coding. This cyclical process was

repeated until we concluded that the themes and coding were complete. These themes were then mapped to the Evaluation Value Theory Codes.

An important aspect for developing successful qualitative research is the establishment of the trustworthiness and credibility of the research processes. We applied a range of techniques identified in foundational research by Lincoln and Guba (1985; 1986) as significant for establishing this rigor (prolonged engagement and persistent observation, referential adequacy, member checking, triangulation, negative case analysis, thick contextual description, external audit/audit trail, and reflexivity and transparency). We then applied *prolonged engagement* by engaging first over the phone for recruitment purposes and then interviewing each participant for an extended period of time, between 60 and 80 minutes. During the interviews, the interviewer was able to observe, identify the characteristics of the discussions that were most relevant to the research question being asked and direct the semi-structured interview process towards exploring these further (*persistent observation*). We applied *referential adequacy* by first extracting the most relevant quotes from the interviews and analyzing them, then returning to the original transcripts and reflecting on this analysis to test for validity. *Member checking* was verbally communicated when the researchers contacted participants to follow-up after their interviews. As a way of generating an *audit trail*, we have stored all raw data including *thick descriptions* of scenarios and field notes in a secure password protected computer as required by the ethics approval. This is accompanied by the data reduction, synthesis and process notes including all instrumentation development for the semi-structured interviews.

As evidence of the *reflexive* process, we have generated a researcher positionality statement. The recruitment, interviewing and co-analysis were conducted by researcher and author (PC) who is a female academic with an industry background in both the male-

dominated manufacturing and construction sectors and who studied industrial design at university. Co-analysis was conducted by researcher and author (NG) who is a female academic with an industry background in the construction sector and who studied construction management at university. This disclosure of positionality of the researchers helps the reader to situate the inquiry and research findings (Secules et al., 2021; Kellam & Cirell, 2018;). We have endeavored to be as *transparent* as possible about our research, without risking any right to anonymity by the participants and schools.

Limitations

The sample of student participants attended either a single-sex or a co-educational high school in New South Wales or Queensland. The schools attended by participants were all located in central urban areas of a capital city (Sydney or Brisbane). The sample is over-represented by participants living in New South Wales who attend a single sex school. This limitation prevents the researchers from drawing any conclusions about the influence of the gender mix of the schools attended. We also acknowledge that the sample size is relatively small as it was an exploratory study with limited funds.

Findings

The participants, drawn from one of three Australian high schools, self-selected based on an invitation to discuss career pathways. Ten participants were recruited from a metropolitan NSW single-sex high school, three from an NSW government co-educational high school and two from a Queensland government co-educational high school. Table 3 describes the participant characteristics.

Table 3: Female Participant Characteristics

Participant Total		(%)
Age median (years)	16.4	
Range (years)	16-18	
High school type	Single Sex (<i>n</i> =10)	66.6
	Co-educational (<i>n</i> =5)	33.3

In all interviews, participants appeared eager to discuss the reasons behind their decisions around their career goals and spoke in an engaged, active and positive way about their own futures. Two of the 15 participants had knowledge of the construction sector through their parents. One participant had a father who was a plumber, and the other had parents who ran a small construction company. Only one of the 15 participants could imagine themselves in a construction career.

The majority of participants (11 of 15) intended on applying to university and were considering applying for careers in areas of either medicine, law or education. The remaining four participants were considering a gap year (a period, typically an academic year, taken by a student as a break between school and university or college education) before deciding or were considering pursuing a creative career in advertising and music (also applying to university). Most of the participants clearly expressed having high expectations of themselves in their careers and valued income, social contribution and quality of life when choosing their career directions as demonstrated in the following quotes from the interview transcripts:

I want to help others in my career, that makes me feel that I am doing good, contributing to society. (Participant 12)

In this day and age, you need to have a job that pays really well so you can buy a house. (Participant 14)

I want to be able to provide for myself and buy myself a house. (Participant 5)

Themes

As a result of the analysis process, the data were categorized into the following themes that emerged from the transcripts:

1. Lack of Awareness: A lack of awareness of construction-related opportunities
2. Lack of Self-Alignment: I am not the type of person who is in construction
3. Effect of Male Domination: Respect, career success and enjoyment.
4. Sector Esteem: A job in construction wouldn't be aiming high enough
5. Parental, Teacher and Curriculum Influence

These themes are discussed in more detail below, supported by a selection of quotes from the data codes. The themes are then mapped across the four value codes of the Expectancy-Value Theory (Eccles 2005).

Theme 1 Lack of Awareness: A lack of awareness of construction-related opportunities

The theme of Lack of Awareness was applied where participants indicated during their interviews that they were unaware of an aspect of the construction industry such as it is

a growth industry that can provide generous opportunities for remuneration or that there are diverse, skilled professions comprising the sector. Findings here represent an opportunity to address knowledge gaps about the construction industry directly through better communication strategies for high school students, potentially leading to greater interest or consideration of this sector as a career.

Apart from the two participants who had parents in the construction sector, most participants had very little knowledge of it and its potential career options. The fact that it is a growth sector and Australia's third largest employer was not known to participants:

I don't know much about the industry; I never hear it mentioned at school.
(Participant 2)

Engineering was more visible to participants and a sector they aspired to work in, but the connections between engineering and the construction sector were not clear to them. In the single-sex school, camps and courses had been run to inspire and support female students with an interest in STEM, particularly engineering. However, construction was not considered a STEM discipline by participants even though engineers work in the construction sector:

A lot of girls at this school want to be engineers. But I don't want to be an engineer. There are still not many women doing engineering and there is a really big push by universities as there are still not very many women in engineering. There are lots of scholarships being offered. (Participant 3)

Construction, however, was not considered as an aspirational career for female students across both single-sex and co-educational school settings:

I haven't really thought about it at all. ... No-one has said don't do it ... but

it just never occurred to me that it could be something I would ever consider.
(Participant 6)

I would be very surprised if any of my friends went into the trades or
construction sector. I would be supportive if they were happy though.
(Participant 9)

I don't think I would be able to do it [work in construction]. (Participant 2)

I know how well-paid [construction work] can be, but my friends don't.
They just work in food and retail and have no idea what they could be
doing. ... But they probably wouldn't know where to start anyway, even if
they wanted to! (Participant 7)

Theme 2 Visualization: I am not the type of person who is in construction

The theme of Visualization refers to whether the students aligned their identities with the construction sector or could convincingly visualize themselves working in the industry. The implications of not being able to visualize yourself in a particular job or role is a significant barrier to choosing that industry as a pathway or career.

Almost all (14 of the 15) participants could not imagine themselves in a construction career. They gave a range of reasons, including that it was too labor-intensive, that it is not prestigious enough, and that they had a fear of not being listened to or respected. When asked about female role models that they were aware of, respondents overwhelmingly stated that the only women they knew of on-site in the sector were the young women responsible for traffic management (holding the stop/go signs). Participants explained that they did not know of any women at executive levels in the construction sector, could not think of a woman who

was known for her success in the sector and could not visualize themselves or their friends achieving in the construction sector.

Fourteen of the participants had never met a woman with a career in construction and only one had met a female construction leader. Participants identified that the women they did encounter in construction were most often found outside the construction site directing traffic rather than managing construction work. This was even the case for participants with male family members working in the construction sector. Participants inferred that the type of work available in construction would not be stimulating but that some professions in the construction sector, such as architecture, were more appealing for young women:

I don't see many girls on construction sites that do more than hold the lollipop signs. (Participant 10)

There are not many successful women in construction. (Participant 2)

There are no women I know who are doing it at a high level – I don't aspire to it at all.....I can imagine being an architect though. (Participant 1)

Theme 3: Effect of Male Domination: Respect, career success and enjoyment

The theme of Effect of Male Domination describes responses from participants that indicated they considered the sector to be too male dominated. This theme indicates whether a female student feels adequately represented, included and potentially welcome in the industry.

Overwhelmingly, a majority of participants (12 of 15) expressed a negative opinion of the construction sector because it was male dominated. A number of participants said they were concerned that they would not be respected in the sector, revealing a perception that the

sector tolerated sexism and revered masculine behaviors such as aggression and assertiveness that would act to exclude women. These behaviors, participants imagined, would impinge their career success and progression:

I am not attracted to that sector because it is so male dominated.

(Participant 2)

I would be worried that I would not be respected in the construction sector.

(Participant 4)

I want to know that what I go into the people there are going to respect me. I would want equal chances of getting a promotion if there was a man standing next to me. (Participant 13)

I can't see myself doing construction at all. I feel like I would be intimidated.

I feel like I would be pushed over, if someone tells me I am doing something wrong I will back off. (Participant 9)

Theme 4: Esteem and Status: A job in construction wouldn't be aiming high enough

The theme of Esteem and Status describes examples where students indicated that the construction industry was either outside or beneath their career aspirations or their parents' aspirations for them. There was a perception among almost all participants (14 of 15) that construction was a poor fit for their career expectations. In some cases, participants said a career in construction was not prestigious enough and would fall short of their career aspirations. In some cases, a career in construction did not match with their altruistic aspirations to serve the community and help people, while in other cases, participants stated that they did not perceive construction careers to be creative or interesting:

I am open to [construction] I guess, but I am not sure it would keep me interested. (Participant 12)

I definitely wouldn't go into construction; it isn't for me as I really want something that suits my creativity. (Participant 14)

The girls [at this school] would be aspiring to big high performing careers and that is not the perception of the construction sector that I have. (Participant 4)

Engineering, however, was highly regarded by all participants, who acknowledged that there was a distinct increase in focus from universities and schools to recruit female engineering students:

All my teachers are really encouraging female students to choose a STEM career. ... They don't really mention the construction industry though. (Participant 12)

Theme 5: Parental, Teacher and Curriculum Influence

The theme of Parental, Teacher and Curriculum Influence describes situations where participants indicated that their choice of career was heavily influenced by people other than themselves. The interview data revealed that parents' opinions had a significant impact on the participants' career outlook. Overall, participants had little experience of the construction sector. Of the 15 young women interviewed, one had a parent who was a plumber, and another had parents who worked in the construction sector. The remaining parent professions included doctor, accountant, musician, teacher, writer, business consultant and at-home carer.

There was evidence from the interviews that parents had an influence on their children's understanding about which career paths were acceptable and appealing, and why:

My mum wouldn't think this [working in the construction sector] was a good idea. I just know it. (Participant 13)

Money isn't a thing for me. ... But my dad said that primary teaching doesn't pay enough. (Participant 4)

Well, I am pretty sure my mum would talk me out of [choosing construction as a career]. (Participant 11)

Some participants gave contradictory statements about the level of their parents' influence. For example, one participant spoke about how her parents were very encouraging and wanted her to do only what she wanted, but later in the interview this participant expressed that she knew her parents would not find construction an acceptable career choice. These types of comments indicate that the issue is not only gendered but class based:

My mum and dad want me to do whatever I want to do. They encourage me. ... Our parents want us to aim high and construction would not be acceptable I don't think. (Participant 15)

For participants with parents in the construction sector, the influence of their parents was also evident. For one participant, her parent's experience in the sector was very positive, and choosing a career in construction for her represented an opportunity to be financially independent and to work outside rather than be stuck in an office:

I got to see how much money you can earn [in construction], how flexible the work can be and also, I really didn't want to be inside in an office all day – so I really think [the construction sector] is perfect for me. (Participant 7)

As for teachers, participants felt that some teachers did not encourage participation in construction, while others had very supportive mentors who regularly suggested new career opportunities, workshops and skill building at school:

I don't think any of my teachers ever mentioned construction as a career option it just never came up – we did talk about engineering and science though [when it came to STEM]. (Participant 11)

I don't think I have ever heard the school career advisor mentioning the construction industry specifically to us girls. I just can't imagine us going, "Oh Yeah." (Participant 3)

Participants also acknowledged that their schooling gave them little exposure to the breadth of roles and careers available in the construction sector. The course content in the education system is not universal across schools, and some participants noted that their school did not provide pre-trade courses such as woodwork, while other participants noted that even though their school offered pre-trade courses, young women were not interested in studying them:

Girls...when we go into high school we are not exposed to that kind of work – hands-on trades, woodwork. If we do, do woodwork, it is making a jewellery stand or a clock. This is good but we don't have a bigger scale or impact in mind. We are not geared to the built environment. (Participant 15)

I think at school we don't think of the construction sector as being a range of roles. It is on-site and it is bricklaying. We have no concept of a range of roles outside that. (Participant 13)

Our school is pretty fair when it comes to offering career choice to both females and males, but really, none of my (girl) friends want to go to the construction sessions. Even though the teachers try to get us there. (Participant 12)

How the results map onto Expectancy-Value Theory

The themes from the semi-structured interviews can be mapped across Expectancy-Value Theory, informing the four value categories of Attainment Value, Cost Value, Interest Value and Utility Value. This theory has been used to examine career decision-making in engineering and technology-related fields in a large body of research, including Matusovich et al. (2010). Our paper differs by exploring why female students are not choosing a male-dominant career as opposed to past research that examines why female students choose a male dominated career.

Table 4 maps the themes generated from the data onto the four Expectancy-Value Theory value codes, providing further insight into the decision making process away from a career in construction.

Table 4: Mapping data themes to the four Expectancy Value Theory Codes: Attainment Value, Cost Value, Interest Value and Utility Value

Value Codes	Attainment Value	Cost Value	Interest Value	Utility Value
	“Consistency of self-concept” Alignment with self-image	Effort, time and psychological	Perceived enjoyment from a career in construction	Perceived usefulness of a career in construction

impact of the
career choice

Mapping Data Themes	Theme 1 Lack of Awareness: A lack of awareness of construction - related opportunities	“I wouldn’t be able to do the [heavy labor] work required.”		“[A career in construction] is not something I would consider.”	“I only ever see girls as lollipop sign holders.”
	Theme 2 Lack of Self-Alignment: “I am not the type of person who is in construction.”	“None of the women in my family ever [went into construction]. I wouldn’t either.”			
	Theme 3 Effect of Male Domination: Impacts on respect, career success and enjoyment	“I want to know that, whatever I go into, people are going to respect me.”		“I feel like I would be intimidated [if I chose a career in construction].”	
	Theme 4 Sector Esteem: “A job in construction would not be aiming high enough”	“I am interested in doing good for society... construction would not give me that opportunity.”	“I need to aim higher [than construction].”	“I am open to it...I guess... but I am not sure [a career in construction] would keep me interested.”	“I think [a career in construction] would be a bit boring for me.”
	Theme 5 Parental, Teacher and Curriculum Influence	“I am pretty sure my mum would talk me out of it [a career in construction].”			“My mum wouldn’t think it was a good idea.”

How the data themes reflect Attainment Value

Attainment Value is understood to be the *consistency of self-concept, or alignment with self-image when considering the construction sector*. The data reflect the range of how self-image and a discord between self-image and beliefs about the construction industry were reflected in this study. Theme 1: Lack of Awareness, revealed a lack of awareness of the

range of opportunities that the construction industry has to offer, including the fact that it is a growth industry in Australia with good payment prospects, impacted how the students valued the industry across all four value codes. As an example of Attainment Value, students held the belief that they were not physically strong enough to contribute to a job in construction, revealing a lack of awareness of the many diverse roles in the sector that do not involve heavy labor or the ways that new technologies reduce the need for physical strength. Theme 2: Lack of Self-Alignment, directly maps to Attainment Value, a strong example in the data being the student who asserted that the men in her family were in the construction industry but the women were not; therefore, she would not consider it.

Theme 4, Sector Esteem, revealed that students held the belief that the construction sector would not align with their values of doing societal good in a career. Finally, the data in Theme 5: Parental, Teacher and Curriculum Influence, revealed examples of family roles and expectations of self: – *“My mum would talk me out of a career in construction.”*

How the data themes reflect Cost Value

Cost Value is understood to mean the price of success in terms of effort in a construction career. This was reflected in Theme 3, which revealed that students held the belief that, because of the small number of women, they would not be respected in a construction career; lack of respect was considered too high a cost to pay. Similarly, the theme of Sector Esteem revealed that the construction industry was not held in high regard and was not considered “aiming high enough,” i.e., not worth the time and effort.

How the data themes reflect Interest Value

Interest Value is understood to mean the perceived enjoyment from a career in construction. Some students held the belief that the industry would not be challenging and

would not hold their interest, reflecting a lack of awareness of the diversity of skill within the sector (Theme 1). Being outnumbered by men meant the students felt they may be intimidated and not enjoy their work (Theme 3: Effect of Male Domination).

How the data themes reflect Utility Value

Utility Value is understood to mean the perceived usefulness of a career in construction. The perception that young women were employed only as street sign (lollipop sign) holders meant that students perceived the usefulness of a career in construction to be limited. There was evidence that students held the belief that it was not a valuable or useful career path (Theme 4), a perception that was reinforced by the opinions of parents (Theme 5).

Discussion

This exploratory research contributes to an understanding of the criteria used by young women in their final years of high school for choosing a possible career and why they are overlooking the construction sector as an option. The results from the data collection are presented across five themes, Lack of Awareness; Lack of Self-Alignment; Effect of Male Domination, Sector Esteem; and Parental, Teacher and Curriculum Influence. The themes map across all four value codes of the Expectancy Value Theory. The theoretical lens of Eccles' Expectancy Value Theory (2005) provides a way of understanding the career choices and an opportunity to build a deeper understanding of not only the reasons why female students choose a career in construction but also why they do not.

The student participants recruited for this study revealed they were thinking in multi-dimensional ways about their career options. They were ambitious as they sought careers perceived as prestigious, aligned with their values and skills and where they felt able to succeed. In contrast, the results from this research reveal that students perceived the

construction industry as a workplace where jobs are physically demanding and not intellectually challenging or socially responsible. The participants revealed a narrow understanding of the breadth of construction careers available and the role of construction in shaping the built environment and, by extension, people's lives. This perception indicates that the impact, diversity and potential of the construction industry are not effectively being understood or communicated at a high school level.

It is also clear that the lack of gender diversity in the construction industry is deterring young women from choosing a career in this sector. Young women are ruling out a career in construction due to the sector's gendered nature because they fear not being respected and not being able to have a fulfilling and successful career. Like gender, social class appears to be a barrier to young women's attraction to construction careers. Construction careers, even though they include engineering and management roles, appear to not carry the same esteem in the eyes of ambitious and educated young women.

These findings suggest that the construction sector needs to reposition itself as an inclusive career for both women and men and needs diverse role models and champions to communicate the potential and diversity of construction careers to young women. To achieve this change, the construction sector must concentrate on retaining and progressing the women currently working in the sector through a variety of interventions, including flexible work practices, transparent promotion procedures and paid parental leave (Galea et al., 2018). In addition, findings from this research support the universities, schools and employers who are eager to attract more young women into the sector by giving them a broader understanding of what is influencing young women's career decisions while still in high school.

The results of this study support the findings of related research, such as Fitzsimmons et al. (2018), which highlights the significant influence parents have on their children's career

choices and development. This supports previous academic studies which provide evidence that parents can give their children the resources and know-how to make decisions about their career (Ginevra et al., 2015; Restubog et al., 2010), engage in career exploration (Guan et al., 2015) and build career optimism (Garcia et al., 2015). Parental influence can also be expressed in the form of pressure and expectation or through transferred values (Fouad et al., 2008). In all aspects of career formation, students' decisions are externally influenced by their school-aged peers, their teachers and parents. Amarnani et al. (2018) suggest that career adaptability is influenced not only by how parents engage and interact but also by the self-esteem of the students themselves.

Participants in this study also revealed the role that schools play in supporting and guiding interest into or away from particular sectors. Of particular interest are the quotes that indicate that the construction sector is not synonymous with a career in STEM, indicating that the construction sector has work to do in educating schools and the public that it is indeed a valid member of the highly promoted and valued STEM professions. Along with parents, teachers and school curriculums influence young women's exposure to construction careers and how the construction sector is valued. A United States study conducted by Faltar and Faltar (2013) highlights the important role that teachers play in influencing students into STEM career paths. Locally, Australian research conducted by Francis and Prosser (2013) focused on the potential for career counsellors to attract students to a career in construction reported that most advisors had little knowledge of the sector and tended to follow gender stereotypes, directing male students to the construction sector. This is one area where further research is urgently needed.

Conclusion

The continued under-representation of women in the construction industry is particularly striking given the wealth of opportunity for women in this growing, profitable and global area. It is an international problem that many sectors have worked hard to address via such initiatives as diverse as university enrollment policies, multi-level education strategies and industry-led engagement programs for young women. Yet, despite these wide-ranging and cross-sectorial strategies, at all stages of education, recruitment, retention and progression, the construction sector is failing to attract and retain women in professional and skilled positions. Australia represents a particularly interesting country to study against a broader international context as it has invested significant attempts to try to rectify this issue; however, despite these efforts it has continued to experience low female enrollments in construction-related university education and even lower participation in the industry.

This Australian study contributes a previously under-explored point of view. The lived experience of young women who are *not* choosing a career in construction can contribute to understanding the success -- or the lack of success -- of initiatives to attract more women to the sector. Understanding the reasons why young women are avoiding this industry at a time when career choices are being made will provide a new way for the policy makers, industry recruiters, university educators and the construction sector to examine their approaches for addressing the problem of gender imbalance. This knowledge will influence how initiatives can be better designed as well as bring insight into why they may succeed or fail.

The career aspirations of high school students are complex and multi-dimensional. The interviews with high school students reported in this research highlight a number of issues that prevent young women from choosing a career in construction, including a lack of

awareness about construction careers and the diversity of career pathways within the sector. In addition, the construction sector has a reputation for being an unchanging, male-dominated sector where women are not listened to nor heard. This is an image that needs to change for young women and their parents to consider the other benefits of working in the sector. Finally, construction professions also appear to lack status and are not considered as highly as professions from other established sectors like engineering, healthcare or law.

To address gender equity and attract young women to careers in construction, our research indicates that this sector needs to significantly improve its image and work to engage directly with the young women it hopes to recruit. This will require changing the outdated masculine behaviors and work practices, and the championing of successful women currently working in the sector. There is a need for the construction industry itself to consider its public image, not only for students but also their parents and schools. Only then will the many efforts already in place have the chance to overcome the poor reputation of the industry among young female high school students.

Implications for Practice

The main findings from this research can guide a number of practical implications for the sector, including employers and educators, around communication, information and education practice:

- Construction industry bodies, in conjunction with government, should initiate cultural reform to change the sector's poor reputation by addressing barriers to gender equity. These barriers include work conditions, gender safety, sexism and backlash to gender equality.

- Government clients should include gender equality provisions (for example, quotas for women's participation and leadership) in their construction procurement processes. This puts gender on the tender and ensures these provisions are enforced in relation to contractors.
- Schools and universities should add gender equity provisions to their construction procurement processes.
- Construction industry should invest in a public campaign that promotes its link to STEM employment, showcases the variety of construction careers available to women, and champions existing women working in construction.
- Construction sector should review and amend recruitment practices for trades and professionals, paying particular attention to informal and normative recruitment practices that act as a barrier to women's recruitment and retention.

Recommendations for further research

This paper contributes to a more comprehensive framing of the problem of why high school students may not be choosing a career in the construction industry. The exploratory nature of the research has revealed a range of new research directions warranting further exploration:

1. How does school type or same-sex education influence students' perceptions of the construction industry?
2. What role should the industry play in communicating information about opportunities, gender disparity, and female leadership?

3. How have current initiatives to engage with female students performed? An evaluation of the effectiveness of high school programs is urgently needed.
4. What further support do schools need to broaden female students' exposure to construction opportunities?

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