A JUST GREEN TRANSITION: ATTITUDES OF SCHOOL PUPILS TO CONSTRUCTION CAREERS

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Construction has a long-term skills crisis, an ageing workforce, and a tendency to recruit from within. Family connections are a common entry mechanism resulting in a homogenised male workforce with females constituting 14% of technical roles and a negligible proportion of trade roles. A challenge facing the industry is to develop green skills. Females are more sympathetic towards green issues than males and given the need for the industry to make a green transition, encouraging females represents an opportunity for the industry. It also offers potential for enhanced earnings for females in 'decent' green roles. A longitudinal project in East Anglia, UK, is giving year 9 school pupils exposure to the construction industry through taster days and work experience. The authors collected data via questionnaires from the pupils regarding their attitudes to the construction industry. Findings from the survey reveal females have a more mixed view of the industry than males and are less likely to believe 'it is for them'. The project has much work to do to promote revised perceptions.

Keywords: education; gender; green transition; skills shortage

INTRODUCTION

The UK built environment creates approximately 25% of the nation's greenhouse gases which highlights the significance of the potential contribution which the industry could make to reduce total carbon emissions (House of Commons 2022). Developing green skills and using green technologies are important for the construction industry's role in the transition to net zero. Yet while trying to deal with issues of sustainability, the industry also experiences several other challenges associated with its workforce — a skills shortage, an ageing demographic, and a tendency to recruit from within. One response to this is employing more females. This is an often-stated goal of the industry, but one which is not nearly realised as much of the industry remains male dominated (Norberg and Johansson 2020). There are projects seeking to understand how to secure long-lasting changes to gender-based employment patterns in the construction industry, and this research is borne out of one of those projects.

Recruitment to the construction industry is often framed around issues of technical skills, competencies, and STEM (science, technology, engineering and mathematics)

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subjects. Despite many efforts for over 20 years to increase the number of females in construction, as recently as 2019, little progress had been made in this area (Naoum, *et al.,* 2019). However, considering a sociological approach to address behaviours around climate crisis (Kwauk and Casey 2022) then opens the debate to new perspectives and alternative approaches helping tackle such important issues. This approach offers value in terms of encouraging females to enter the industry and a challenge in overcoming the status quo in the context of construction. At the same time, there is understanding that children's career choices are often gendered (Scholes and McDonald 2022).

This paper has its roots in a funded industry-based longitudinal project with an emphasis on equal opportunity seeking to encourage children to regard construction as a potential career choice and subsequently to gain employment in the industry. The project begins with school children aged 13 to 14, offering taster days, activities, and industry work experience opportunities. These children will be tracked over a period of five years to establish whether the project, with its provision of information and experience, is effective in encouraging young people to join the industry. Schools participating in the scheme must provide a 50:50 male to female split in the students they nominate. Here we focus on the role the project could play in broadening the participation of females in the construction industry. If successful, the project could be mutually beneficial as it may both contribute positively to females' earnings while benefitting the green transition of the industry as females are better disposed towards 'green' approaches. This first phase of the project explores the gendered nature of school children's perceptions of the construction industry. As the study progresses, their perceptions of the industry will continue to be monitored, evaluating the efficacy of the actions taken. It is hoped that the project will facilitate development of resources to continue promoting career choices which are less gendered than at present.

This paper examines these children's perceptions of the construction industry at the outset of the project. This will also allow for subsequent examination of how their perceptions evolve as the project unfolds. First is a discussion of the influences on career choice, perceptions of the construction industry, and 'green' construction skills. Following this are the method and findings of the project as it has thus far progressed.

The Gender Imbalance

The Learning and Work Institute Report (2022) suggests young people's awareness and knowledge of green skills is low, with 63% reporting that they had never heard of green skills and do not know what they are. 24% had heard of green skills yet did not know what they are. Only 11% knew what green skills are. Compounding this, there is a significant gender gap in young people's knowledge and understanding of green skills. Females are less likely than males to be aware of green skills, which may in part follow from their lower participation in STEM disciplines (Stojanov and Bremner 2024).

Earnings for operatives skilled in the use of green technologies are higher than for those without such skills, suggesting that developing these skills can lead to well-paid work, including for females. Additionally, there is evidence suggesting that in respect of consumption, 'green' issues and femininity are cognitively linked (Brough, *et al.,* 2016), and which may be an indicator of wider issues at play. Combined, these factors suggest there is scope to encourage women to engage with development of their own green skills. Individuals possessing such skills can earn more than

otherwise, highlighting how the industry would benefit from more females who are likely to be sympathetic to these issues. However, currently females are less interested in training in green skills (NESTA, 2023) and remain reluctant to enter the construction industry; progress addressing this problem has had limited success.

Approximately 300,000 women work in construction, a figure little changed over the past 25 years (Office for National Statistics 2025). Women comprise only 1.3% of operatives in manual trades and 16% in professional construction roles, illustrating gender segregation by occupation within the construction industry (Wright 2015). Women are more likely to work in areas such as architecture rather than being site-based. There may a tendency to regard construction as 'dirty and messy', and females could deem such attributes negatively for themselves.

Influences on Career Choices

Family and environment influences

Diverse and inter-related factors influence the career path chosen by an individual including family influence, psychology of the individual, and social environmental factors such as the influence of friends (Lan Oo, *et al.,* 2019). However, given that there is pressure to conform or at least adhere to social norms, so the degree of 'free' choice for females to join the industry may be more limited than might have been supposed. Therefore, this suggests the necessity for a long-term drive to support and encourage changes in these social norms and influences.

That family and environment, including peer pressure, exerts influence over approach to education and choice - or lack of choice - of career has been acknowledged for some time (Willis 1977). Other aspects of influence include jobs which may be secured through informal social networks and connections (Merlino 2019) and thus the individual's network of relatives, friends and acquaintances may represent directions of opportunity. Equally, the absence of types of network or connections represents a vacuum of information, 'persuasion' and opportunity for children. Given that social connections may include a gendered dimension, this represents part of a pattern of social and subsequently employment reproduction. Lack of suitable informal networks and role models which could have encouraged or inspired females to join the construction industry are likely to be weak or absent.

Gender influences

Gendered roots of career choice have their foundations as early as primary school (Scholes and McDonald 2022). Career choices are influenced by stereotypes and professions which could be deemed 'feminine' often reap less financial reward (Jaoul-Grammare 2024). However, the picture is more complex than this; females tend to select more altruistic careers, and gender-based aspirations along with their role in child-rearing play some part in this situation (Chevalier 2007).

Many occupations could be considered as being 'gendered', for example childcare (Haralambos and Holborn 2008) where the 2021 UK census data show 97% of early years education practitioners and childcare employees were female. By contrast, and of interest to us, in construction, most manual trades operatives were male, for example 99% of bricklayers were male (Office for National Statistics 2023).

Reasons for this tendency to occupational gender segregation include stereotyping, poor and outdated careers information, business culture problems, downgrading largely female jobs, and that females often need part-time and flexible working (House of Commons 2005) to accommodate child-care commitments. Gender

segregation has resulted in women tending to be in occupations which are low paying (Giddens and Sutton 2017). Nonetheless, the effect of being 'post-parenthood' on women's wages is recognised here (Francis-Devine 2024). Women often undertake fewer hours of formal employment (Norman 2019) allowing them to spend time in the home. Parenthood then impinges on career progression if females seek flexibility to accommodate their childcare commitments, reinforcing differentials in earnings.

Influence of schools and stereotypes

Careers in STEM subjects are often underpinned by proficiency in mathematics. However, school children often perceive mathematics as 'not very exciting'. Worse, frequently they hold misconceptions around STEM careers, for example car mechanic being conflated with engineer (Prieto and Dugar 2017). This suggests that females would also need support to help overcome antipathy towards mathematics as well as support to develop their interest in STEM subjects and knowledge of STEM careers.

Schools have long been regarded as agents of social reproduction (Apple 1990) and their influence - witting or not - on the choice of construction as a career may be one area where this is especially visible. Counter-stereotypical role models, although useful for females, need to be relatable to counteract pre-existing social stereotypes and the practical considerations of childcare which still exert influence over both female and male children (Olsson and Martiny 2018).

Research has found it possible to address problems around gender bias and stereotyping for women in STEM fields (Moss-Racusin, *et al.,* 2018). However, the reality is that training in these areas remains limited, and in schools there are constraints of delivering the national curriculum within school timetabled hours and budget. That sexual harassment and violence continue in schools today (House of Commons 2023) suggests there are deep-seated challenges to address. The end does not yet perhaps seem to be in sight. Worse, schools have in the last few years experienced regressive challenges with misogyny promoted and normalised by popular social media influencers promoting "hegemonic masculinity" (Haslop, *et al.,* 2024) for boys' social status and identity. This suggests the challenges are indeed considerable to address gender bias and gender-based employment patterns.

Brown and green skills and technologies

'Green' and 'brown' sectors refer to industries based on their environmental impact. Green skills are often associated with the green sector or the environmental goods and services sector (EGSS) i.e., those industries involved in the provision of goods and services for environmental protection and resource management including pollution prevention, resource efficiency and clean technologies. Both sectors require green skills to support the green transition (Strachan, *et al.,* 2023), recognising the role of all sectors in terms of environmental activity and minimising carbon emissions. Inspired by the International Labour Organisation's (ILO's) four categories of green employment effects, the Eco-Transformation of Industries Matrix (Kapetaniou and McIvor 2020) analyses industries in the UK based on their current level of environmental friendliness. The matrix currently recognises the construction industry as a follower with high carbon emissions and high level of environmental activity. It remains highly polluting but is also the agent of change for a better built environment. To make this move will require green skills, to which females potentially have an affinity, but these skills are also conflated with STEM, to which females are under-recruited. The impasse is clear: the industry needs green skills, green skills pay well,

women are entitled to well paid ‘decent jobs’, but they are under-represented in the construction industry which offers those jobs.

METHOD

The project from which our data derives was initiated by a Tier 1 contractor and a county council with support from industry contractors and consultants. Its goal over a five-year period is to provide a group of school children with early and ongoing exposure to the construction industry. It begins with children in year 9 and will track them through to the end of year 13. Activities provided include taster days, work experience and site visits. Schools were invited to participate and asked to provide approximately thirty pupils each, split evenly between males and females. This is the first year of the project.

The project is a longitudinal study, initially from 2024 to 2029. To evaluate the efficacy of the programme, the authors were invited to conduct a survey. Ethics approval was secured via the university's protocols for this research. This paper begins at the starting point, examining the base line of children's perceptions.

The children were invited to participate in the project and thus were self-selecting. However, it is not known whether there were any school, parental, or peer-based influences regarding an individual child's decision as to whether they would participate. The number of participants at this stage was 99, and 94 gave consent to have their data included. There is an assumption that as the project unfolds the number participating will decline as some lose interest.

Participants and their parents were informed the data from the survey would be provided to the university for analysis. Consent to undertake the survey was requested in the first question. The data of those who declined is excluded from this research. The children's identities were not known to the researchers, who were not involved with the provision of the project's activities and did not visit the schools. The children participated in the various activities of the project, regardless of whether they consented to take part in the survey.

On the morning of the first taster day the children were asked by the project facilitators to complete an anonymous online survey. The object of this was to establish their perceptions of the construction industry before they had received any experiences or activities of the project. A survey was an appropriate means to gather data as it was important to gather data from all the children involved in the study and to be able to analyse relationships between gender and perceptions (Gray 2014). It was also considered that a questionnaire was the most effective and consistent way to gather the data given the different locations involved (Matthews and Ross 2010).

This survey was composed of 26 checkbox questions and one free-text question. Designed by the project team in consultation with the researchers, the questions asked for views of the construction industry and what working in it might be like. Children were also asked whether they had any relatives in the industry and to identify their gender. Once the survey was conducted, the researchers were provided with an excel file containing the raw data.

The design of the questionnaire enabled the researchers to explore if there were differences in sentiment between girls and boys where gender is the independent variable. This enables the development of the null hypothesis: there is no difference in perception of the construction industry between boys and girls. A Chi Square test and a Mann-Whitney U-test were used with two questions: 'Is the construction

industry for someone like me?' And, 'how attractive is the industry?', respectively. An independent T-test was used with the combined means of seven Likert questions. In each case, differences in responses between boys and girls was tested.

FINDINGS AND DISCUSSION

Analysis focuses on whether there is a difference between male and female pupils' attitudes to the construction industry. It is important to emphasize the survey was carried out on the first morning of the first activity of the project. Thus, this is a measure of perception before the pupils had been exposed to any positive messaging about the industry. This paper reports part of those results: whether there is a gender-based differing perception of the construction industry and a construction career.

Is the construction industry for someone like me?
The pupils were asked the following: 'to what extent do you agree that the construction industry is for someone like you?'A Chi-Square Test of Independence was performed with the Likert responses collapsed into 'agree', 'disagree' or 'don't know'. The observed frequencies revealed that among female pupils, 10 believe the construction industry is for them, 12 believe it is not and 24 don't know. Among male pupils, 36 believe the construction industry is for them, 1 believes it is not and 11 don't know. The relationship between these variables was significant, $X\mathbf{2}(2, N = 94) = 28.802$, $p<.001$. Female pupils were less likely than male pupils to believe the construction industry was for someone like them. Many more females were unsure compared with males.

Is there a positive view of the construction industry?
Seven Likert-type questions on a four-point scale, with a fifth 'don't know' option were asked of the pupils to indicate a positive or negative view of the construction industry. The topics were: how dangerous construction is; if the work is varied; how dirty and messy construction might be; whether construction is a well-paid career, if it makes a positive impact on people's lives, if it changes the world in which we live, and, if construction is a creative career.

Taken in isolation, the questions reveal differences in opinions between males and females about the working conditions of the industry. Girls viewed construction as dirtier than boys (61% compared with 48%) and more dangerous (46% compared with 30%).

In terms of construction being a well-paid career, making a positive impact, being creative, the results are much closer. Both males and females had a positive view of pay in the construction industry (males = 78%; females 77%). Both males and females agreed that a construction career can be creative (males = 88%; females = 87%). Similarly, there was agreement that construction changes lives (males = 80%; females = 78%).

Across the seven Likert questions, females were more likely to answer 'don't know'. From the sample, 79.2% of males had a relative working in the construction industry while only 56.5% of females had a relative working in the industry. It could, therefore, be possible that more of the boys were better informed, through this contact, about the construction industry but it doesn't necessarily follow that this familiarity will be positive. Furthermore, it isn't obvious why school age males would have more relatives working in the industry than females.

The means of the seven Likert scale questions were used for an independent T-test to see if there was a difference across the seven Likert questions. Male pupils (n=48)

reported a more positive view of the construction industry (mean = 3.05, SD = .347) than girls (n=45) (M = 2.96, SD = .424). The difference between the genders is not significant. Both male and female pupils had a moderately positive view of the industry.

How attractive is a career in the construction industry?
At the end of the survey the pupils were asked 'based on what you know at the moment, how attractive to you is a career in the construction industry?'. Responses were given on a 10-point Likert scale where 1 is not attractive and 10 is very attractive.

A Mann-Whitney U-test showed that there was a significant difference (U= 399.5, p = <.001) between the responses of male and female pupils when asked how attractive a career in construction is. The mode rank for boys (n = 48) is 7 and 8 (12 responses each) and for girls (n = 46) the mode was 6 (10 responses). Boys view of a career in the construction industry is more positive than girls' view.

DISCUSSION

The survey analysis shows female pupils at the age of 13 or 14 hold the view that the construction industry is less suitable for them when compared with male pupils. This shows gendered ideas about suitable job roles take place early. For projects such as this, it also shows children are starting not with a blank canvas, but with preconceptions to manage and overcome. Whether these preconceptions come from home, education or elsewhere cannot be explored here and these may manifest in informal networks and connections that influence careers (Gabler 2021). But the data does show a difference between girls and boys in the way they perceive the construction industry before they know very much about it. Given that boys have a more positive disposition towards the construction industry at this age, they are more likely to take an interest in construction career opportunities. The mandated 50:50 ratio of boys and girls was anticipatory of these gender-based perceptions, as left to their own devices the schools and pupils were deemed more likely to have formed a male dominated cohort.

Overall, females tended to regard the construction industry as 'not for someone like them'. Boys were much more likely to consider construction as an attractive career prospect than were girls. Interestingly, the prospect of well-paid work was not enough to tempt the girls to consider construction as a realistic career choice, although they are comparable to boys in their view of the industry making a positive difference. Other larger surveys have shown that, for females, earning potential was one of the construction sector's appealing factors (Redrow 2024). Construction has the smallest gender pay gap (ONS 2024) and communicating that fact to females should be a goal of the project.

The positive impact of diversity on business productivity and profitability is well known. The business case for gender diversity on executive teams has more than doubled over the past decade Companies in the top quartile for both gender and ethnic diversity in executive teams are on average 9 percent more likely to outperform their peers (McKinsey 2022). However, it is not just a case of numbers and representation, it requires a corporate mind shift to truly realise any benefits. The 'add women and stir' approaches of early gender and development efforts failed to consider the influence of gendered relations of power and gender norms on the achievement of gender equality (Datzberger and Le Mat 2018). Our analysis shows females already

feel differently about the industry, long before they could join it. Diversifying the senior leadership of the construction industry is different and somewhat remote from gender equality for those entering the industry at the bottom.

Gendered occupational segregation amplifies the risk that women will lose the most from the climate transition. Male-dominated sectors, such as electricity, construction and manufacturing, are likely to see the biggest increases in jobs over the next 10 years. Climate transitions will increase labour market disparities and gendered inequalities in the long term based on the current trajectory. Historically, in economic and societal transitions, gender justice has often been overlooked leading to the marginalisation of women and the exacerbation of existing inequalities. Therefore, in the green transition there is recognition that greater equality and inclusion are key to social justice and just transition, as gender diversity also contributes to more innovative and inclusive solutions (Mininni and Hiteva 2023). Our analysis shows females do believe the construction industry can make a positive impact, but they are less sure, compared to males, about whether they themselves will be a part of this impact.

CONCLUSIONS

The real value of the project which has been the basis of this study will be revealed over time and is not yet known. The initial survey reveals that, even at a young age, male and female pupils have different views on the construction industry as a career. That females find it less attractive is not surprising given what we know, but the baseline for the project has now been set empirically. Our small sample size and geographic clustering are limitations on generalisation, and we have not ascertained where current attitudes have come from. Future funding may allow this to happen, and to expand the reach of the programme and our accompanying research.

The ability to access relatively young people, years before they will commit to a career, and to ask about how they perceive the construction industry has provided a view that might not be surprising: males and females have different views. Construction performs very poorly for female representation. These findings function as a cautionary tale to the construction industry. The promise of green skills remains high, and women have the skill set to thrive and earn well in "decent jobs" (ILO 2012), but their view of the industry already formed at such an early age is a barrier to address. That it should clearly be exhibited in this 2025 study is indicative of how much work remains to be done.

It will be interesting to see whether, and to what extent, the project is able to encourage the children to modify these gender-based perceptions. This would encourage girls to consider more widely their choices for their post-school employment than they may otherwise have done.

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