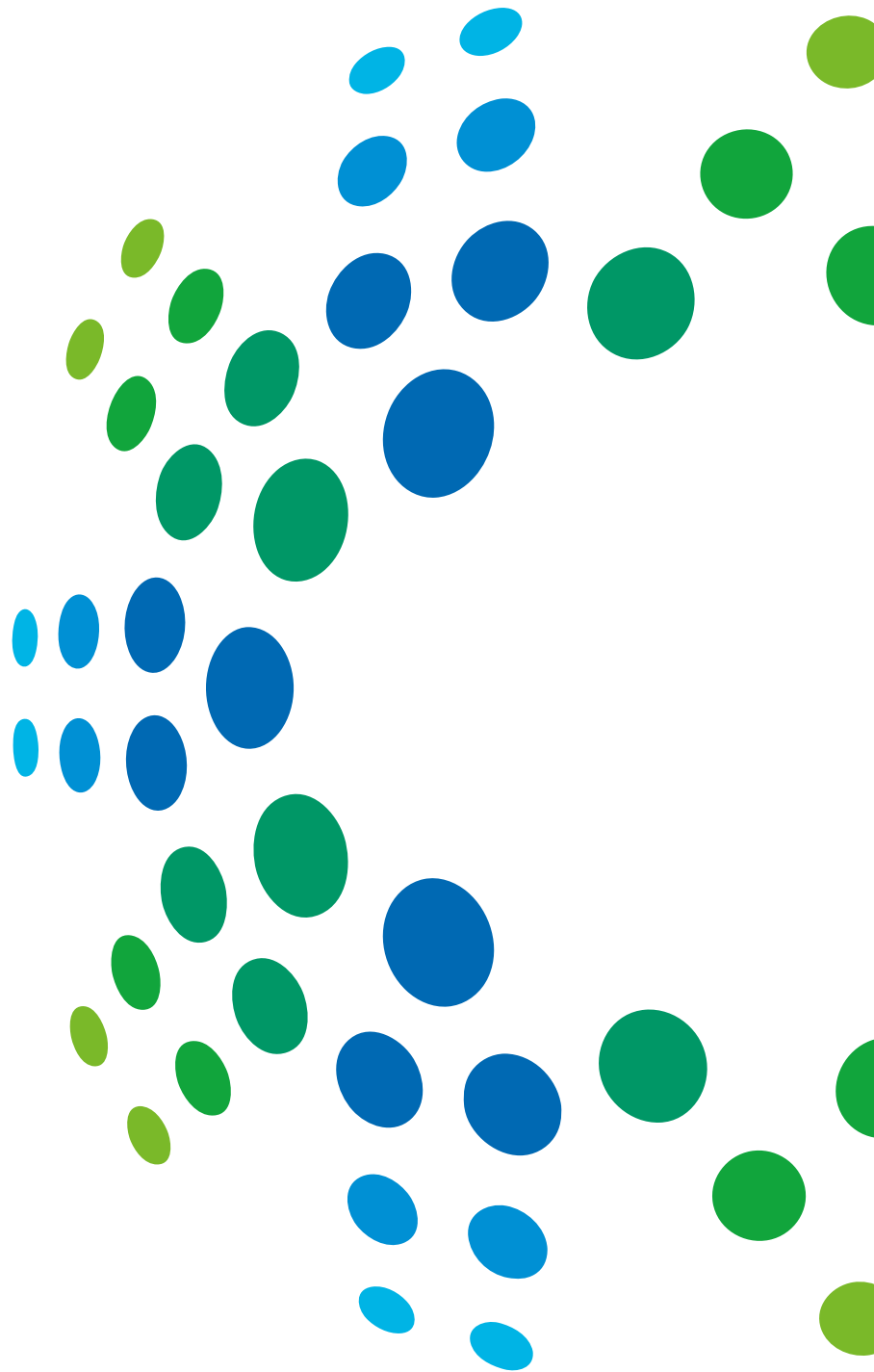


EngineeringUK

Engineering Brand Monitor

Parents and students



Engineering Brand Monitor - Parents and students

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Foreword

As the world emerges from the disruption caused by the Covid-19 pandemic, the need for engineering talent is intensifying. Ambitions to 'level up' the country and make the UK a science superpower and an innovation nation will be hugely dependent on our engineering and tech workforce, as will achieving net zero by 2050. Yet the young people who will become tomorrow's engineers have had their education and careers provision worryingly disrupted.

If we are to ensure that more young people from more diverse backgrounds consider a future in STEM and engineering, it's important to understand their current perceptions, interests and aspirations. We also need to understand more about one of their key influencers: their parents. That's why in 2021, for the first time, our Engineering Brand Monitor survey was conducted in a way that linked 4,000 parent and child responses.

More than half of young people say they know about the things engineers do, and that they are interested in pursuing a career in engineering

We found that young people's perceptions of engineering strongly relate to their parents, the extent to which they have experienced careers activities and their demographic backgrounds.

Young people whose parents said they know what engineers do were more than twice as likely to express an interest in an engineering career than those whose parents said they did not. Unfortunately, just 56% of parents agreed they know about the different types of things engineers could do in their jobs. Given how many parents there are, it's hard to imagine how we can help them all to understand what engineers do – but organisations concerned about the future of engineering, or simply wanting to ensure that all children can access valuable careers, could be doing more to help parents in this way.

More than half of young people say they know about the things engineers do, and that they are interested in pursuing a career in engineering - though only two-fifths know how to get into engineering. Strikingly, we found that the rates of young people reporting knowledge of what engineers do, feeling engineering fit well with who they were, and an interest in pursuing a career in the profession were 40% to 60% greater for those who had attended a careers event with an employer in the past 12 months than those who had not. This provides a strong argument for ensuring that there is more provision of these experiences.

More boys than girls see engineering as a good 'fit' for them and express interest in a career in engineering, a contrast that may be exacerbated by the finding that two-thirds of girls felt that girls face more barriers to getting ahead in engineering than boys. Similarly, more barriers were perceived for those from

ethnic minority backgrounds and socially disadvantaged groups than their counterparts. This mirrors underrepresentation in the workforce and continues to highlight the need for more to be done to ensure engineering is, and is seen as, an inclusive career for all.

At EngineeringUK, we've adapted all of our activities to be more inclusive and increased our targeting to young people from groups underrepresented in engineering, with bursary support for priority schools. Our Neon platform enables teachers to find engaging and relatable activities for their students. We're evaluating, learning and adapting as we go and sharing our learnings with organisations with aligned goals. We are delighted to deliver The Tomorrow's Engineers Code on behalf of those organisations to create a community of practice around shared pledges to work together to deliver coordinated, impactful and inclusive activity. If you are not already a Signatory or Supporter, please join us.

We hope that the insights from this report encourage and enable government, industry and all supporters of engineering and technology into action to deliver more and more equitable STEM careers provision and outreach – and in doing so, to ultimately grow the talented and diverse engineering workforce essential to our future.

Executive Summary

The Engineering Brand Monitor (EBM) is an annual survey of the knowledge, perceptions and understanding of engineering of young people, their parents, and teachers. In 2021, for the first time, responses from parents and young people aged 7 to 19 were linked together and the association between them examined. The survey was completed by 4,317 child-parent pairs between 14 April and 11 May 2021.

This report details results from the young person and parent survey, with a particular focus on 4 main outcomes related to young people's:

- **Knowledge about what engineers can do in their jobs**
- **Image of engineering**
- **Perception that being an engineer 'fits' well with who they are**
- **Interest in a career in engineering**

A separate report on the responses of teachers can be found on the EngineeringUK website at www.engineeringuk.com/teachersebm

Capability, opportunity and motivation

Guiding our analysis is the notion that for young people to develop knowledge, positive perceptions about, and aspirations towards engineering, they first need the **capability, opportunity and motivation to do so. This report is structured around these 3 aspects.**

Capability

For young people to start to consider engineering as a career option for themselves, they need to have, and to be confident that they have, the capability to do so.

- Young people who thought they were good at, and enjoyed, maths and science subjects at school were more likely to say they know what engineers can do in their jobs, have a more positive image of engineering, report that being an engineer fits with who they are, and say they are interested in pursuing a career in engineering in the future.
- For example, 68% of those who enjoyed science said they know what engineers do, compared to just 28% of young people who said they didn't enjoy science.

Opportunity

Young people also need to know what opportunities are available to them to pursue engineering – and an accurate understanding of the full breadth and variety of engineering to assess whether these opportunities are right for them.

- Overall, 55% of young people said they know about the different types of things engineers can do in their jobs. This was notably lower than the proportion who said the same of scientists (63%) or those working in technology (64%), suggesting that though there is more work to be done to improve young people's understanding of STEM careers, with lack of knowledge being particularly acute for engineering.

Our results clearly highlighted a need to improve young people's understanding of the educational pathways they would need to pursue if they wanted to be an engineer.

- Just 2 in 5 young people said they know what subjects or qualifications they would need to take next to become an engineer.
- Over a quarter of young people said they were not knowledgeable at all about the different apprenticeship options available to them. And the majority (66%) of young people did not know what T levels were.

Engagement with careers activities appeared to be particularly important in fostering knowledge and interest in engineering.

- For example, young people who had attended a careers event with an employer were much more likely to report knowledge of what engineers do (75% compared with 53%), feeling engineering fit well with who they were (67% compared with 41%), and an interest in pursuing a career in the profession (71% compared with 48%) than those who had not attended such an event in the past 12 months.

Motivation

Finally, to be able to pursue engineering, young people need to have the motivation to do so: they need to see engineering as a suitable career for themselves and to wish to pursue it.

- Half of young people (52%) said that they think engineering would be a suitable career for them, 44% said that being an engineer fits well with who they are, and 75% of young people said that if they wanted to, they could become an engineer.
- Young people's aspirations relating to engineering careers were generally high, with 51% of young people saying they were either

interested or very interested in pursuing a career in engineering. However, around a fifth of young people (21%) said they were not interested or not at all interested.

Demographic differences

One of the most pressing issues facing the engineering community is the wide disparity in participation in engineering careers according to a person's demographic characteristics. We explored how young people's experiences, interests and aspirations relating to engineering differed by their demographic characteristics, in particular their gender, ethnicity, social background and disability status.

Gender:

Currently, just 16.5% of people working in engineering are women¹. But to what extent is this disparity preceded by gender differences in experiences, interests and aspirations expressed in childhood? We found that boys provided consistently more positive responses than girls when asked about their knowledge, image, 'fit' and overall interest in engineering. This is an enduring trend, and previous iterations of the EBM have found similar gender differences in responses. Despite some improvement, there remains much to be done to create equally positive perceptions about – and aspirations towards – engineering among both boys and girls.

- A significantly higher proportion of boys said they knew about the different types of things engineers can do than girls (61% compared to 48%).
- A much higher proportion of boys said being an engineer fits well with who they are (53% compared to girls (35%))

¹ EngineeringUK analysis of the Labour Force Survey 2021

- While nearly two-thirds of boys said they were interested in a career in engineering (63%), just 2 in 5 girls said the same (39%).
- 63% of young people either agreed or strongly agreed that girls face more barriers that make it harder for them to get ahead in engineering than boys. Girls were more likely to agree with this statement, with 68% of girls agreeing compared to 57% of boys.
- Over a third (34%) of young people either agreed or strongly agreed that boys would make better engineers than girls. Overall agreement was much higher among boys, with 40% of boys agreeing compared to 27% of girls.

Ethnicity:

While ethnic minority students, in general, are more likely to pursue STEM degrees, with 28% of engineering students in HE from ethnic minority backgrounds², just 11% of people working in engineering are from ethnic minority backgrounds compared to 13% in the overall workforce³. There are also large differences in participation in engineering education and careers when looking across more specific ethnic groups.

- Two-thirds of Asian young people (67%) said they knew about the different types of things engineers can do, compared with just 54% of white young people and just under half of young people from mixed or multiple ethnic groups (49%).
- 43% of white young people said they think being an engineer fits well with who they are, compared with around half of Asian young people (52%).
- For white young people, there were substantial differences in proportions of girls and boys reporting fit with engineering

careers. For young people from ethnic minority backgrounds, however, there were no gender differences in perceptions of 'fit.'

- Interest in a career in engineering was lowest among white young people and those from mixed or multiple ethnic groups (51% and 50%) and highest among Asian young people (67%).

Social background:

Young people's social background has also been linked to participation in STEM and engineering. Young people whose parents were both highly educated (degree level or above) and had a higher income (£40k+) had the most positive responses related to knowledge of and interest in engineering careers. This is key because we know that there is a lack of opportunity for social mobility in the UK⁴, and encouraging young people from all backgrounds to consider a career in engineering has a role to play in addressing this.

69% of young people with parents who have a higher income and are more highly educated said they know what engineers do, compared to 48% of young people whose parents had lower income and education levels.

59% of young people whose parents had higher income and education said that being an engineer would fit well with who they are, compared to 37% from low income and education families.

65% of young people from a higher income and level of education family said they were interested in a career in engineering, compared to 43% of young people from a lower income and level of education family.

² Advance HE. 'Equality in higher education: students statistical report 2020' [online], accessed 18 August 2021

³ EngineeringUK analysis of the Labour Force Survey 2021

⁴ Social Mobility Commission. 'Social Mobility Barometer 2021' [online], accessed 26 August 2021

Disability status

Just 11% of people working in engineering occupations are disabled, compared to 15% of people working in other industries⁵.

However, whether young people were disabled or not was not associated with any of the 4 outcomes. Disabled young people were just as likely to report positive perceptions of, and high aspirations towards, engineering as non-disabled young people.

Parental influences

For the first time this year, the Engineering Brand Monitor survey was conducted in a way that allowed parent and child responses to be linked, enabling us to assess the extent to which there is an association between young people's views and that of their parents.

- 55% of parents agreed that it was important to them that their child engages with STEM activities outside of school. Fewer parents (36%) said that they and their child regularly do STEM activities together and just 39% said that they are confident giving their child advice about careers in engineering.
- 78% of young people whose parents said they regularly do STEM activities with their child said they were interested in a career in engineering.
- Nearly 9 in 10 young people whose parents said they were confident giving their child advice about careers in engineering said they were interested in a career in engineering.
- Young people who had at least one parent who worked in a STEM field had more positive responses against all outcomes compared to those who did not. They were more likely to say they know what engineers can do in their jobs, had a more positive view of engineering, were more likely to see engineering as a career that 'fits who they are', and were more likely to say they were interested in a career in engineering.

Recommendations

Our research illustrates the ongoing need to level the playing field regarding STEM careers and education so that all young people – regardless of their gender, ethnicity, social background and disability status – have the confidence that they have the capability to become an engineer, and increased aspirations to do so. It also highlights areas for improvement in relation to careers provision and education and makes recommendations for the engineering sector and policymakers around 5 key themes.

Diversity in engineering

The STEM community and those engaging with young people in careers advice must support all young people to feel confident in their capability to become an engineer, especially girls, students from underrepresented minority ethnic groups, disabled young people and those from socioeconomically disadvantaged backgrounds. We would like to see the community better understand what works for different groups, develop more programmes and activities aimed at the groups currently underrepresented in the engineering profession, and promote the engineering workforce as an inclusive and diverse environment.

Our results show that young people perceive that barriers still exist for women, ethnic minority groups and people from socially disadvantaged backgrounds in getting into engineering, and more work needs to be done to break down these barriers to inclusion to make engineering a more attractive future career for young people. We must be mindful of the differential outcomes of certain groups as they move through education and the workforce – for example, that whilst young people from certain minority ethnic groups

⁵ EngineeringUK analysis of the Labour Force Survey

have a more positive image of engineering than their white peers, they are underrepresented in the workforce. This, alongside the underrepresentation of disabled people in the workforce - despite there being no differences between the perceived knowledge of and interest in a career in engineering - warrants further investigation.

Access to STEM activities

We recommend that engineering employers work together to enable more schools and colleges to offer the opportunity for their students to participate in STEM inspiration and careers activities that provide a positive view of engineering and showcase the breadth of jobs available in the sector. To enable schools and colleges to engage more with employers, we also recommend that government provides increased and ongoing investment in careers provision in schools and colleges.

Our findings show there is a strong association between engagement in STEM activities and an interest in a future career in engineering, but access to such activities varies between schools, with those with higher numbers of pupils eligible for free school meals less likely to run STEM activities⁶. We also highlight that young people who have taken part in STEM activities involving employers have significantly higher knowledge of what engineers do and more aspirations to be an engineer than their peers. It is important that employers engage more with schools and their students to foster and encourage a better understanding of and interest in the career.

Increasing knowledge of vocational opportunities and apprenticeships

We recommend that government works closely with the engineering community and schools and colleges to improve the knowledge amongst young people of the different routes into engineering. We also urge government to run a public awareness programme targeted at parents, young people and employers promoting T levels ahead of other qualifications coming offline to ensure that young people are aware of how they differ from other vocational options.

The majority of young people surveyed (60%) said they did not know what subjects or qualifications they would need to take next to become an engineer. It was also clear they had limited understanding of the vocational routes available to them more broadly, with over a quarter (27%) saying they were not knowledgeable at all about the different apprenticeship options available to them. And while it might be expected that fewer young people would have comprehensive knowledge about T levels, given this is a new qualification only recently introduced, we were surprised to see that the majority (66%) of young people did not know what T levels were at all. Young people cannot make informed choices if they do not know what subjects they need to study to pursue engineering or the different pathways into the profession. It is therefore imperative that education on routes into engineering is clear and accessible to young people and their influencers.

⁶ Engineering Brand Monitor 2021, STEM secondary teachers report, EngineeringUK

Showcasing the breadth and variety of engineering

Engineering is an industry that requires people with a wide breadth of skills and offers a diverse range of careers and the engineering community must work to promote this. Highlighting the relevance of engineering in relation to issues that are of importance or interest to young people such as environmental sustainability and computing/gaming is likely to make a career in engineering more attractive to more young people.

This could include sustained campaigns such as 'This is Engineering', 'The Big Bang Fair' and 'Engineer a Better World' that challenge stereotypes. Furthermore, engagement programmes could be developed that highlight the need for creativity and leadership skills in the engineering sector.

Supporting parents with STEM careers information

We recommend that more work is done to provide parents with accurate and detailed careers information through, for example, affordable and accessible STEM activities that parents can participate in with their child. These could be facilitated via schools or other channels.

Our findings show the strong association between parents' understanding, knowledge, and perceptions of engineering and that of their children's, and the key role they have to play in providing careers advice. As such, accurate, clear and detailed careers information must be available to and accessible for parents and carers (as well as teachers). This should include targeted work to engage parents of poorer socioeconomic backgrounds, who we know often have lower STEM capital than those from higher socioeconomic backgrounds.

Further research

In addition to the recommendations above, we would like the STEM community and government to better understand some of the differences that exist in terms of aspirations in relation to a career in STEM and look to develop programmes and activities to ensure that all young people, whatever their background, gender or ethnicity may be, consider a STEM career to be a possibility for them.

- We would like government and the STEM community to better understand what drives young people's enjoyment of STEM subjects and look to develop approaches that will lead to more young people, particularly girls, pursuing STEM subjects in school.
- We would also like government and the STEM community to look in more detail at what drives differences in aspirations between girls of different ethnic groups and use this knowledge to develop programmes and projects that will inspire more young women from all ethnic backgrounds to take up a career in STEM and engineering.

1. Introduction

In 2021 EngineeringUK surveyed over 4,000 young people aged 7 to 19 and their parents, as well as over 500 teachers across the UK, as part of the annual Engineering Brand Monitor (EBM) survey. The survey aimed to understand perceptions and understanding around engineering, as well as aspirations and intentions to pursue engineering as a career, and how parents and teachers can influence these aspirations.

While the EBM has been run by EngineeringUK since 2010, significant changes were made to the survey content and structure this year. In 2021, for the first time, parents were asked to answer questions about their perceptions of engineering, professional backgrounds, and how much they engage in careers activities with their child, before handing the survey over to their child to complete. This means that responses from parents and young people to the EBM can be linked and the association between responses from each examined.⁷

This report details results from the child and parent survey, with a particular focus on 4 main outcomes related to young people's perceptions of, and aspirations towards engineering:

- Knowledge about what engineers can do in their jobs: the extent to which young people know what an engineering career involves, and what they could do day-to-day as an engineer
- Image of engineering: whether young people have an overall positive or negative view of engineers, their contribution to society, and what a job in engineering would be like
- Perception that being an engineer 'fits' well with who they are: whether young people see themselves as engineers or not

- Interest in a career in engineering: young people's self-reported interest in becoming an engineer in the future

Many interventions that engage young people in STEM focus on improving young people's knowledge about STEM and engineering, their image of engineering, their perception that they are suited to engineering, and their reported likelihood of pursuing engineering in the future as outcomes. The COM-B framework, described in more detail in section 1.1, offers a route to explore why some young people develop positive aspirations towards engineering, and why others do not.

While the last outcome focuses specifically on young people's intentions to pursue engineering, all outcomes are considered vitally important in young people's development of positive aspirations towards engineering as a career.⁸

For each outcome, we first consider the relationships between the young person's demographic characteristics and social background. This analysis is intended to reveal specific areas where interventions and outreach activities may most effectively reduce disparities in participation and ultimately make engineering a more diverse workforce. For some characteristics, for example, clear differences in perceptions and aspirations are likely to drive differences in later participation. However, for others it would seem these are not the main barriers to pursuit of a career in engineering, and a lack of associations point to potential barriers later on in the education or career pipeline.

Guiding our analysis is the notion that for young people to develop knowledge, positive perceptions about, and aspirations towards engineering, they first need the capability, opportunity and motivation to do so. This report is structured around the COM-B framework, with sections relating to each aspect of the model.

⁷ We recognise that in obtaining paired data, this may have limited the sample of young people surveyed to those whose parents were also willing to be surveyed. However, we expect this effect to be fairly minimal, since some level of parental involvement is always necessary in research with young people due to the requirement of parental consent for those aged under 16.

⁸ The full data tables relating to children, parents and teacher responses to each question can be found on the EngineeringUK website at www.engineeringuk.com/ebmdata

1.1 The COM-B model of young people’s aspirations and pursuit of engineering careers

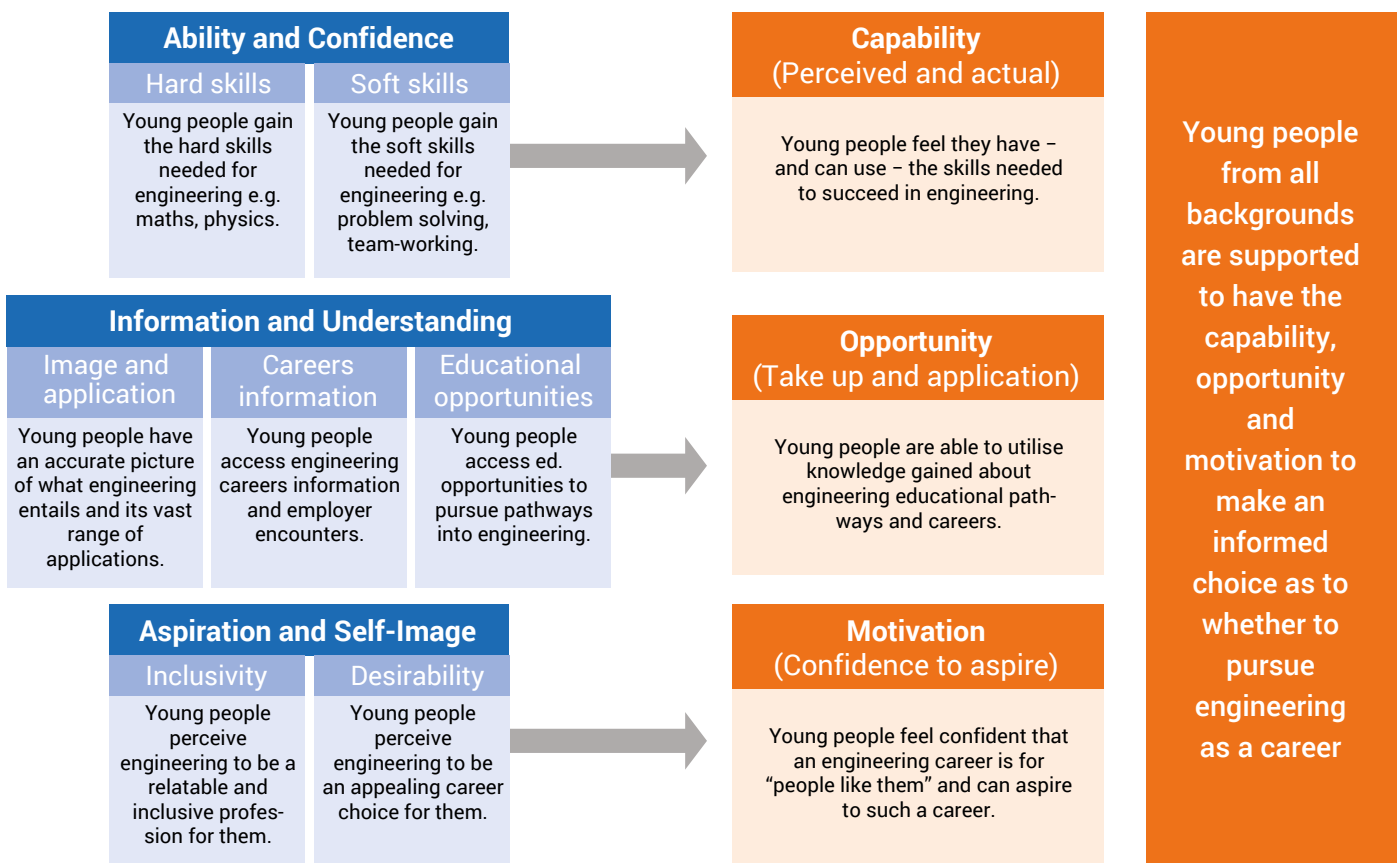
Efforts by government, employers and STEM outreach providers to deliver quality careers information and STEM inspiration often seek to encourage more young people from more diverse backgrounds to decide to pursue STEM education and careers. But we know that there is a wide range of complex factors that can influence young people’s decisions, and an important starting point is to understand the determinants of these choices.

The factors affecting decision making can be organised according to the COM-B model, a framework for understanding the processes that shape individuals’ behaviour⁹. According to the COM-B framework, Behaviour is a function of an individual’s:

- psychological or physical **Capability** to carry out the behaviour (for example their knowledge or skillset)
- **Opportunity** for the behaviour afforded by the physical and/or social environment (such as social support and availability of information)
- automatic and reflective **Motivation** to enact the behaviour, where automatic refers to their emotions and drives, and reflective refers to their planning and intentions

The COM-B framework is a useful reminder that the provision of careers education and engineering engagement will be most effective in increasing engineering participation if it is underpinned by a coordinated effort to address the multitude of factors that shape decisions. Changes in behaviour hinge not only on increasing opportunities for young people in engineering but also on instilling in young people the motivation and capabilities to succeed in these fields.

Figure 1.1 EngineeringUK impact framework for engineering outreach



⁹ Michie, S. et al. ‘The behaviour change wheel: A new method for characterising and designing behaviour change interventions’, Implement. Sci., 2011.

As discussed in further detail in the Educational Pathways into Engineering report¹⁰, there are multiple and complex factors that enable or limit the pathways for young people into engineering, including, for example, limited knowledge or perceptions of engineering, subject choices and academic attainment, science capital¹¹ and key influencers (such as parents and teachers)¹². These factors broadly relate to young people's own capabilities, the opportunities they have access to and know about, as well as their individual motivations. In order to support young people and provide equal opportunities, the engineering community should collaborate to address all these components to ensure equal opportunities for all.

1.2 Methodology

Survey development and cognitive testing

In 2020, EngineeringUK commissioned AdvanceHE¹³ to review and redevelop its existing EBM surveys to ensure the questions being asked of young people, parents and teachers were indeed capturing what they intended to measure and aiding understanding of how to inspire more and more young people from diverse backgrounds into engineering.

To do so, Advance HE carried out extensive cognitive testing with 30 young people aged 7 to 19 and 21 parents with children between those ages. The interviews aimed to test:

- **Comprehension:** Researchers asked interviewees if they understood the question-and-answer options, and if there were there any words in the questions or options they did not understand

- **Ability to provide a valid and accurate answer:** Researchers tested whether participants were able to answer the question, whether their answer was listed among the question options, and whether their answer accurately captured their reasoning or thought processes. For some questions, interviewees were either probed to talk about their reasons for choosing an answer or volunteered additional information to qualify their answers. Researchers looked out for inconsistencies in the explanation different respondents gave for similar answers, for example, if 2 respondents chose the same response option but went on to express opposing viewpoints

- **Cognitive load/effort:** Researchers recorded whether participants took a long time to answer the question or hesitated before giving their answer. Interviewees were asked explicitly whether they found each question hard to answer. If questions are very difficult for participants to answer, this may be reflected in a lack of coherence in responses or may cause participants to discontinue the survey

The previous EBM survey was adapted and modified based on this research. For many of the questions wording was adapted and options added (or removed) based on the feedback and responses of participants. While this means that not all questions can be compared like-for-like with previous versions of the EBM, the reliability and validity of questions to measure constructs of interest has been strengthened.

¹⁰ EngineeringUK Educational Pathways into engineering, 2020

¹¹ The concept of 'science capital' was developed by Professor Louise Archer and colleagues from the ASPIRES (now ASPIRES 2) project in order to understand the underrepresentation of certain social groups in post-16 science and their perception of science being 'for me'. Science capital refers to the science-related knowledge, attitudes, experiences and resources one acquires in life. See Archer, L. et al. "Science capital": A conceptual, methodological, and empirical argument for extending bourdieusian notions of capital beyond the arts', J. Res. Sci. Teach., 2015.

¹² EngineeringUK. 'Educational Pathways into Engineering', 2020.

¹³ Advance HE is a member-led, sector-owned charity that works with institutions and higher education across the world to improve higher education for staff, students and society.

Fieldwork

One major change to the questionnaires in 2021 is that the parent and young people responses are linked. The parents answered a 10-minute questionnaire, including demographic information and their views on engineering, then handed the survey to one of their children to complete.

EngineeringUK commissioned Everfi UK to manage the fieldwork process for each audience, and Everfi, in turn, subcontracted Kantar Public UK to deliver the fieldwork for young people and their parents, using Kantar's research panels to identify respondents. The survey was completed by 4,317 child-parent pairs, and fieldwork was open between 14 April and 11 May 2021. There were quotas for young people's age, gender, nation, as well as parent's household income. These quotas were intended to ensure a representative spread across the UK and among young people from diverse backgrounds.

Once fieldwork closed, EngineeringUK worked with Everfi UK¹⁴ to develop and apply weights for the data to ensure the sample was representative of certain characteristics of interest of the UK population. The weighting used the Labour Force Survey to identify the characteristics of parents in the UK, and a target weighting approach was used, using UK nation, gender and qualification (university education/no university education) of parents to match the population of the EBM sample to the population of UK parents. Young people in the survey were not weighted separately, as EngineeringUK ran tests on the effect of weights on young people and found the post-weight population to be broadly representative of the population of young people in the UK.

Analysis

For the majority of analysis in this paper, descriptive statistics are presented, with simple tests of association (Pearson's chi-squared or T-tests, where appropriate) used to test whether associations were statistically significant. All relationships shown in this paper were statistically significant unless it is explicitly stated otherwise. The error bars displayed on charts show the 95% confidence intervals surrounding the estimate. These may sometimes be overlapping slightly where the Pearson's chi-squared or T-test is identifying a significant difference between groups.

Associations

In this paper, we talk frequently about the associations between 2 or more factors. What we mean by this is that the 2 factors are related to one another. For example, young people's perception of their ability in science is associated with their interest; young people who thought they were good at science were more likely to say they were interested in a career in engineering compared to young people who did not think they were good at science. If there was no association, young people's responses to the question about their interest in a career in engineering would be the same whether or not they thought they were good at science.

What we cannot say with this analysis is whether one factor causes another. Using the example above, we cannot say that perception of ability in science causes greater interest in a career in engineering. Or that, if young people's perception of their ability increased, they would be more likely to want to pursue a career in engineering. This is because we cannot directly test what would happen to the same young people if we could influence their perception of ability, and nothing else.

¹⁴ Everfi UK is a technology company committed to driving social impact through education. Everfi UK is the current name of the organisation previously known as EdComs, who have over 35 years' experience working in the classroom and the community.

2. Demographic differences

There are wide disparities in participation in engineering careers according to a person's demographic characteristics. To date, much of the focus has been on gender disparities in engineering, which are particularly large, but there have also been increasing efforts to document the underrepresentation of people from certain ethnic groups, social backgrounds, and disabled people in engineering education and careers. Currently, just 16.5% of people working in engineering are women (compared to 47.7% of the overall workforce), and just 11.4% were from an ethnic minority background (compared to 13.4% in non-engineering occupations)¹.

Increased workforce diversity improves innovation, creativity, productivity, resilience and market insight. Given the important societal issues many engineers seek to solve, improving the diversity of the workforce is likely also to diversify the beneficiaries of engineering products and services to those groups who are currently underrepresented in engineering.

To understand why these inequalities occur and persist, we first need to understand whether they are preceded by differences in attitudes towards, and perceptions of, engineering in childhood. Through understanding this we can pinpoint where interventions would be best applied to help to diversify engineering as an industry, whether interventions need to start early at school, or whether events later on in educational and career pathways lead to underrepresentation of certain groups of people (or both).

This section details to what extent responses regarding:

- Knowledge about what engineers can do in their jobs
- Image of engineering
- Perception that being an engineer 'fits' well with who they are
- Interest in a career in engineering

are associated with young people's demographic differences. In other words, how do young people's perceptions of, and aspirations towards engineering differ by, for example, their gender?

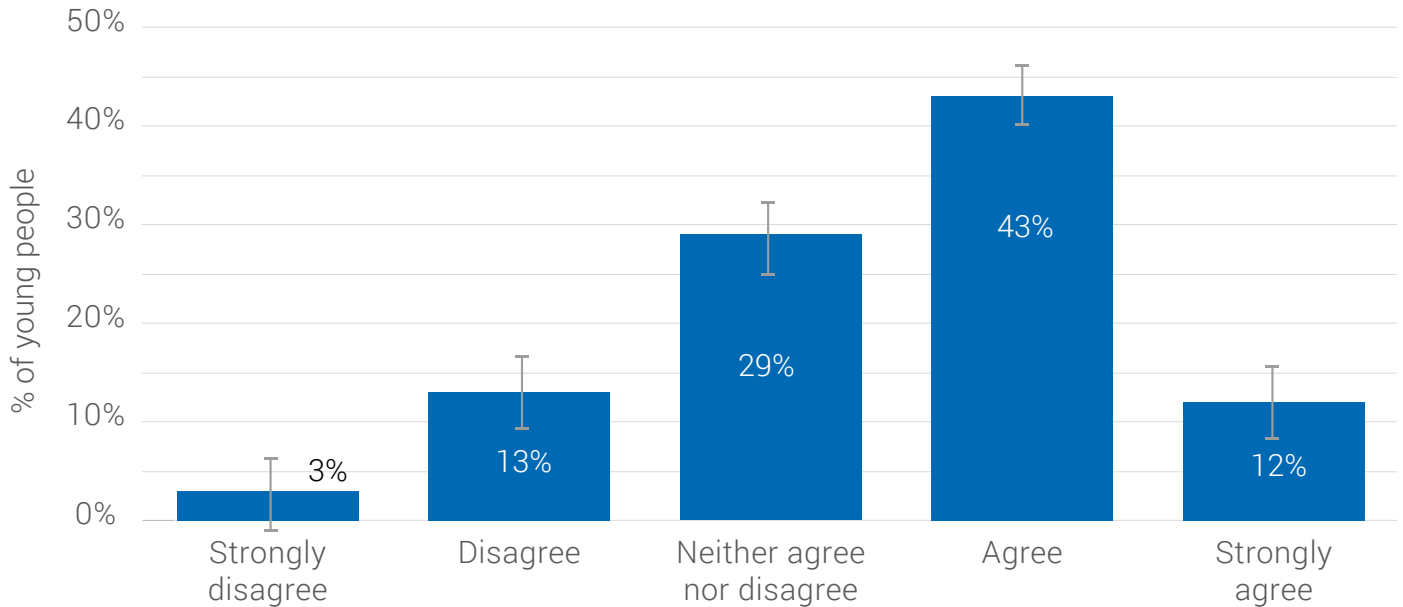
2.1 Knowledge about what engineers can do in their jobs

The first key outcome considered in this report is the extent to which young people know what engineers can do in their jobs. Knowledge about a career, and what's involved in a job, is an important first step in the development of career aspirations. Teacher, parent, and outreach efforts to develop young people's knowledge about what engineers can do can also help to ignite aspirations for engineering among young people who had no previous knowledge or to dispel negative connotations young people may have related to engineering careers¹⁵.

Young people were asked how far they agreed or disagreed that **'In general, I know about the different types of things the following people can do in their jobs: engineers'**. Overall, the majority of young people, 55%, said they agreed (43%) or strongly agreed (12%) with this statement. 16% of young people disagreed (13%) or strongly disagree (3%), and just under 3 in 10 (29%) said they neither agreed nor disagreed.

¹⁵ Sheldrake, R. 'Changes in children's science-related career aspirations from age 11 to age 14. Research in Science Education,' 2020.

Figure 2.1 Proportion of young people who agreed or disagreed that 'In general, I know about the different types of things the following people can do in their jobs: engineers'



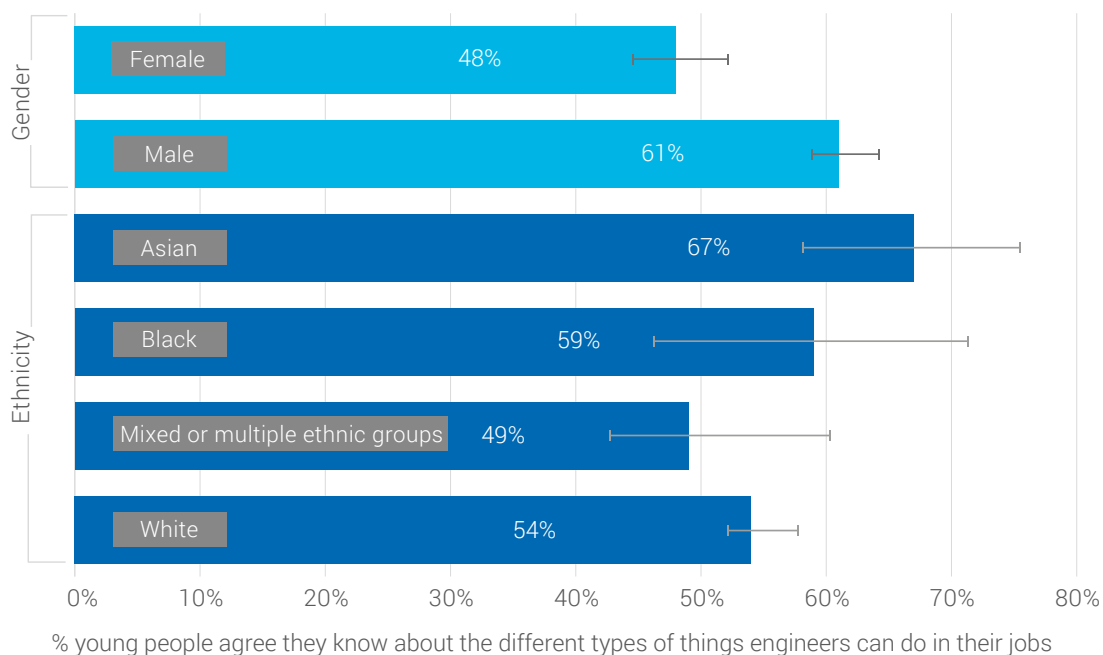
Source – EngineeringUK Engineering Brand Monitor 2021

Q - In general, I know about the different types of things the following people can do in their jobs: Engineers. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'.

While there were no differences in reported knowledge about what engineers do by young people's age group, disability status or country of residence (England, Scotland, Wales and Northern Ireland), there were significant differences by gender and ethnicity. A significantly higher proportion of boys said they knew about the different types of things

engineers can do than girls (61% compared to 48%). Similarly, two-thirds of Asian young people (67%) said they knew about the different types of things engineers can do, compared with just 54% of white young people and less than half of young people from mixed or multiple ethnic groups (49%).

Figure 2.2 Proportion of young people who agreed that they know about the different types of things engineers can do in their jobs, by gender and ethnicity



Source – EngineeringUK Engineering Brand Monitor 2021

Q - In general, I know about the different types of things the following people can do in their jobs: engineers. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree.'

Social Background

Social background is a complex concept to measure quantitatively. Young people’s parents were asked about their own or their partner’s

highest educational qualification, and their household income. For this report young people were split into 4 groups:

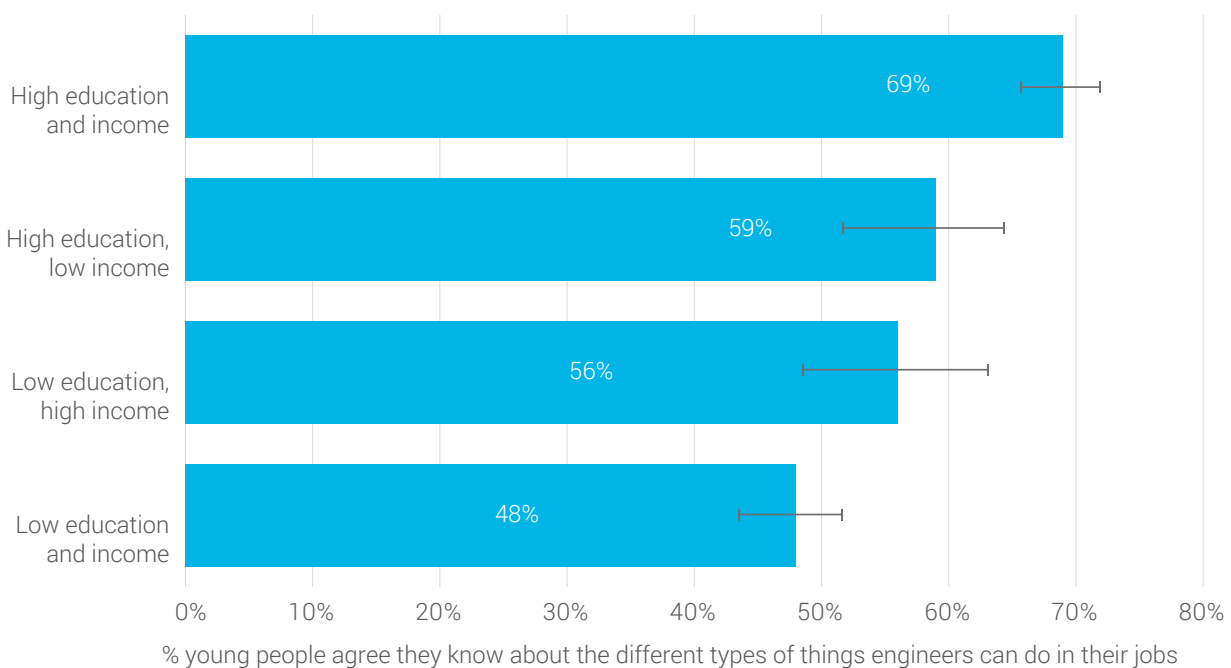
Name	Description	% young people in the sample
High education and income	Young people who had at least one parent with a degree or higher qualification, and had a household income above £40,000 per year	41%
High education and low income	Young people who had at least one parent with a degree or higher qualification, and had a household income below £40,000 per year	11%
Low education and high income	Young people for whom neither parent had a degree or higher qualification, and had a household income above £40,000 per year	22%
Low education and income	Young people for whom neither parent had a degree or higher qualification, and had a household income below £40,000 per year.	26%

Where young people were growing up in a lone parent family, 'at least one/neither parent' is substituted with 'a/their parent.'

The aim of combining measures of parental education and household income in this way was to tease out the relationship between a young person's views and their parent's academic knowledge and related capital versus material resources (as measured through household income).

Social background was also associated with knowledge about what engineers do; 69% of young people from a high income and highly educated background said they know what engineers do, compared to 48% of young people whose parents had low income and education levels.

Figure 2.3 Proportion of young people who agreed that they know about the different types of things engineers can do in their jobs by social background



Source – EngineeringUK Engineering Brand Monitor 2021

Q - In general, I know about the different types of things the following people can do in their jobs: engineers. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree.'

2.2 Positive image of engineering

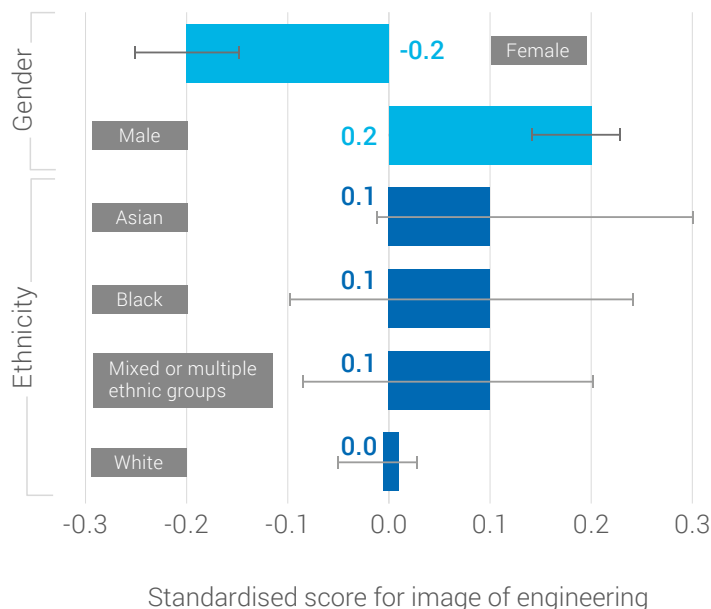
Young people’s image of engineering was measured by combining responses to the following 4 statements:

- I see lots of examples of engineering in my everyday life
- Engineering is a career that would allow me to work in lots of different areas
- Engineers are important for improving the environment
- A job in engineering would be interesting

All questions were measured using a 5-point Likert scale, from strongly disagree to strongly agree. Responses to the 4 questions were highly correlated and statistical tests confirmed they could be combined to measure one underlying construct: image of engineering¹⁶.

There were significant differences in image of engineering by ethnicity and gender, with white young people having the most negative image and Asian young people having the most positive on average. Young people from all ethnic backgrounds, except white young people, had a more positive image of engineering than average. Boys also had a more positive image of engineering compared to girls.

Figure 2.4 Mean image of engineering by young people’s ethnicity and gender



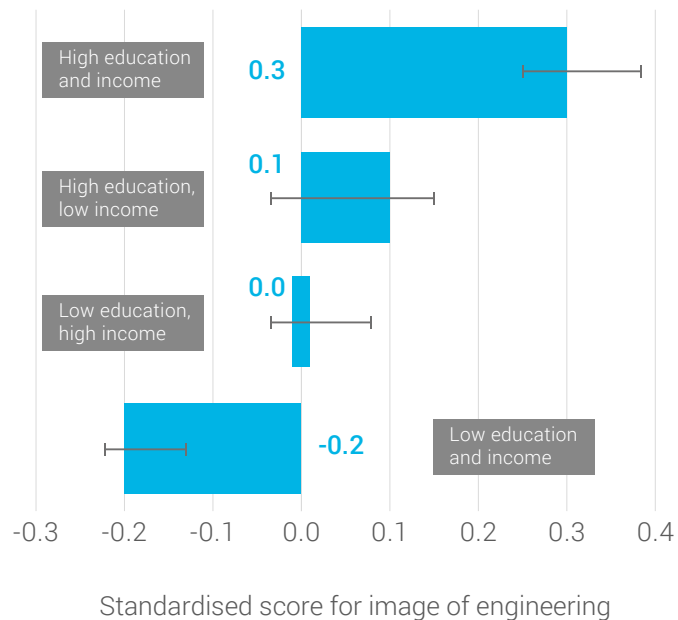
Source – EngineeringUK Engineering Brand Monitor 2021

Standardised scores were calculated by combining responses to 4 questions: I see lots of examples of engineering in my everyday life; Engineering is a career that would allow me to work in lots of different areas; Engineers are important for improving the environment; A job in engineering would be interesting. Responses were on a 5-point Likert scale from ‘strongly disagree’ to ‘strongly agree’. Numbers represent the mean scores of young people from each group.

Some of the largest differences were between young people from different social backgrounds. Young people whose parents had high education and income had the most positive image of engineering (0.3, higher than 62% of their peers), and young people whose parents did not have a degree and had low income had the least positive image (-0.2, lower than 58% of their peers).

¹⁶ This construct was standardised to mean zero and standard deviation 1, such that scores reflect children’s relative image of engineering in comparison with other children in the sample. A negative score indicates a child has a more negative image of engineering than the average child, and a positive score indicates a child has a more positive image of engineering than average. The scores are normally distributed, such that a score of 1 would indicate the child has a more positive view of engineering than 84.1% of their peers.

Figure 2.5 Mean image of engineering by young people's social background



Source – EngineeringUK Engineering Brand Monitor 2021

Standardised scores were calculated by combining responses to 4 statements: I see lots of examples of engineering in my everyday life; Engineering is a career that would allow me to work in lots of different areas; Engineers are important for improving the environment; A job in engineering would be interesting. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Numbers represent the mean scores of young people from each group.

2.3 Perception that being an engineer 'fits with who I am'

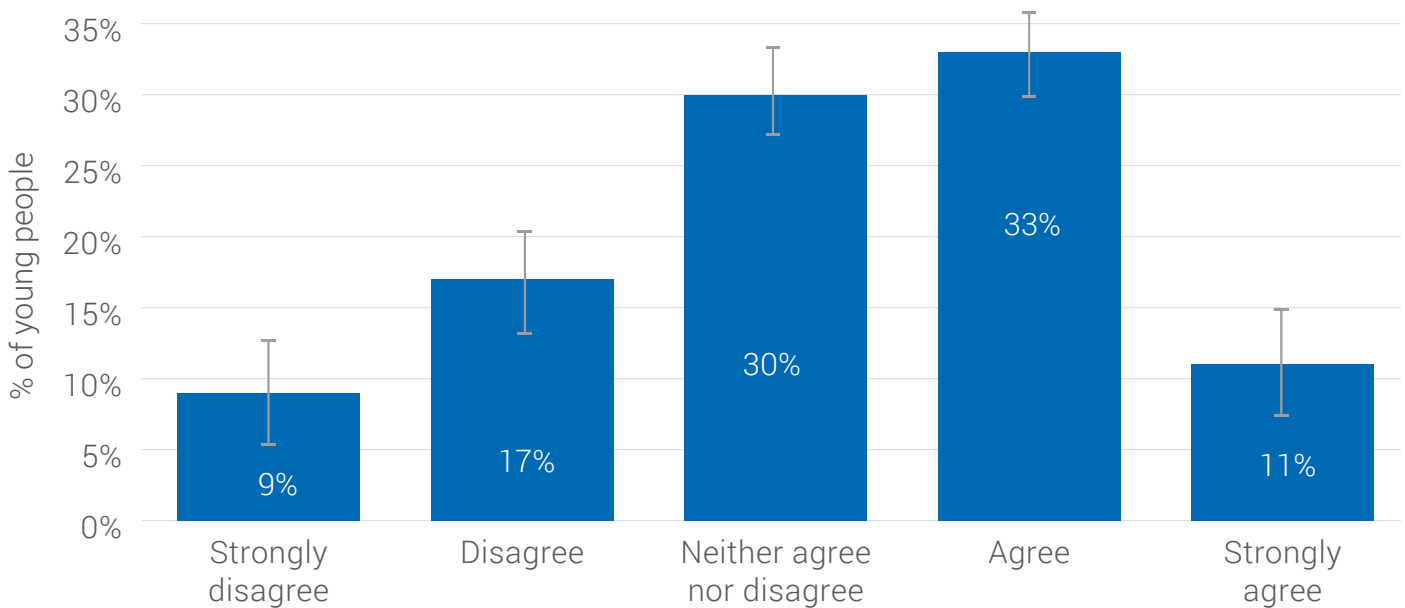
Along with knowledge about what a career in engineering involves and an overall positive view of engineering, young people must see themselves as engineers. For this reason, we have included young people's perception that being an engineer fits well with who they are as one of our key indicators. There are many reasons young people may not see themselves as engineers, some relating back to overall perceptions of engineers, and others to how young people perceive their own attributes and capabilities. Young people's conceptions of themselves, and how these relate to their ideas about engineers, have been linked to gender inequalities in aspirations. Sections 3 and 4 explore the relationships between young people's perceptions of themselves, and engineers, with attitudes and aspirations¹⁷ towards engineering in more detail. This question considers directly whether young people see themselves as potential engineers.

Overall, less than half (44%) of young people said they agreed (32.7%) or strongly agreed (11.3%) that 'I feel that being an engineer fits well with who I am.' Just over a quarter (26.1%) of young people disagreed (17%) or strongly disagreed (9.1%), and 29.9% said they neither agreed nor disagreed. In the remainder of this section, young people who agreed refers to those who agreed or strongly agreed.

Less than half of young people said they feel being an engineer fits well with who they are.

¹⁷ Archer, L. et al. 'The "exceptional" physics girl: A sociological analysis of multimethod data from young women aged 10 to 16 to explore gendered patterns of post-16 participation'. American Educational Research Journal, 2017.

Figure 2.6 Proportion of young people who said that ‘being an engineer fits well with who I am’



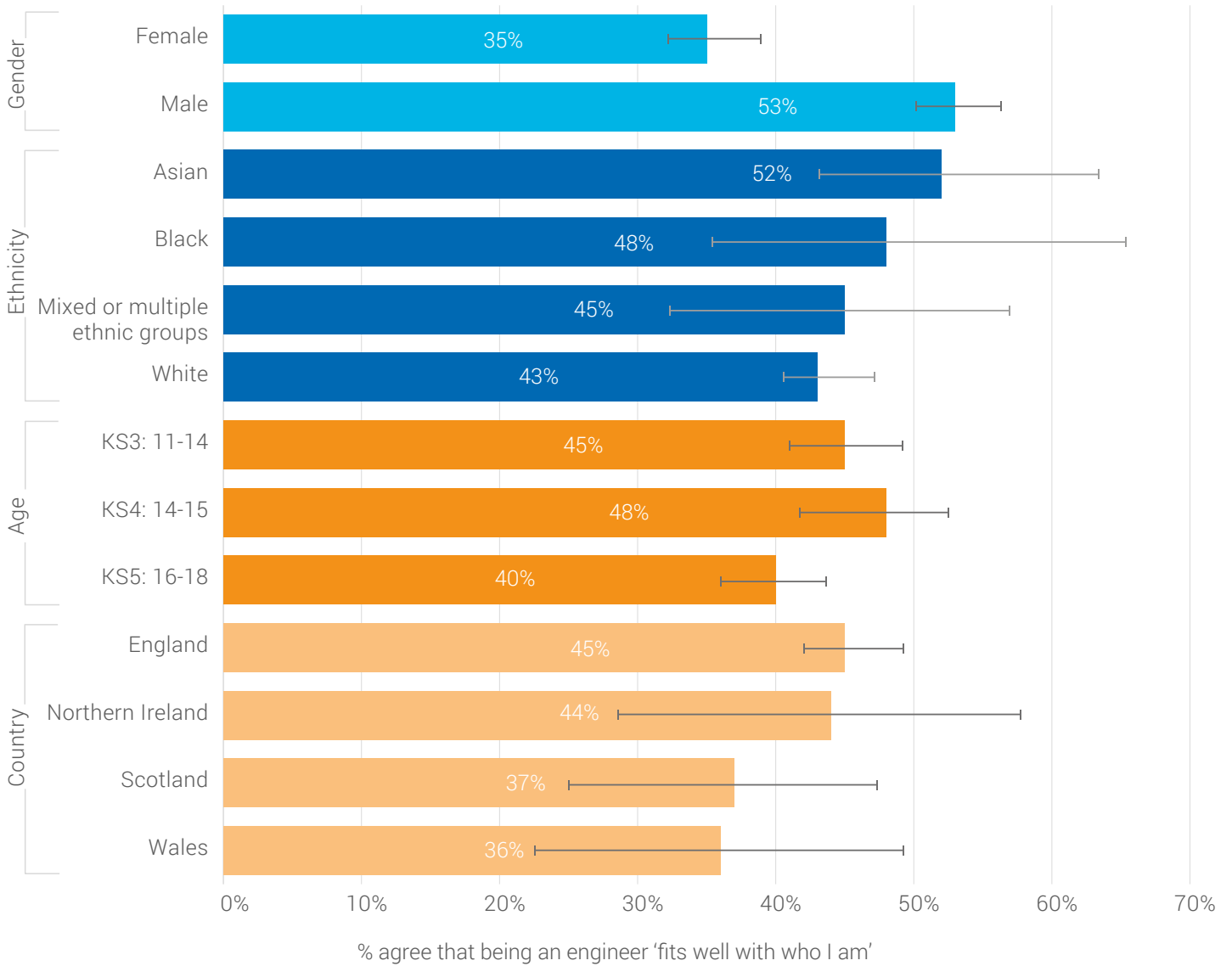
Source – EngineeringUK Engineering Brand Monitor 2021

Q - How much do you agree or disagree with the following statements? I feel that being an engineer fits well with who I am. Responses were on a 5-point Likert scale from ‘strongly disagree’ to ‘strongly agree’.

Young people's perceptions of their ‘fit’ with engineering careers differed by their ethnicity, gender, age group, country of residence, social background and school characteristics. Relatively low proportions of white young people said they think being an engineer fits well with who they are (43%), compared with relatively high proportions of Asian young people (52%). A much higher proportion of boys said being an engineer fits well with who they are (53%) compared to girls (35%), and perceptions of fit with being an engineer appeared to drop off at key stage 5 (age 16 to 18). Young people resident in England said being an engineer fits well with who they are in the highest proportions (45%), and young people resident in Wales in lowest proportions (36%).

Gender differences in young people's perceptions that being an engineer fit with who they were differed by ethnicity. For white young people, there were substantial differences in responses between girls and boys. However, for young people from ethnic minority backgrounds, the gender differences were small and were not statistically significant. Just 32% of white girls agreed that being an engineer fits with who they are, compared to around half (48%) of ethnic minority girls. In contrast, differences were observed between boys and girls in each of the socioeconomic groups regarding if being an engineer fits with who they are. Further research could aim to unpick in more detail why the gender difference is so much more pronounced in engineering for white young people than those from ethnic minority backgrounds.

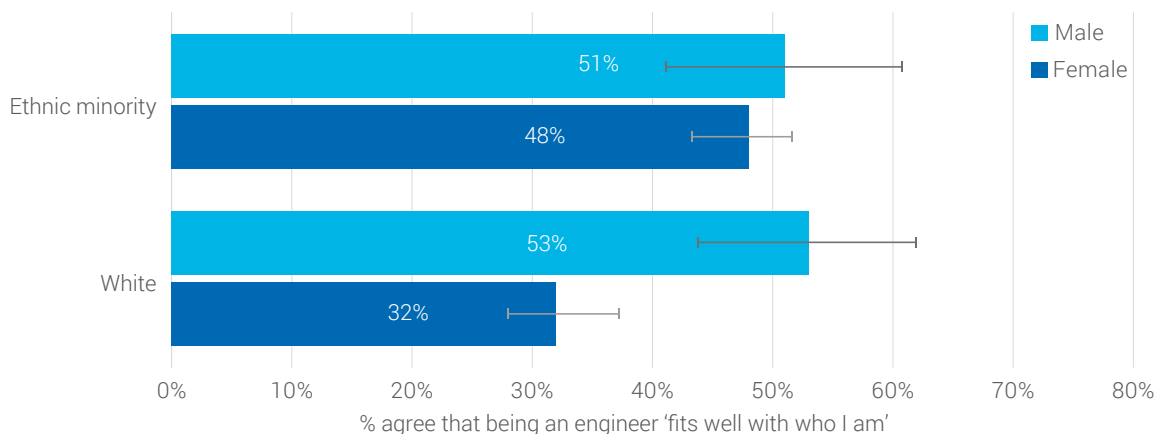
Figure 2.7 Proportion of young people who said that 'being an engineer fits well with who I am' by gender, ethnicity, age and country of residence



Source – EngineeringUK Engineering Brand Monitor 2021

Q - How much do you agree or disagree with the following statements? I feel that being an engineer fits well with who I am. Responses were on a 5-point Likert scale from strongly disagree to strongly agree. Percentages presented represent the proportions reporting 'agree' or 'strongly agree.'

Figure 2.8 Proportion of young people who said that 'being an engineer fits well with who I am' by gender, split by ethnicity



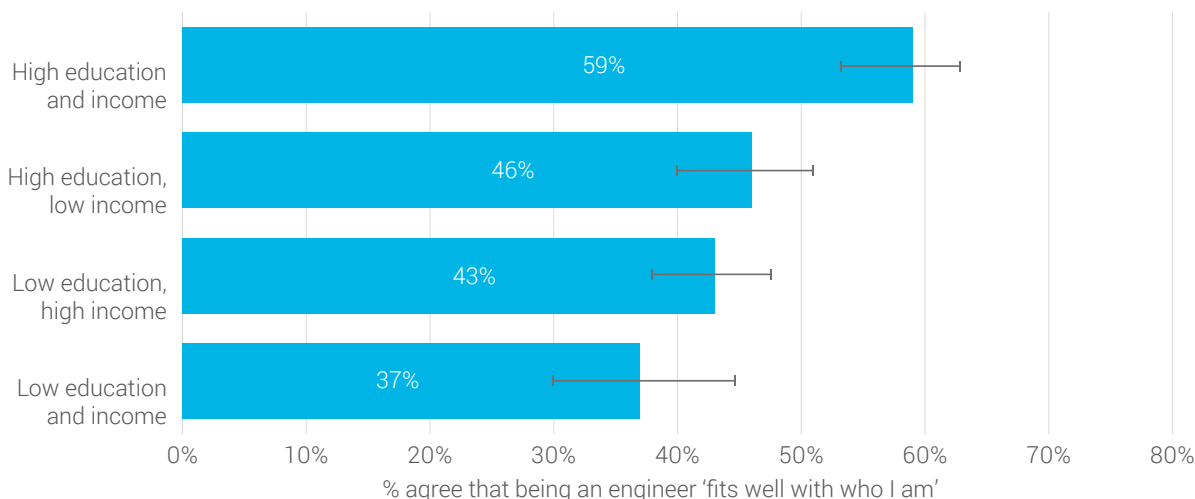
Source – EngineeringUK Engineering Brand Monitor 2021

Q - How much do you agree or disagree with the following statements? I feel that being an engineer fits well with who I am. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree.'

In line with findings around knowledge about engineers and positive image about engineering, fewer young people from lower socioeconomic backgrounds said that being

an engineer would fit well with who they are (37%) than those from more advantaged backgrounds (59%).

Figure 2.9 Proportion of young people who said that 'being an engineer fits well with who I am' by social background



Source – EngineeringUK Engineering Brand Monitor 2021

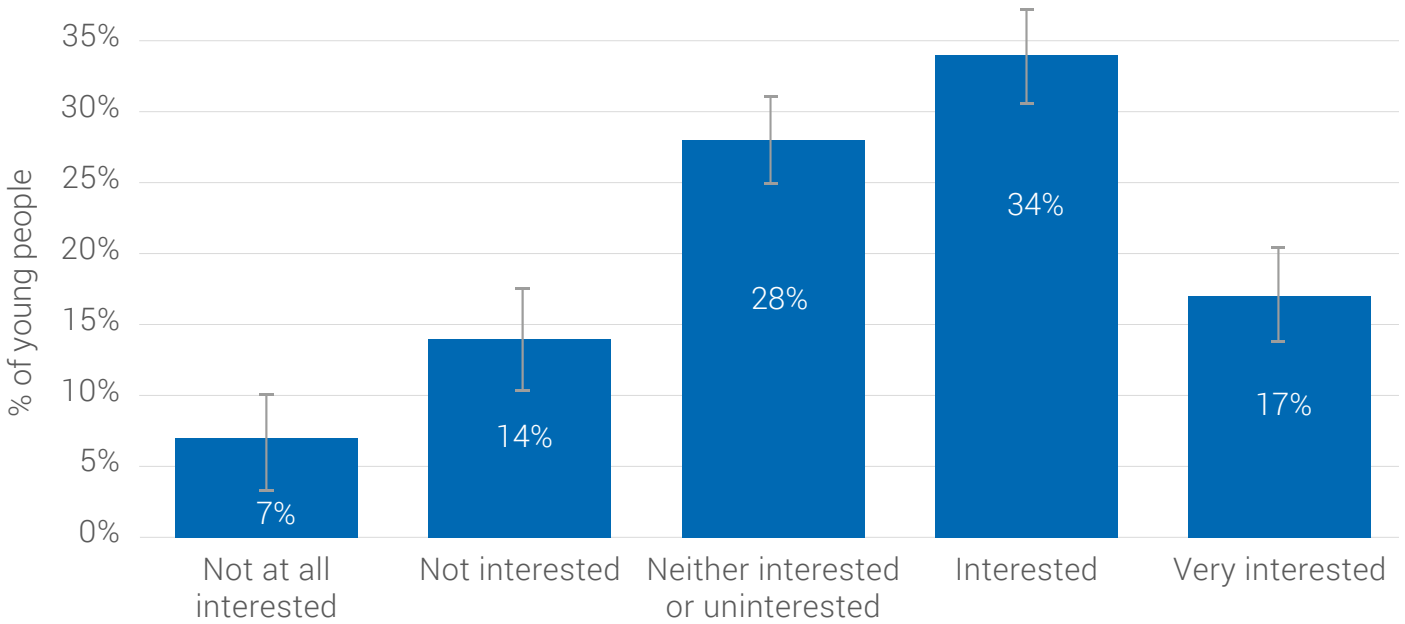
Q - How much do you agree or disagree with the following statements? I feel that being an engineer fits well with who I am. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree.'

2.4 Interest in a career in engineering

Overall, young people's reported interest relating to engineering careers was high: half of young people (51%) said they were either interested (34%) or very interested (17%) in

pursuing a career in engineering. However, around a fifth of young people (21%) said they were not interested (14%) or not at all interested (7%) in a career in engineering.

Figure 2.10 Interest in a career in engineering



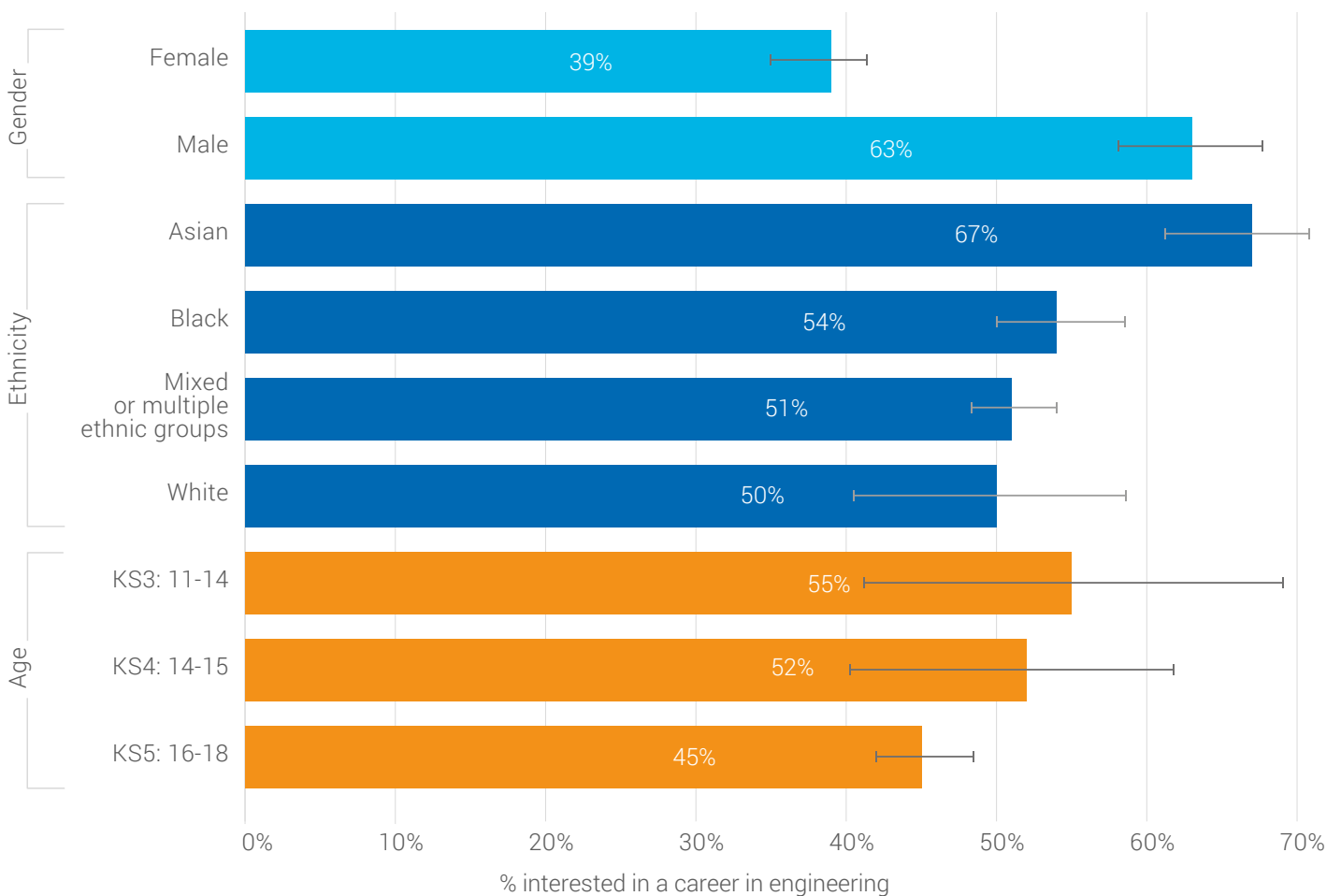
Source – EngineeringUK Engineering Brand Monitor 2021

Q How interested are you in a future career that involves any of the following?: engineering. Responses were on a 5-point Likert scale from 'not at all interested' to 'very interested.'

Reported interest in pursuing a career in engineering differed by gender, ethnicity and age. While nearly two-thirds of boys said they were interested in a career in engineering (63%), just 2 in 5 girls said the same (39%). Half, or over half, of young people from all ethnic groups said they were interested in a career in engineering, but this was lowest among white young people and those from mixed or multiple ethnic groups (51% and 50%) and highest among Asian young people (67%).

Interest decreased as the age of young people interviewed increased. 55% of young people in key stage 3 (aged 11 to 14) said they were likely to pursue a career in engineering, compared to just 45% of young people in key stage 5 (aged 16 to 18).

Figure 2.11 Interest in a career in engineering by gender, ethnicity and age

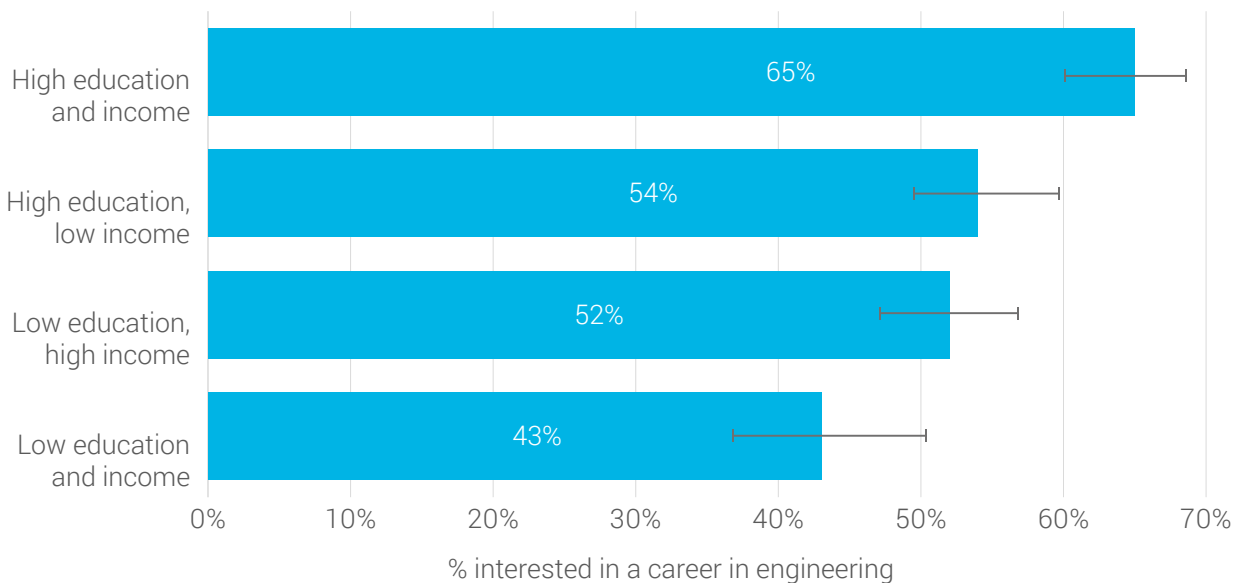


Source – EngineeringUK Engineering Brand Monitor 2021

Q How interested are you in a future career that involves any of the following?: engineering. Responses were on a 5-point Likert scale from 'not at all interested' to 'very interested.' Percentages presented represent the proportions reporting 'interested' or 'very interested.'

Young people's background was also associated with their interest in engineering careers. Young people from highly educated and high-income families were most likely to say they were interested in a career in engineering. 65% of young people from a high income and education family said they were interested in a career in engineering, compared to 43% of young people from a low income and education family.

Fewer young people from lower socioeconomic backgrounds said that being an engineer would fit well with who they are than those from more advantaged backgrounds.

Figure 2.12 Interest in a career in engineering by social background

Source – EngineeringUK Engineering Brand Monitor 2021

Q How interested are you in a future career that involves any of the following?: engineering. Responses were on a 5-point Likert scale from 'not at all interested' to 'very interested.' Percentages presented represent the proportions reporting 'interested' or 'very interested.'

The underrepresentation of disabled people in engineering

This report has covered in some depth the differences in young people's perceptions of, and aspirations towards engineering by their gender, ethnicity and social background. What is missing is details of differences in these outcomes by disability status. However, there are also large differences in participation in engineering education and careers by disability status. Currently, 14% of students in higher education are disabled, compared to just 9% of students studying engineering.¹⁸ Disability was not included in this section - not because we did not consider differences in outcomes by disability, but because no statistically

significant differences in any of the outcomes were observed by disability status. That is to say, disabled young people reported the same perceptions of and interest in engineering as non-disabled young people.

This leaves the question of why disabled people are underrepresented in engineering at both higher education and in the workforce if they are equally knowledgeable about and interested in engineering. Further research should interrogate what happens between schooling and participation in non-compulsory education that causes later disparities.

¹⁸Advance HE. 'Equality in higher education: students statistical report 2020' [online], accessed 18 August 2021.

3. Capability

3.1 Overview

A key premise of engineering outreach is that for young people to start to consider engineering as a career option for themselves, they need to have, and to be confident that they have, the psychological capability to do so. Capability includes not only hard skills, such as academic competence, particularly in maths and science subjects but also soft skills, such as enjoyment of maths and science subjects in school. There is a considerable body of literature linking young people's enjoyment and perception of ability in science and maths subjects at school to their aspirations relating to STEM careers more generally.¹⁹

It is also widely understood that both absolute and relative capability play a part in a young person's educational and career choices – that is, not only whether they are 'good' at a subject (such as science) but how 'good' they are compared to other subjects (such as English). Young people's relative capability in science and maths over non-STEM subjects has been linked to gender disparities in aspirations.²⁰ Girls, on average, perform better relatively in most subjects in UK education, but differences are highest in non-STEM subjects²¹, and this has been linked to girls' preferences to pursue non-STEM careers.

This section explores the extent to which young people surveyed expressed enjoyment and perceived ability²² in science and maths as compared to English, and how this influenced their knowledge about, image of, and aspiration towards engineering.

Overall, the majority of young people enjoyed, or thought they were good at the academic subjects included in the question. A similar proportion of boys said they enjoyed maths and science (68%), and fewer said they enjoyed English (59%). In contrast, a higher proportion of girls said they enjoyed English (68%) compared to science (60%) and maths (54%).

Gender differences in perception of ability followed a similar pattern, with girls most likely to say they were good at English (77%), and least likely to say they were good at science (57%). While boys thought they were equally good at maths and science, a higher proportion of boys said they were good at maths (71%) than science or English (65%).

The fact that overall, young people rated their ability in all subjects highly is promising given capability is considered a prerequisite for the pursuit of further study of engineering. If young people enjoy science and maths and think they are capable in both subjects, they will be more likely to pursue careers that heavily rely on both subjects in the future. However, the number and proportion of young people who do not enjoy, or do not think they are good at either subject remain substantial. It is clear

¹⁹ Sheldrake, R., Mujtaba T. and Reiss M. J. 'Students' Intentions to Study Non-Compulsory Mathematics: The Importance of How Good You Think You Are', British Educational Research Journal, 2014.

²⁰ Wang, M. T., Eccles, J. S. and Kenny, S. 'Not lack of ability but more choice: Individual and gender differences in choice of careers in science, technology, engineering, and mathematics', Psychological science, 2013.

²¹ Cavaglia, C. et al., 'Gender, achievement, and subject choice in English education', Oxford Review of Economic Policy, 2020.

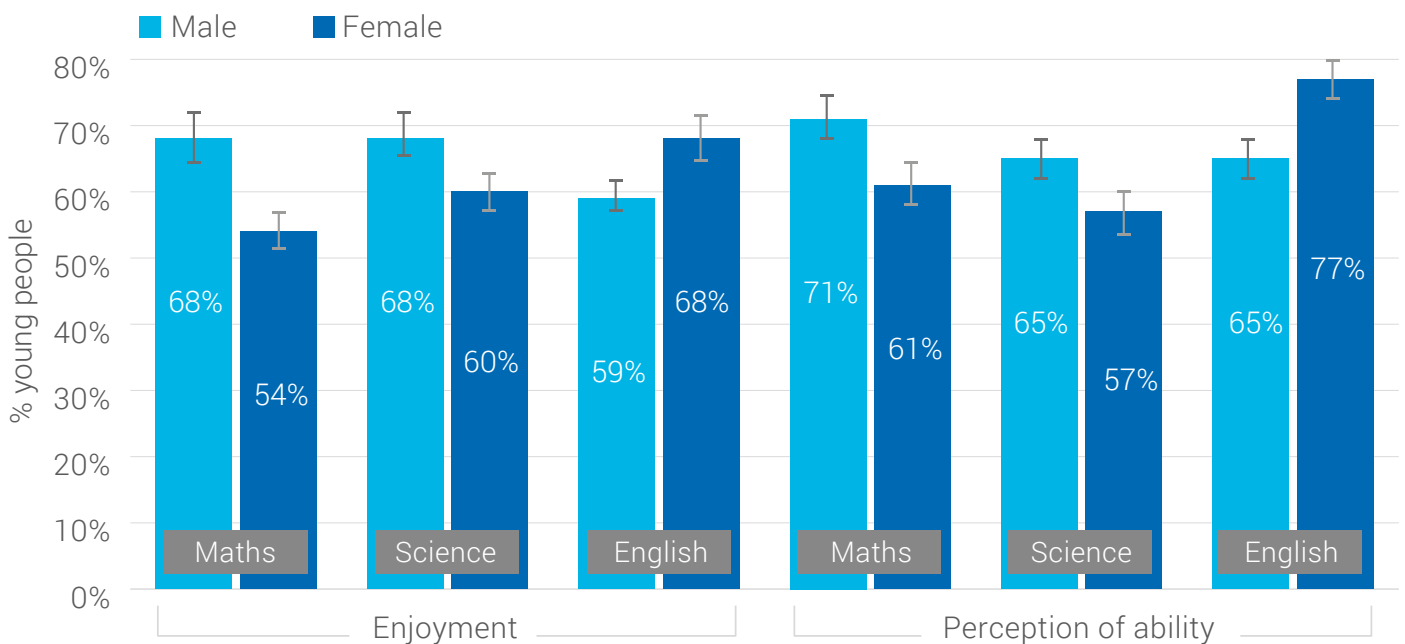
²² To measure enjoyment, children were asked: How much do you enjoy the following subjects: maths, science, physics, biology, chemistry and English. Response options included: don't enjoy it at all, don't really enjoy it, it's OK, enjoy it a little, enjoy it very much. To measure perception of ability, children were asked: how far do you agree or disagree with the following statements? I am good at [maths, science, physics, biology, chemistry, English]. Children were provided with a 5-point Likert scale to record their responses, from strongly disagree to strongly agree. For the purposes of analysis presented below, positive responses were combined. For enjoyment, enjoy it a little and enjoy it a lot were combined to 'enjoy', and for perception of ability agree and strongly agree were combined for 'agree.' Statistical testing was conducted using the full responses.

that particular attention here should focus on developing girls' capability, who despite having similar (or higher) academic attainment are less likely to say they enjoy, or think they are good at maths and science.²³

Furthermore, while young people appear to enjoy science as much, or more than, maths and English, perception of ability in science and maths among girls was particularly low.

Young people's relative capability in science and maths over non-STEM subjects has been linked to gender disparities in aspirations.

Figure 3.1 Proportion of girls and boys who said they enjoyed, or thought they were good at, science, maths and English



Source – EngineeringUK Engineering Brand Monitor 2021

Q1 - How much do you enjoy doing the following subjects? Responses were on a 5-point Likert scale from 'don't enjoy it at all' to 'enjoy it very much'. Percentages presented represent the proportions reporting 'enjoy it a little' or 'enjoy it very much.'

Q2 - How far do you agree or disagree with the following statements? I am good at... Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree.'

Young people could also choose 'don't study this subject.'

²³ EngineeringUK, 'Educational pathways into engineering', 2020.

Capability and its relationship with indicators of opportunity and motivation

A key hypothesis underpinning the questions asked in the EBM is that capability, as measured through young people's enjoyment and perception of ability in science and maths predicts young people's knowledge about, image of, and aspirations towards engineering. This is based on considerable research and literature²⁴, however, the design of our survey allows us to empirically test the extent that this is the case and, furthermore, whether young people's capability predicts one of these factors more strongly than others.

The following sections detail the relationship between young people's capability, as measured by their perception of ability and enjoyment of school subjects, and their knowledge about, image of, and motivation towards engineering. There were strong associations between capability and each of these factors, highlighting the interplay between capability, opportunity and motivation for young people. Young people who thought they were good at and enjoyed maths and science subjects at school were more likely to say they know what engineers can do in their jobs, have a more positive image of engineers, report that being an engineer fits with who they are, and to say they are interested in pursuing a career in engineering in the future. This strongly suggests that work to improve young people's enjoyment of STEM and confidence in their abilities (as measured by perceived ability) is likely to yield greater understanding and knowledge of engineering careers and vice versa.

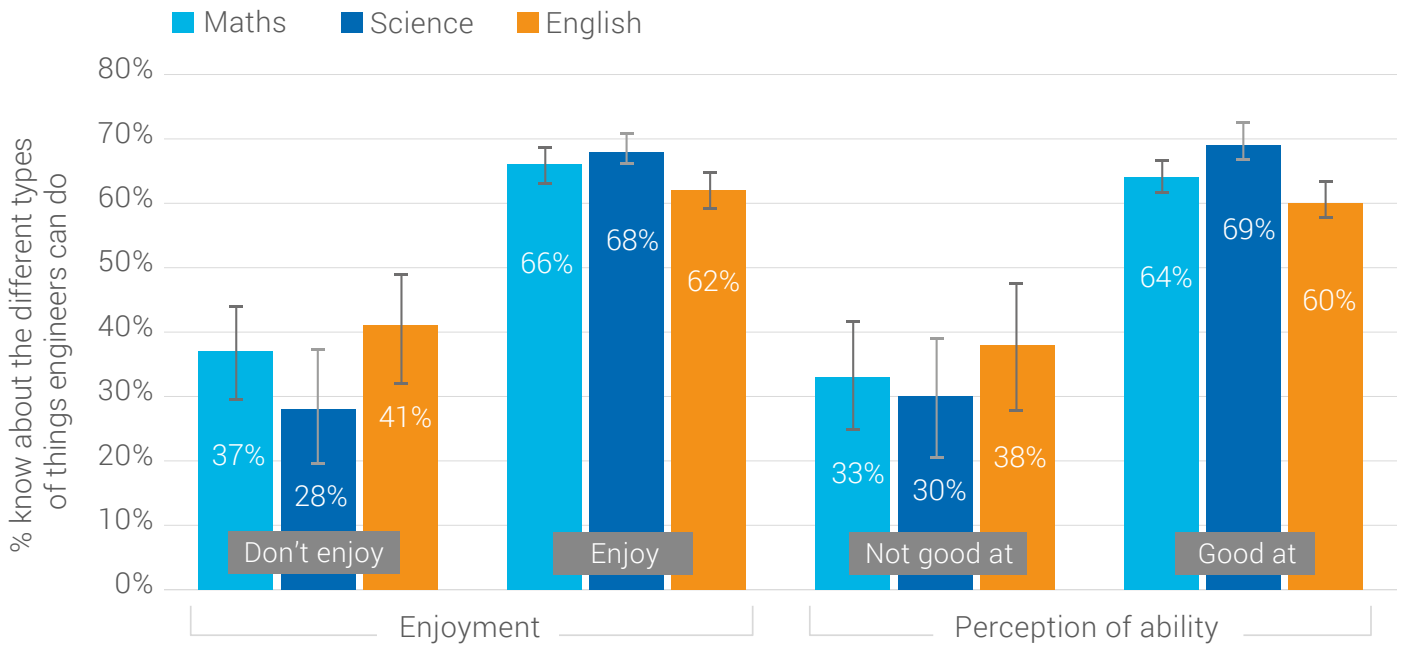
3.2 Knowledge about what engineers can do in their jobs

Young people's enjoyment of and perception of ability in all academic subjects was associated with their engineering knowledge. Higher proportions of young people who said they enjoyed maths, science, and English, and those who said they were good at these subjects, said they know what engineers do in their jobs. Differences were large for all subjects, but particularly so in science. For example, just 28% of young people who said they didn't enjoy science said they know about the different types of things engineers can do in their jobs, compared to 68% of those who enjoyed science. Similarly, 30% of young people who said they were not good at science said they know what engineers can do, compared to 69% of those who said they were good at science.

Young people who thought they were good at and enjoyed maths and science subjects were more likely to say they know what engineers do.

²⁴ Archer, L. and DeWitt, J. 'Understanding Young People's Science Aspirations: How students form ideas about 'becoming a scientist'', Routledge, 2016.

Figure 3.2 Proportion of young people who agreed that they know what engineers can do in their jobs, by enjoyment of and perception of ability in each subject



Source – EngineeringUK Engineering Brand Monitor 2021

Q1 - How much do you enjoy doing the following subjects? Responses were on a 5-point Likert scale from 'don't enjoy it at all' to 'enjoy it very much'. Percentages presented represent the proportions reporting 'enjoy it a little' or 'enjoy it very much.'

Q2 - How far do you agree or disagree with the following statements? I am good at... Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree.'

Young people could also choose 'don't study this subject.'

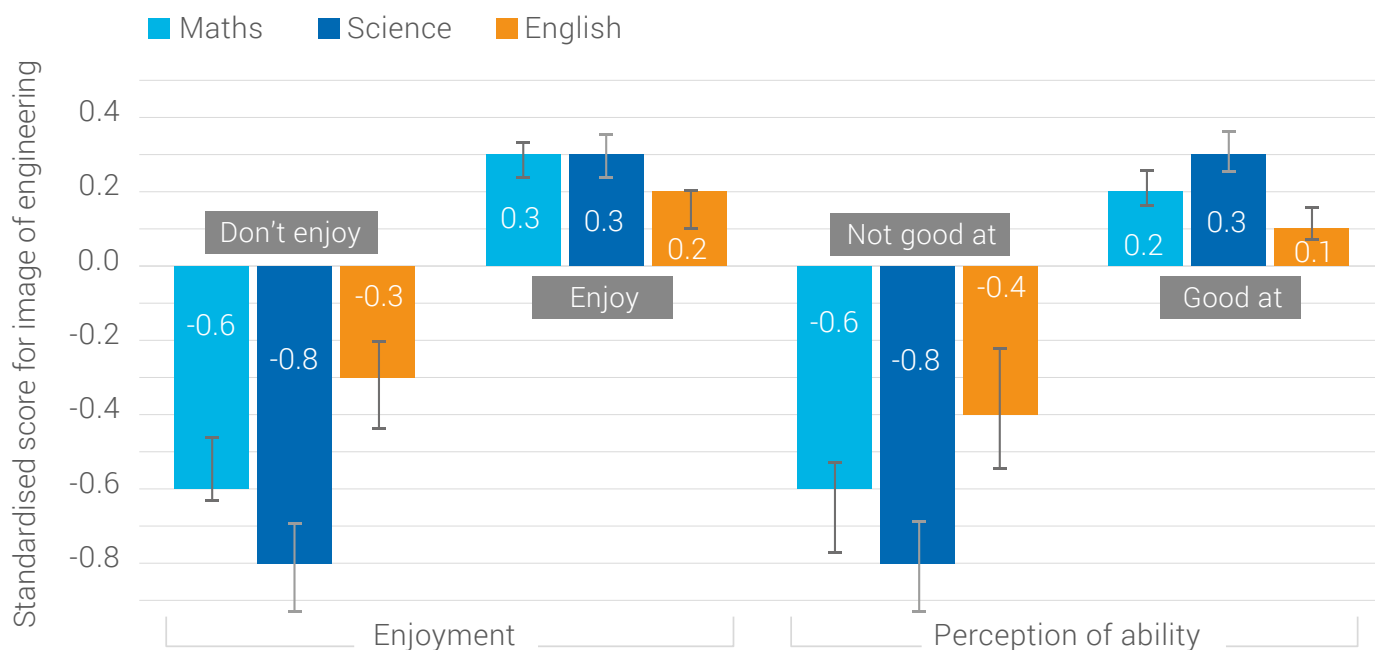
Q3 - In general, I know about the different types of things the following people can do in their jobs: Engineers. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree.'

3.3 Positive image of engineering

Young people’s enjoyment and perception of ability in maths, science and English were all associated with positive images of engineering, however, associations were strongest for

science and maths subjects. Young people who enjoyed, and thought they were good at, all subjects had more positive images of engineering in general.

Figure 3.3 Mean image of engineering by young people’s enjoyment and perception of ability in each subject



Source – EngineeringUK Engineering Brand Monitor 2021

Q1 - How much do you enjoy doing the following subjects? Responses were on a 5-point Likert scale from ‘don’t enjoy it at all’ to ‘enjoy it very much’. Numbers represent the mean scores of young people who responded ‘enjoy it a little’ or ‘enjoy it very much.’

Q2 - How far do you agree or disagree with the following statements? I am good at... Responses were on a 5-point Likert scale from ‘strongly disagree’ to ‘strongly agree’. Numbers represent the mean scores of young people who responded ‘agree’ or ‘strongly agree.’

Young people could also choose ‘don’t study this subject.’

Standardised scores were calculated by combining responses to 4 questions: I see lots of examples of engineering in my everyday life; Engineering is a career that would allow me to work in lots of different areas; Engineers are important for improving the environment; A job in engineering would be interesting. Responses were on a 5-point Likert scale from ‘strongly disagree’ to ‘strongly agree’. Numbers represent the mean scores of young people from each group.

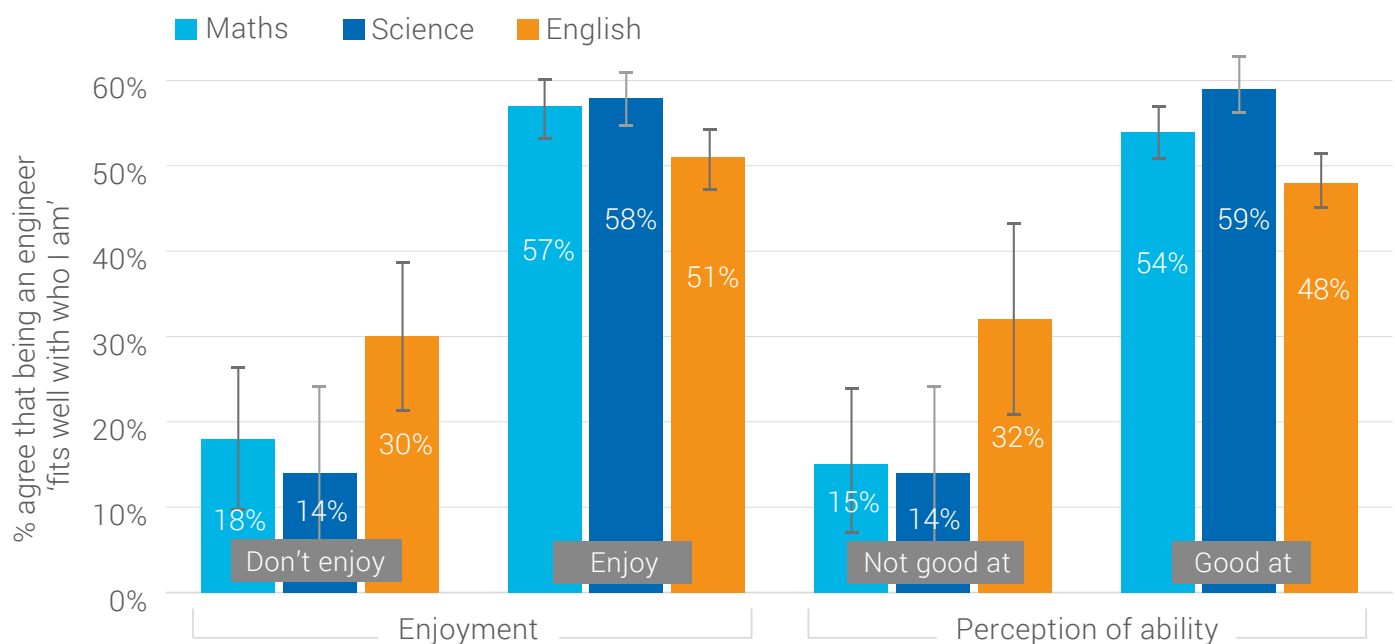
3.4 Perception that being an engineer 'fits with who I am'

There were large differences in perception of fit with engineering careers and young people's reported enjoyment of, and perception of ability in, maths and science subjects. Of young people who said they enjoyed and were good at maths, 54.3% and 56.7% said they felt an engineering career fits well with who they are. Similarly, 59.1% and 58% of young people who said they enjoyed and were good at science

said they felt an engineering career fits well with who they are. In contrast, very small proportions of young people who said they did not enjoy or were not good at science and maths, agreed.

It should be noted that, even among young people who said they enjoyed or were good at science and maths, almost half did not agree that being an engineer fit well with who they are.

Figure 3.4 Proportion of young people who said that 'being an engineer fits well with who I am' by enjoyment of, and perception of ability in each subject



Source – EngineeringUK Engineering Brand Monitor 2021

Q1 - How much do you enjoy doing the following subjects? Responses were on a 5-point Likert scale from 'don't enjoy it at all' to 'enjoy it very much'.

Q2 - How far do you agree or disagree with the following statements? I am good at... Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree'.

Young people could also choose 'don't study this subject.'

Q3 - How much do you agree or disagree with the following statements? I feel that being an engineer fits well with who I am. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree'.

Enjoyment and perception of ability in English were also associated with young people's perception that being an engineer fit with who they were, although the relationships were smaller than those with science and maths subjects. The fact that young people who enjoy and think they are good at all school subjects are more likely to see themselves as an engineer indicates that young people associate engineering with academic study. This chimes with research findings around the portrayal of, and people's perceptions of, scientists in general as being extraordinarily clever or 'brainy'.²⁵

Comparative enjoyment and perception of ability in science and maths compared to English were also important here. Young people who enjoyed science and maths more than English, or thought they were better at science and maths than English, were particularly likely to say being an engineer fit with who they were. In other words, a young person was more likely to think engineering fit in with who they were if they expressed greater enjoyment in – or thought they were better at – maths and science than English than those who enjoyed and perceived their ability to be equally as good in all 3 subjects.

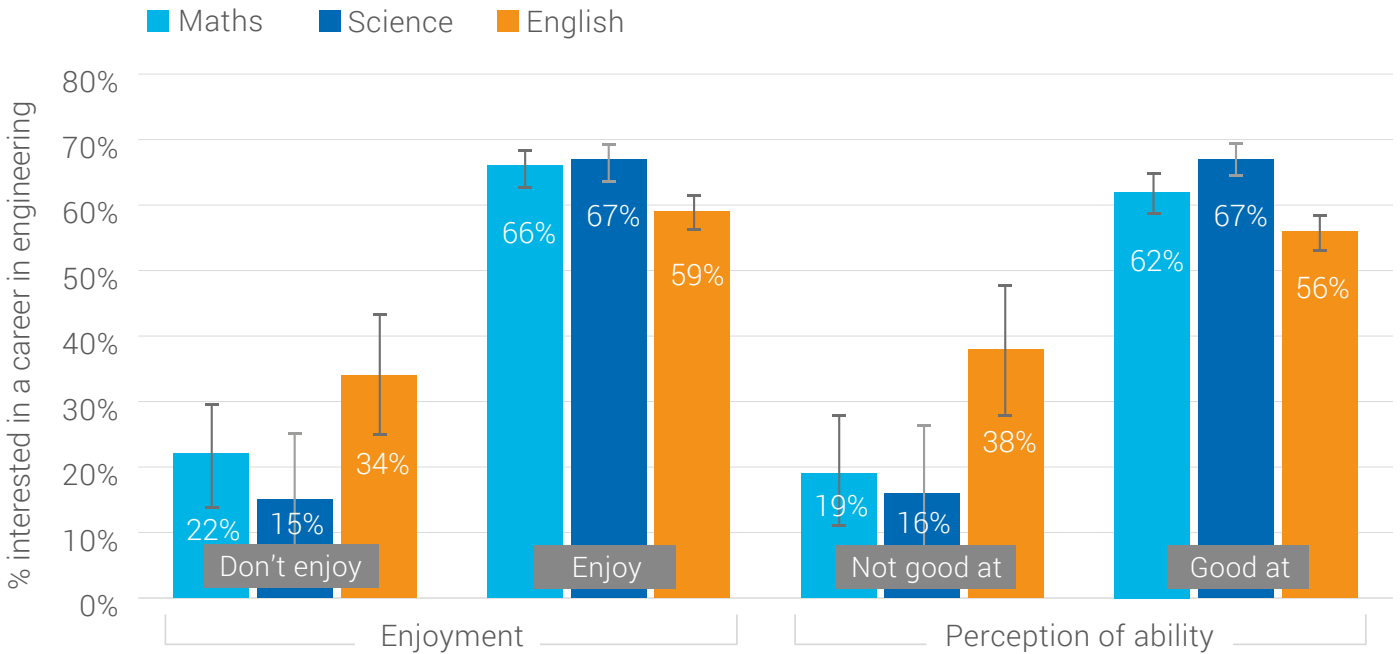
3.5 Interest in a career in engineering

Young people's reported enjoyment of, and perception of ability in STEM subjects at school was strongly associated with whether they said they were interested in a career in engineering or not. 66% of young people who said they enjoyed maths, and 62% of young people who said they were good at maths, said they were interested in a career in engineering. Similarly, 67% of young people who enjoyed science, and 67% of those who said they were good at science, also reported high aspirations towards engineering. While the differences were less stark, enjoyment of, and perception of ability in, English was also associated with engineering aspirations. This suggests that more general enjoyment of and perception of ability in academic study is linked to aspirations towards a career in engineering, and highlights the need to show the role of creativity, problem-solving and team-working in engineering careers in addition to attract more young people.

In terms of relative enjoyment of, and perception of ability in, science and maths study, young people who said they were likely to pursue a career in engineering were more likely to rate their enjoyment and their ability in maths and science more highly than their enjoyment and perception of ability in English.

²⁵ Archer, L. et al. 'ASPIRES 2: Young people's science and career aspirations, age 10 to 19', London: UCL Institute of Education, 2020.

Figure 3.5 Interest in a career in engineering by enjoyment of and perception of ability in each subject



Source – EngineeringUK Engineering Brand Monitor 2021

Q1 - How much do you enjoy doing the following subjects? Responses were on a 5-point Likert scale from 'don't enjoy it at all' to 'enjoy it very much'.

Q2 - How far do you agree or disagree with the following statements? I am good at... Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree'.

Young people could also choose 'don't study this subject.'

Q3 How interested are you in a future career that involves any of the following?: Engineering. Responses were on a 5-point Likert scale from 'not at all interested' to 'very interested'. Percentages presented represent the proportions reporting 'interested' or 'very interested'.

4. Opportunity

4.1 Overview

Young people may have the capability, enjoy and think they are good at maths and science, but if they do not know what engineering is, about the variety of jobs engineers can do, or how to pursue a career in engineering, they may decide to pursue a different career goal altogether.

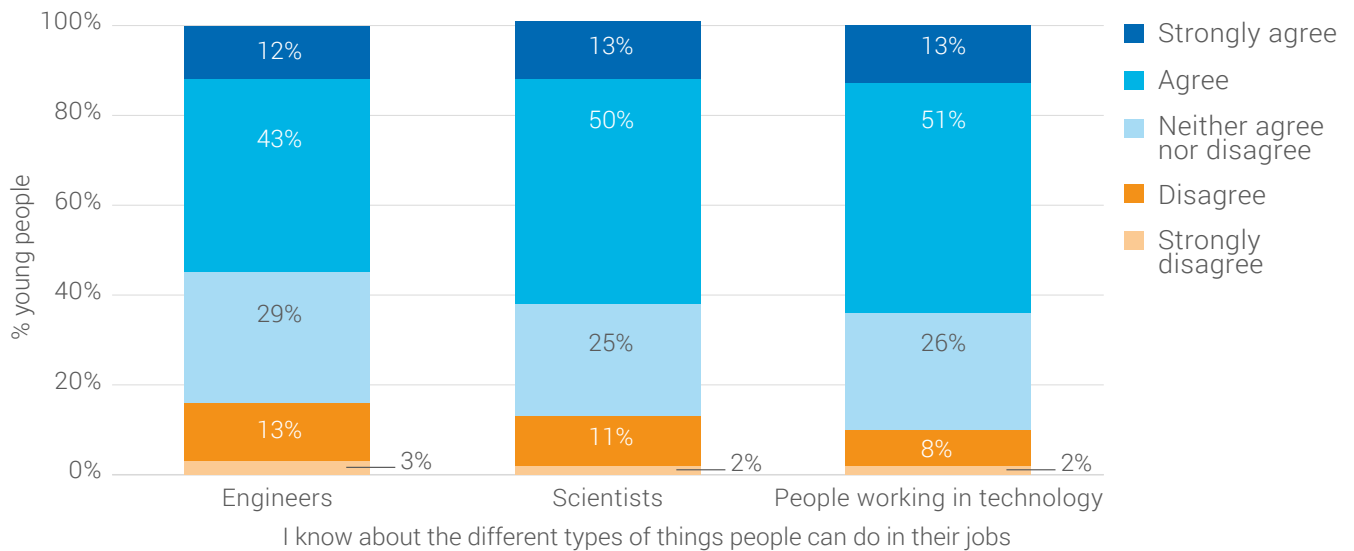
A key hypothesis, therefore, underpinning the EBM is that young people not only need the capability to pursue a career in engineering, but they must also have the opportunity to do so. This opportunity can take many forms. Perhaps one of the most obvious is that young people need to be afforded the 'right' educational opportunities to be able to become an engineer. However, to fully be able to make an informed decision about whether to take up these opportunities, they must also have an accurate picture of what engineering is and understand the variety of careers in – and pathways into – the profession.

For this reason, to measure opportunity the EBM sought to capture the following concepts:

- **Image and application:** young people need to have an accurate picture of what engineering is, and what a career in engineering would entail. This includes knowledge of the range of applications of engineering, and how engineering interacts with everyday life
- **Careers information and activities:** young people need accurate knowledge of the different career pathways to engineering, as well as the career opportunities open to someone who has pursued further or higher education in engineering
- **Educational opportunities:** young people need to be afforded the educational opportunities to be able to pursue engineering further. They also need to have information about the various routes into engineering and educational pathways available to decide whether they can, and would want to, pursue those pathways

Overall, 55% of young people said they know about the different types of things engineers can do in their jobs. This was notably lower than the proportion who said the same of scientists (63%) or those working in technology (64%), suggesting that though there is more work to be done to improve young people's understanding of STEM careers, that lack of knowledge is particularly acute for engineering.

Figure 4.1 Young people's reported knowledge about the different types of things engineers, scientists and people working in technology can do in their jobs



Source – EngineeringUK Engineering Brand Monitor 2021

Q - In general, I know about the different types of things the following people can do in their jobs: engineers, scientists, people working in technology. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'.

In addition to knowing what engineers can do in their jobs, it is important that young people have an accurate perception of the skills engineers require, and what particular characteristics might make good engineers. Engineering as a career often suffers from negative stereotypes, for example, that engineers work in isolation, that social skills and creativity are not important for engineers, and that engineers need to be naturally extraordinarily 'brainy' or academically gifted to succeed. These stereotypes have even been linked to gender disparities in interest in engineering careers.²⁶

For that reason, we asked young people a series of questions designed to understand their perspectives of characteristics that define engineers. Young people were provided with a list of 11 possible characteristics (shown in figure 4.2) and asked which of these they thought engineers need to do their job well. The characteristics chosen by the highest number of young people were practical, analytical,

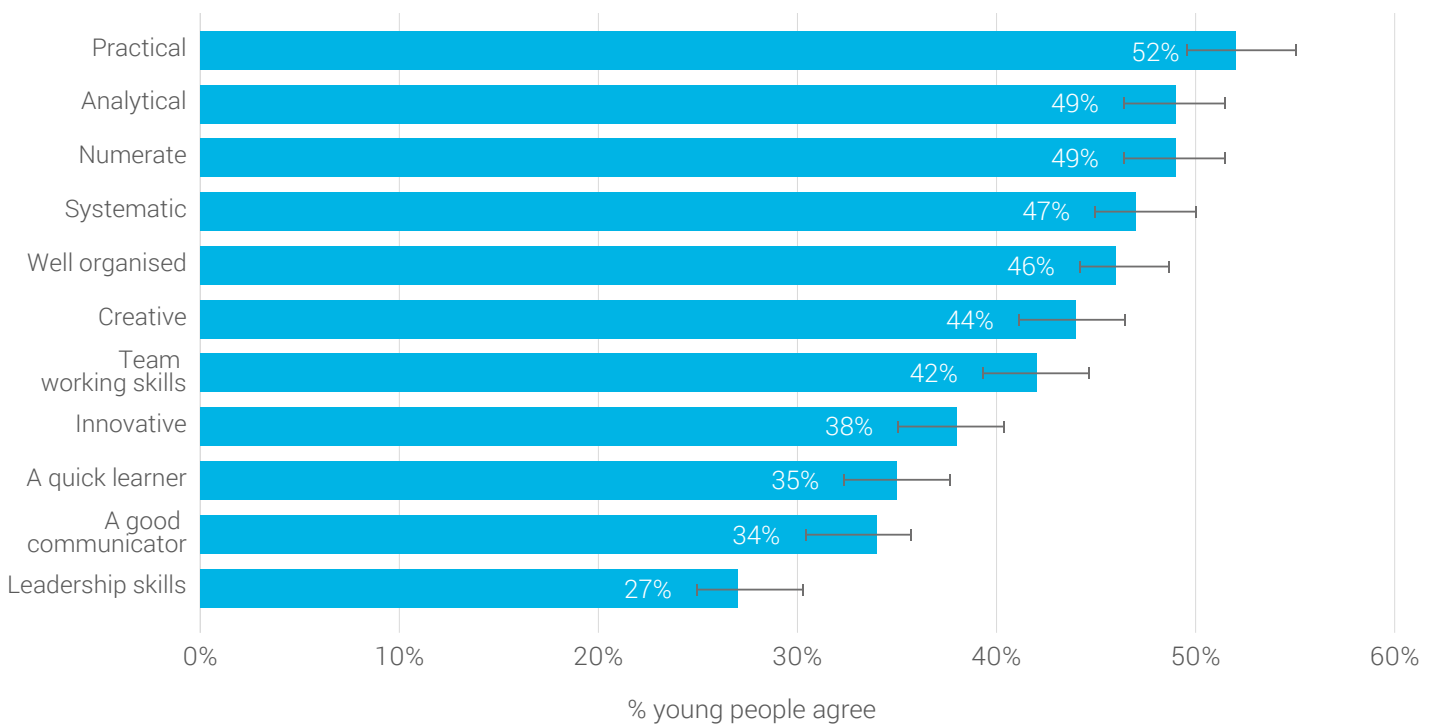
numerate, and systematic. The characteristics chosen by the fewest young people were 'a quick learner,' 'a good communicator,' and 'leadership skills'.

These characteristics commonly referred to as 'soft skills', are often perceived as unnecessary for scientists and engineers to do well in their jobs. However, a lack of people and personal skills has been linked by experts to skill-shortage vacancies in the sciences. The most recent employer skills survey in 2019, found that around two-thirds (66%) of skill-shortage vacancies were at least partially caused by a lack of people and personal skills.²⁷ Consequently, a better understanding of the skills needed to get on in engineering could help boost applications among people who see these skills in themselves and motivate others to nurture and develop soft skills. STEM outreach can do more to instil in young people the importance of soft skills in engineering jobs if we are to recruit engineers with the varied set of skills that the sector is demanding.

²⁶ Cheryan, S., Master, A. and Meltzoff, A. N. 'Cultural stereotypes as gatekeepers: Increasing girls' interest in computer science and engineering by diversifying stereotypes', *Frontiers in psychology*, 2015.

²⁷ Department for Education. 'Employer skills survey 2019', 2020.

Figure 4.2 Characteristics young people said engineers need to have to do their job well



Source – EngineeringUK Engineering Brand Monitor 2021

Q - Which of these characteristics do you think engineers need to have to do their job well? Please select all that apply. Options included: innovative, practical, creative, numerate (good with numbers), a good communicator, well organised, team working skills, leadership skills, a quick learner, systematic (good at making a plan), analytical (able to think critically), none of these, don't know.

Young people were also asked about the factors they would find important in deciding upon a career more generally. This can give an insight into what young people are thinking about when choosing which career to pursue, and how far this overlaps (or not) with their image of engineers and engineering in general. The young people surveyed most commonly indicated 'something I am interested in' (56%) and 'enjoyment' (51%) as important factors when deciding upon a career, followed closely by pay (49%). This shows that what the majority of young people value most is that they can do something with intrinsic value, that engages and excites them, but they

also are already thinking about income and remuneration for their work. The next 6 factors – job security, something that challenges me, being valued, making a difference/having impact, opportunities to be creative, working conditions and environment – were chosen by around 30% of young people. However, job security was the fourth most popular, chosen by 36% of young people.

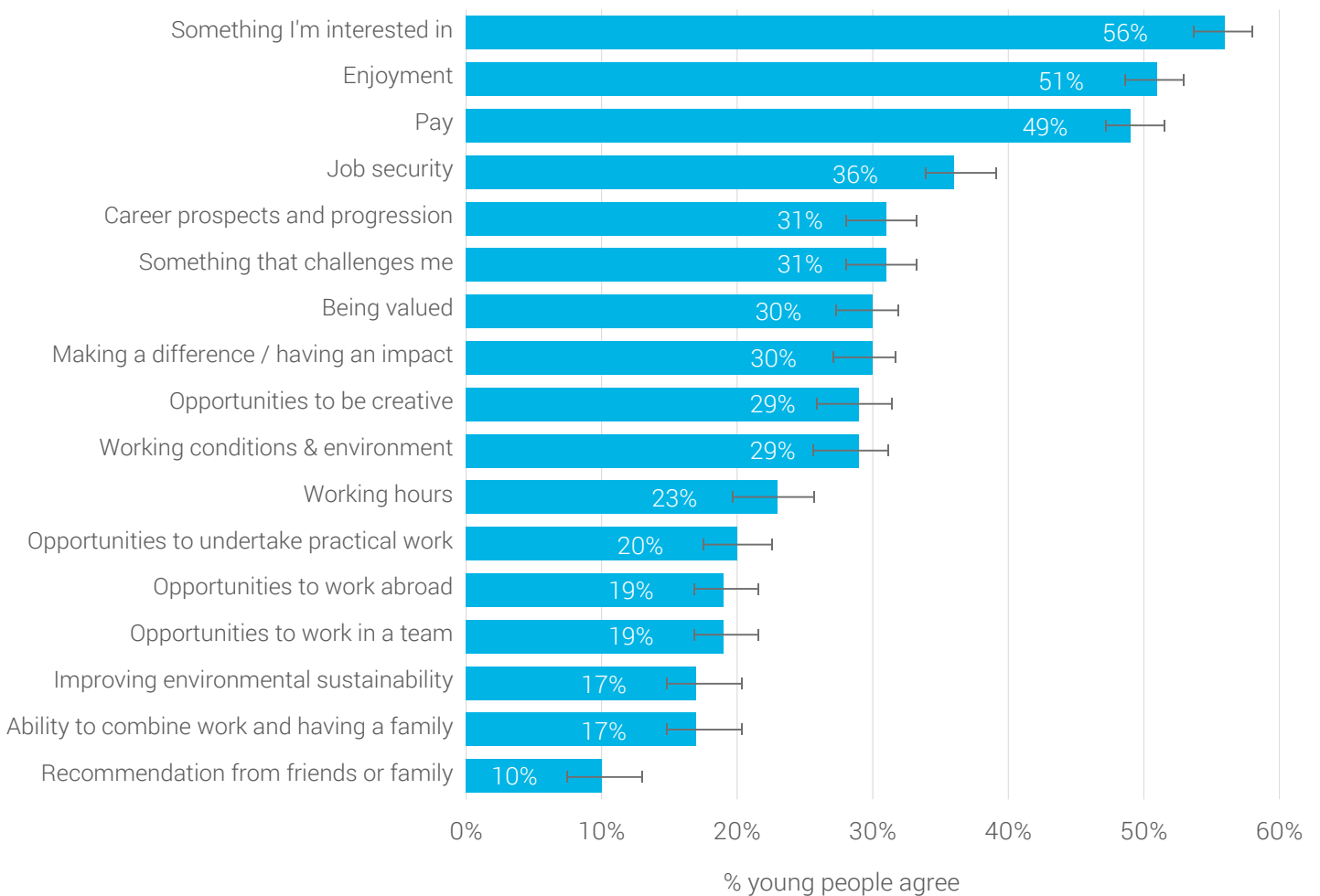
Research from EngineeringUK in 2020 indicated that young people had placed more emphasis on job security as an important career factor in light of the pandemic, so it may be that this factor has retained its importance in 2021.²⁸

²⁸ EngineeringUK, 'Young people and Covid-19', 2020.

Somewhat surprisingly, 'recommendations from friends and family' was chosen by the fewest young people (10%). While this suggests that few young people explicitly consider recommendations, this is not to say that friends and family do not influence young

people's career choices. Section 6 outlines the relationship between parents' knowledge, image, and aspirations towards engineering with young people's own perceptions and choices.

Figure 4.3 Factors young people said would be important to you when deciding upon a career



Source – EngineeringUK Engineering Brand Monitor 2021

Q - Which of the following factors do you think would be important to you when deciding upon a career? Please select all that apply. Options included: pay, working conditions & environment, working hours (9-5), opportunities to work abroad, enjoyment, something I'm interested in, something that challenges me, making a difference/having an impact, career prospects and progression, being valued, job security, recommendation from friends or family, opportunities to undertake practical work, opportunities to work in a team, opportunities to be creative, ability to combine work and having a family, improving environmental sustainability, other (write-in), don't know.

Beyond parental influence, another important way young people learn about engineering careers is through careers activities. In this report, when we talk about careers activities, we are referring to any activity that a young person undertakes, either in school or outside of school, in which they are learning directly about different careers, for example, by attending careers fairs in school or extra-curricular careers events with their parents.

Young people were asked which careers activities they had taken part in in the past 12 months. This period covered the Covid-19 pandemic and resultant lockdowns, which have impacted the ability of young people to access careers activities and events. In recognition of this, the survey explicitly allowed respondents to report on both activities that took place in person as well as online and in doing so has given us insight into how young people's engagement with careers advice and guidance may have changed in this time.

In line with findings from our briefing on young people's experience of careers advice and guidance during the Covid-19 pandemic²⁹, young people appeared to spend less time taking part in formal career activities, and relied more heavily on their informal networks (for example, friends and family) for advice and guidance around careers).

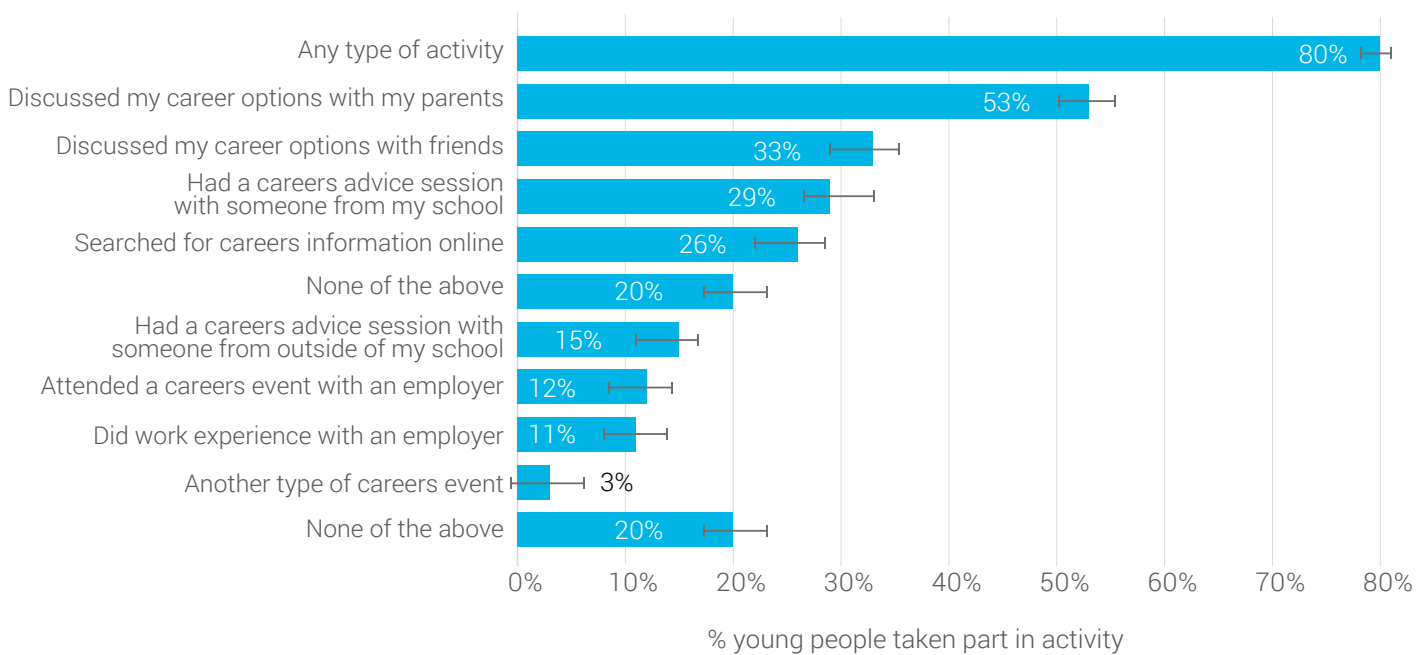
Overall, 1 in 5 young people had not taken part in any careers activities in the past 12 months. Even though recommendations from friends and family was chosen by just 10% of young people as a factor for consideration in choosing a career, the most common activity was discussing careers option with parents,

highlighting the importance of parental influence. Over half of young people had discussed career options with their parents, just a third with their friends, 29% had a careers advice session with someone from their school and 26% had searched for careers information online. On the other side of the scale, engagement with employers was much lower than with family, friends and schools. 11% of young people had done work experience with an employer and 12% attended a careers advice session with an employer.

This increased importance placed on informal networks has clear implications given the uneven distribution of knowledge of what engineers do in their jobs across young people from different social backgrounds detailed in section 2. Furthermore, section 6 details the very stark differences in parent's knowledge about, image of, and appeal for their children to have a career in engineering. Young people turning more to their parents for advice, rather than schools and teachers, will only exacerbate these inequalities.

1 in 5 young people had not taken part in any careers activities in the past 12 months.

²⁹ EngineeringUK. 'Young people and Covid-19,' 2020.

Figure 4.4 Careers activities young people had taken part in, in the past 12 months

Source – EngineeringUK Engineering Brand Monitor 2021

Q - In the past 12 months, have you taken part in any of the following: Please select all that apply. Options included: discussed my career options with my parents; searched for careers information online; discussed my career options with friends; had a careers advice session (either online or in person) with someone from my school; had a careers advice session with someone from outside of my school (for example, an independent careers adviser) either online or in person; attended a careers event with an employer, either online or in person (for example, a tour of a workplace or a careers fair); did work experience with an employer (either in person or online); another type of careers event (either in person or online); none of the above.

As discussed at the start of this section, opportunity also encompasses young people's understanding of the educational pathways they would need to follow if they wanted to be an engineer. This includes knowledge of qualifications or subjects young people would need to study to become an engineer, as well as the variety of routes into engineering.

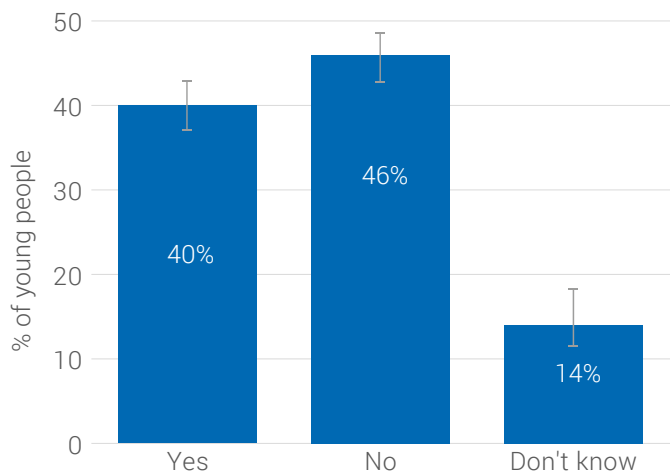
Our results clearly highlighted a need to improve young people's understanding of the educational pathways they would need to pursue if they wanted to be an engineer.

Just 2 in 5 young people said they know what subjects or qualifications they would need to take next to become an engineer, with the majority (60%) saying that they did not know. Over a quarter of young people said they were not knowledgeable at all about the different apprenticeship options available to them. And while it might be expected that fewer young people would have comprehensive knowledge about T levels, given this is a new qualification only recently introduced, we were surprised to see that the majority (66%) of young people

did not know what T levels³⁰ were at all. When broken down by age group, 26% of young people in KS3, 43% of young people in KS4 and 38% of young people in KS5 said they know what T levels are. While those young people for whom T levels might be the next stage of their studies (those in KS4) were more likely than the other groups to know what they are, fewer than half did.

These findings highlight a particular area where teachers, parents and outreach workers could give young people the tools to pursue engineering in the future. If young people do not know what subjects or courses they should pursue/are available to become an engineer, they may unintentionally close the option of engineering off to themselves in the future.

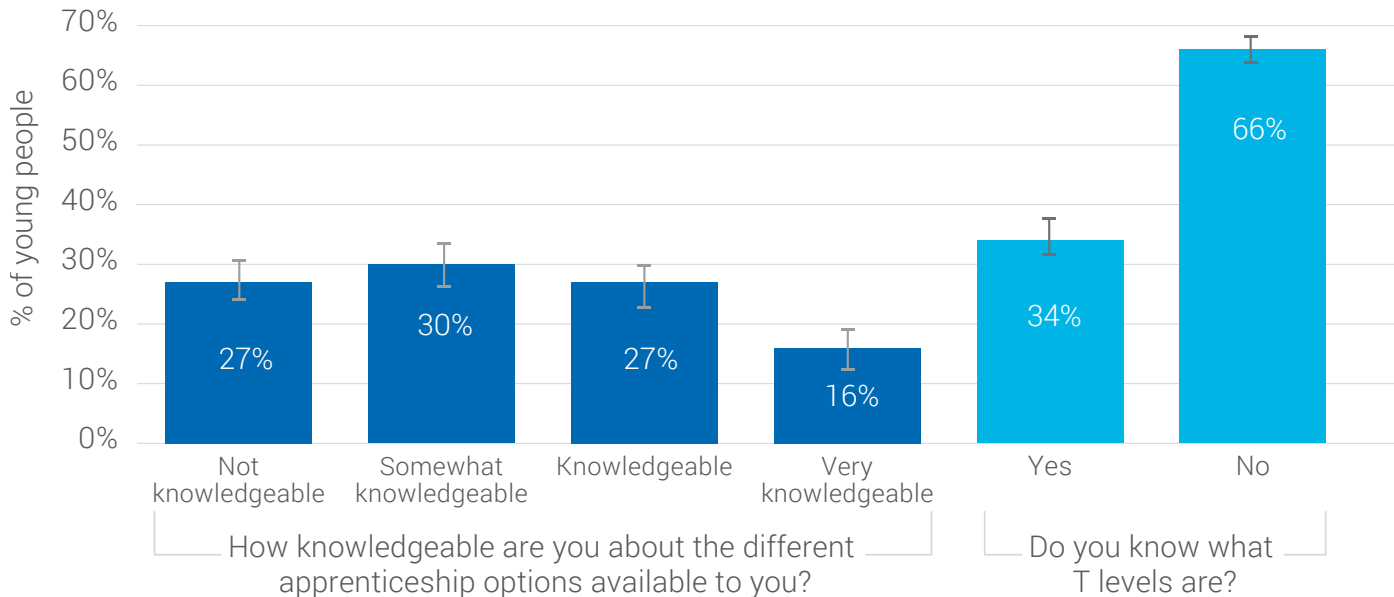
Figure 4.5 Do you know what subjects or qualifications you would need to take next to become an engineer in the future?



Source – EngineeringUK Engineering Brand Monitor 2021

Q - I know what subjects or qualifications I would need to take next to become an engineer in the future

Figure 4.6 Young people's reported knowledge about apprenticeship options and T levels



Source – EngineeringUK Engineering Brand Monitor 2021

Q - I know what subjects or qualifications I would need to take next to become an engineer in the future

³⁰ For the first time this year, a question about T levels was included in the EBM. T levels are a new qualification developed with employers offering a mixture of classroom and on the job learning. T levels are equivalent to 3 A levels, and while a limited number of T levels were available from September 2020, and range of additional subject areas will be added in 2021 and 2022.

A levels, and while a limited number of T levels were available from September 2020, and range of additional subject areas will be added in 2021 and 2022. For children completing the EBM survey and looking forward at their options past key stage 3, studying an engineering related subject will be a viable option. See: www.gov.uk/government/publications/introduction-of-t-levels/introduction-of-t-levels

4.2 Knowledge about what engineers can do in their jobs

Young people's perceptions of the characteristics engineers need to do their jobs well were associated with their overall knowledge about engineering careers. We know that engineering is a sector that requires creativity and vision, but this is often counter to popular perceptions of engineers.

Young people who chose characteristics not as typically associated with engineers, like creativity and teamwork, were more likely to also report higher levels of knowledge about what engineers do. In contrast, young people's choice of characteristics more typically associated with engineers, like analytical and numerical ability, was not associated with greater knowledge about what engineers do.

Figure 4.7 Young people who chose the following characteristics were...

Most likely to say they know what engineers can do in their jobs	Least likely to say they know what engineers can do in their jobs
Leadership skills	Practical
Innovative	Numerate
Creative	Systematic
A good communicator	Analytical

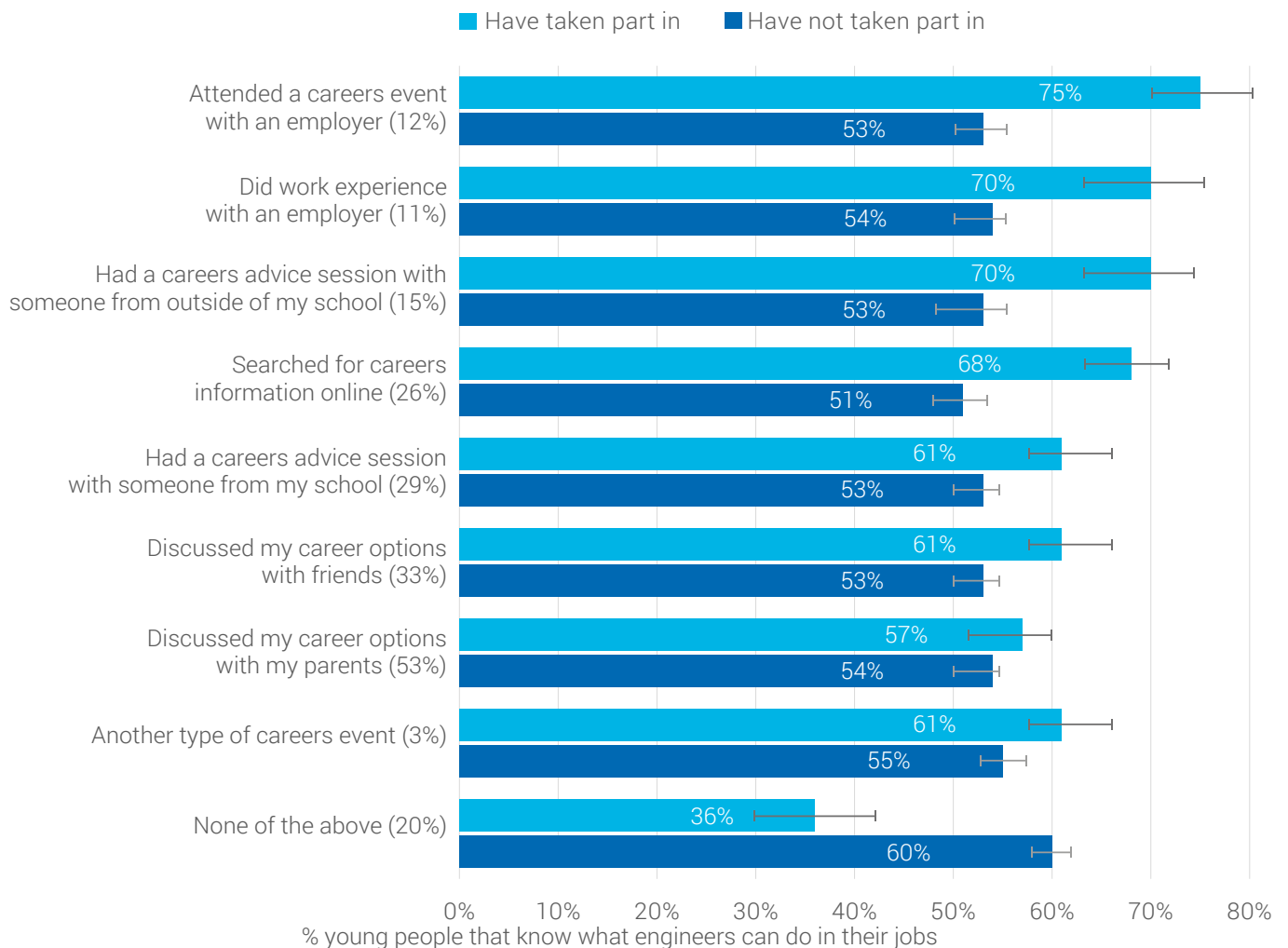
One of the main goals of encouraging engagement with careers activities is to broaden young people's knowledge of the types of jobs they can pursue in the future, and what's involved in those jobs. It would be hoped, therefore, that engagement with

careers activities is associated with knowledge about engineering careers. It is also important to understand exactly which types of careers activities are associated with increased knowledge about what engineers do so that we may learn which activities are the most effective in improving knowledge.

Overall, higher proportions of young people who had engaged with careers activities said they know about the different types of things engineers can do. Just 36% of young people who chose 'none of the above' in the list of careers activities (which included 'other') said they knew what engineers can do in their jobs. In comparison, 60% of young people who had taken part in at least one careers activity said they knew what engineers can do in their jobs. Careers activities associated with significantly high proportions of young people reporting that they know what engineers can do include: attending a careers event with an employer, doing work experience with an employer, having had a careers advice session with someone from, or outside, their school, searching for careers information online, or discussing career options with friends.

The only activity not associated with knowledge about engineers was 'discussed careers options with my parents.' Young people who had done so were no more likely to say they know what engineers do than young people who hadn't. This is somewhat surprising given parents' views about engineering were associated with knowledge of what engineers can do but suggests that young people need to seek information outside of their family to gain better information around engineering careers. However, Section 6 reveals stark differences in parents' knowledge about engineering careers (and STEM careers in general) and it is perhaps more important that parents are better informed about what engineering careers involve.

Figure 4.8 Proportion of young people who agreed that they know what engineers can do in their jobs by participation in different careers activities³¹



Source – EngineeringUK Engineering Brand Monitor 2021

Q1 - In the past 12 months, have you taken part in any of the following: Please select all that apply. Options included: discussed my career options with my parents; searched for careers information online; discussed my career options with friends; had a careers advice session (either online or in person) with someone from my school; had a careers advice session with someone from outside of my school (for example, an independent careers adviser) either online or in person; attended a careers event with an employer, either online or in person (for example, a tour of a workplace or a careers fair); did work experience with an employer (either in person or online); another type of careers event (either in person or online); none of the above.

Q2 - In general, I know about the different types of things the following people can do in their jobs: engineers. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Displayed are the percentage who selected 'agree' or 'strongly agree'.

³¹ The numbers in brackets refer to the proportion of children in the total sample who took part in each activity

4.3 Positive image of engineering

Young people's overall image of engineering differed depending on the characteristics they said were important for engineers to do their jobs well. Image of engineering was most positive among young people who chose **innovative, creative, a good communicator, or leadership skills**. While still significantly higher than average, positive ratings were lowest among young people who chose **practical** or **numerate**.

Young people who hadn't taken part in any careers activity at all had a strongly negative image of engineering.

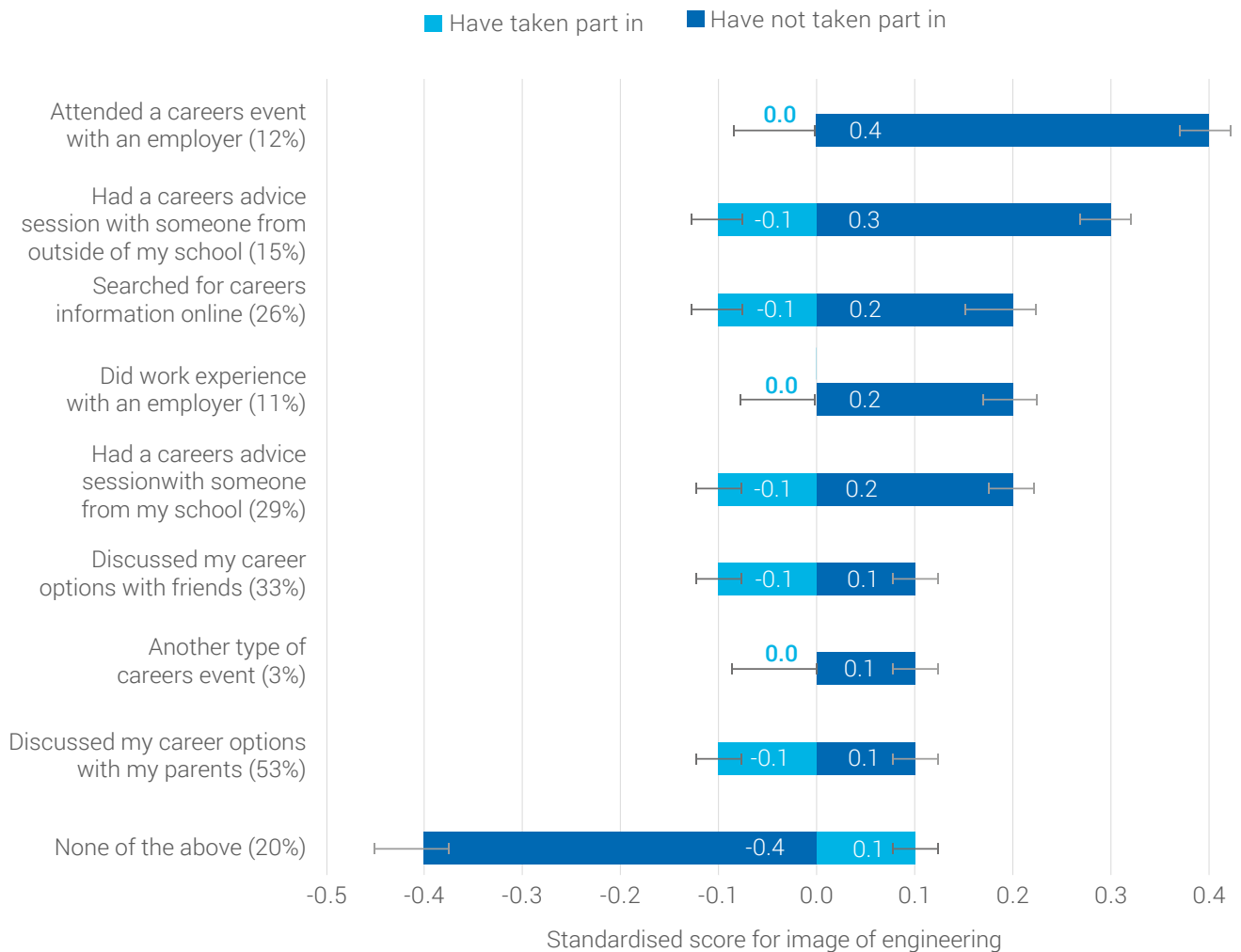
Figure 4.9 Young people who chose the following characteristics reported the...

Most positive image of engineering on average	Least positive image of engineering on average
Innovative	Practical
Creative	Numerate
Leadership skills	Analytical
A good communicator	Systematic

Engagement with careers activities appeared to be particularly important in fostering a positive image of engineering. Young people who had attended a careers event with an employer, had a careers advice session with someone from outside of their school, or searched for careers information online, had more positive images of engineering than young people who hadn't taken part in these activities.

By contrast, young people who hadn't taken part in any careers activity at all had a strongly negative image of engineering, compared to average.

Figure 4.10 Mean image of engineering by participation in different careers activities



Source – EngineeringUK Engineering Brand Monitor 2021

Q - In the past 12 months, have you taken part in any of the following: Please select all that apply. Options included: discussed my career options with my parents; searched for careers information online; discussed my career options with friends; had a careers advice session (either online or in person) with someone from my school; had a careers advice session with someone from outside of my school (for example, an independent careers adviser) either online or in person; attended a careers event with an employer, either online or in person (for example, a tour of a workplace or a careers fair); did work experience with an employer (either in person or online); another type of careers event (either in person or online); none of the above

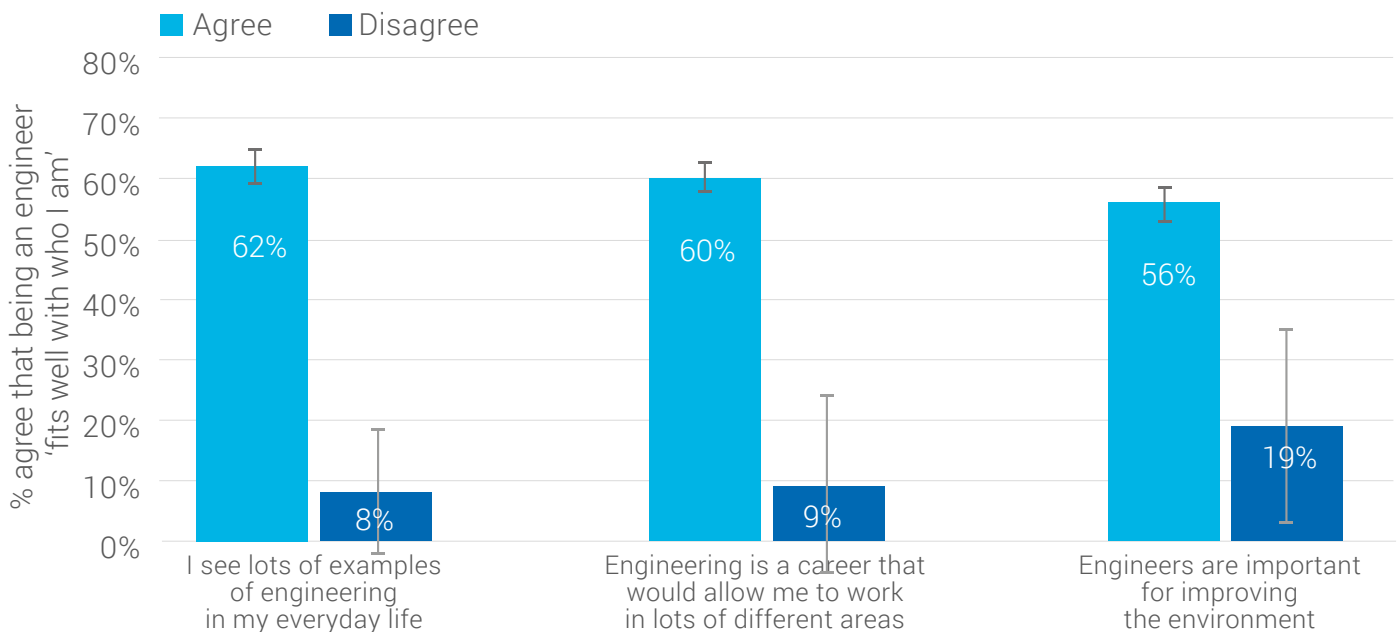
Standardised scores were calculated by combining responses to 4 questions: I see lots of examples of engineering in my everyday life; Engineering is a career that would allow me to work in lots of different areas; Engineers are important for improving the environment; A job in engineering would be interesting. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Numbers represent the mean scores of young people from each group.

4.4 Perception that being an engineer 'fits with who I am'

A much higher proportion of young people who reported positive views about engineering careers also reported that an engineering career fits well with who they are. Nearly 8 times the proportion of young people who agreed that they see lots of examples of engineering in their everyday life said engineering fits with who they are compared

to those who disagreed. Seven times the proportion of young people who said engineering is a career that would allow them to work in lots of different areas agreed that engineering fits with who they are, compared to those who disagreed. And finally, 3 times the proportion of young people who said engineers are important for improving the environment agreed that engineering fits with who they are, compared to those who disagreed.

Figure 4.11 Proportion of young people who said that 'being an engineer fits well with who I am' by image of engineering



Source – EngineeringUK Engineering Brand Monitor 2021

Q1 - How much do you agree or disagree with the following statements regarding engineering?: I see lots of examples of engineering in my everyday life; Engineering is a career that would allow me to work in lots of different areas; Engineers are important for improving the environment. Percentages presented represent the proportions reporting 'agree' or 'strongly agree'.

Q2 - How much do you agree or disagree with the following statements?: I feel that being an engineer fits well with who I am; Responses were on a 5-point Likert scale from 'strongly disagree' strongly agree.' Percentages presented represent the proportions reporting 'agree' or 'strongly agree.'

Standardised scores were calculated by combining responses to 4 questions: I see lots of examples of engineering in my everyday life; Engineering is a career that would allow me to work in lots of different areas; Engineers are important for improving the environment; A job in engineering would be interesting. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Numbers represent the mean scores of young people from each group.

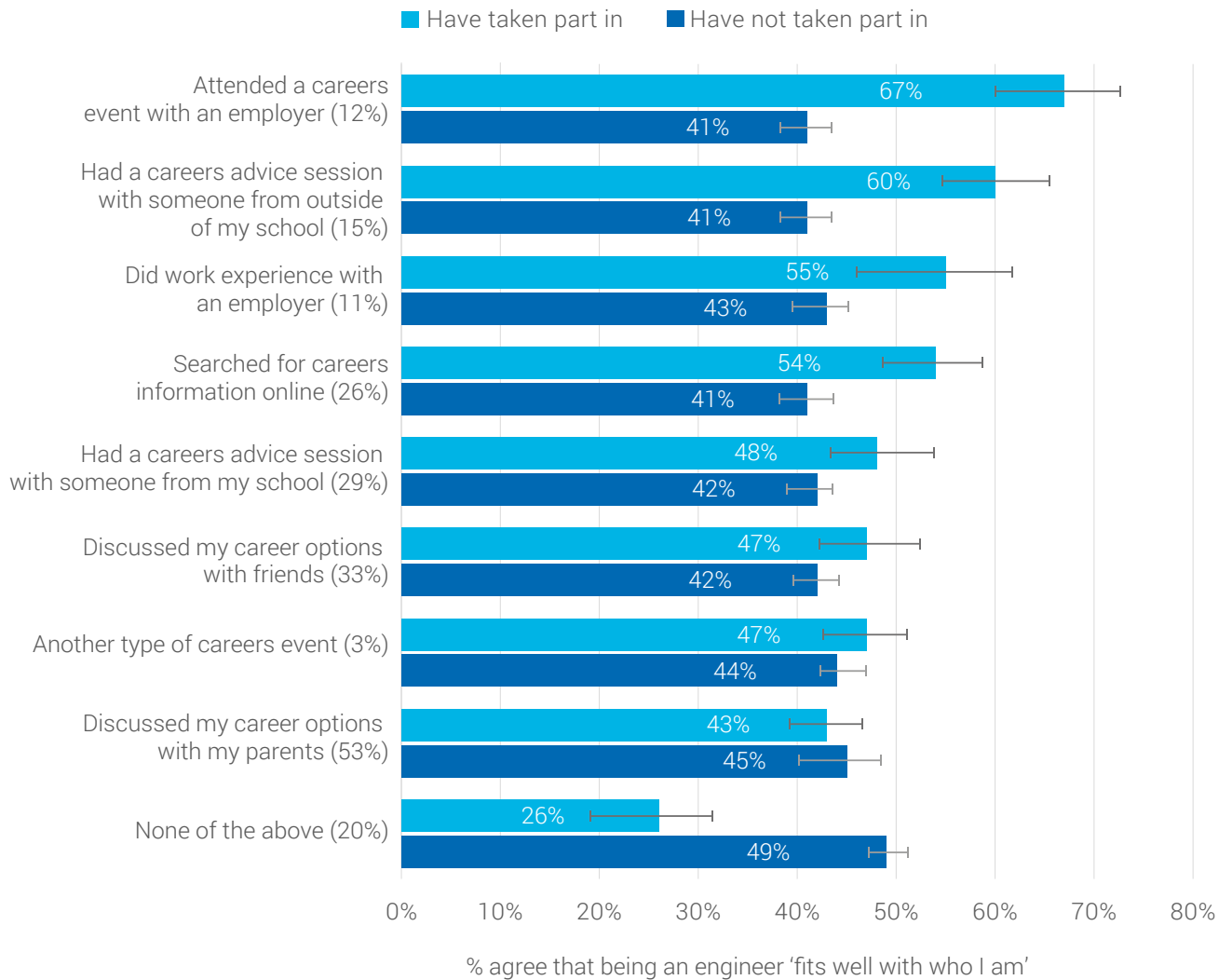
Higher proportions of young people who said that engineers needed to be innovative, creative, a good communicator, well-organised, have team-working skills, leadership skills, and be a quick learner also said that an engineering career fit well with who they were than those who did not. In contrast, lower proportions of young people who chose practical or numerate as characteristics engineers needed to do their jobs well said engineering fits with who they are, compared to young people who did not choose these characteristics.

Figure 4.12 Young people who chose the following characteristics were...

Most likely to say being an engineer fits well with who they are	Least likely to say being an engineer fits well with who they are
Innovative	Numerate
A good communicator	Practical
Leadership skills	Analytical
Creative	Systematic

A number of careers activities were associated with young people's perceptions of fit with engineering. Higher proportions of young people who had searched for careers information online, discussed careers options with their friends, had a careers advice session (either with someone in, or outside, their school), attended a careers event with an employer, or did work experience with an employer, said being an engineer fit well with who they were.

Figure 4.13 Proportion of young people who said that ‘being an engineer fits well with who I am’ by careers activities³²



Source – EngineeringUK Engineering Brand Monitor 2021

Q1 - In the past 12 months, have you taken part in any of the following: Please select all that apply. Options included: discussed my career options with my parents; searched for careers information online; discussed my career options with friends; had a careers advice session (either online or in person) with someone from my school; had a careers advice session with someone from outside of my school (for example, an independent careers adviser) either online or in person; attended a careers event with an employer, either online or in person (for example, a tour of a workplace or a careers fair); did work experience with an employer (either in person or online); another type of careers event (either in person or online); none of the above.

Q2 - How much do you agree or disagree with the following statements?: I feel that being an engineer fits well with who I am; Responses were on a 5-point Likert scale from ‘strongly disagree’ strongly agree.’ Percentages presented represent the proportions reporting ‘agree’ or ‘strongly agree.’

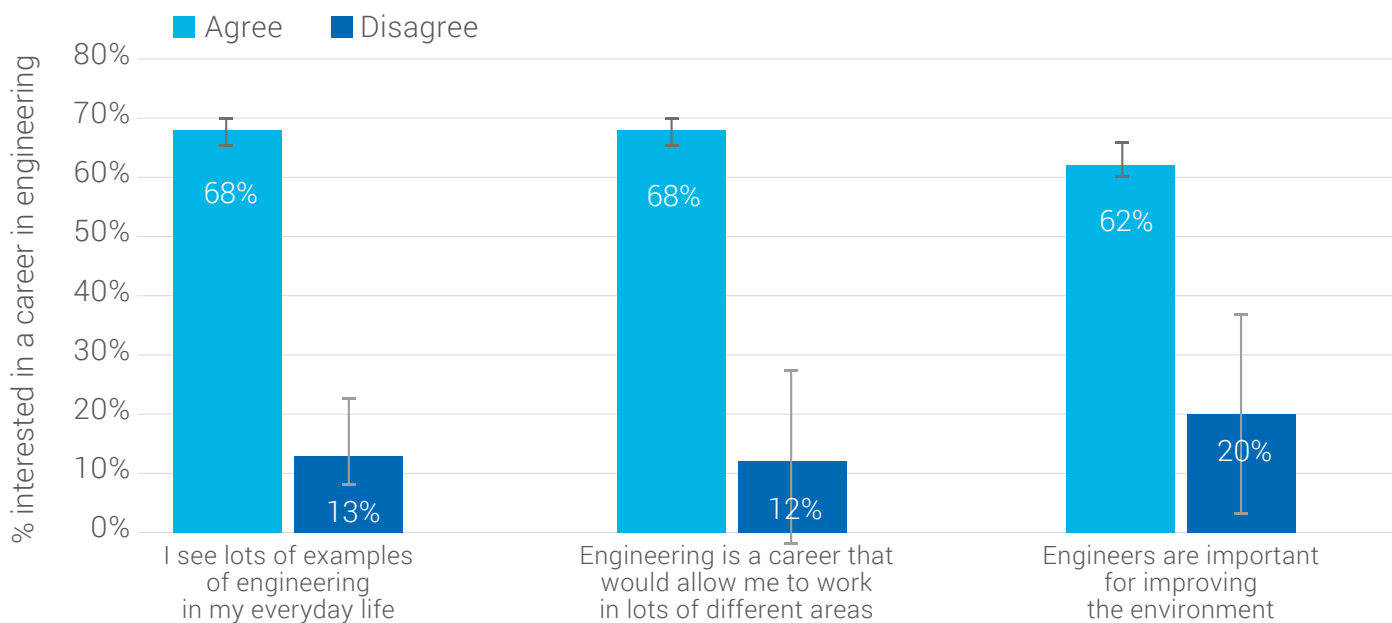
³² The numbers in brackets refer to the proportion of children in the total sample who took part in each activity

4.5 Interest in a career in engineering

There were stark differences in young people’s interest in engineering careers by their image of engineering. Of young people who said they see lots of examples of engineering in their everyday life, 68% said they were interested in a career in engineering, compared to just 13% who did not. Similarly, of those who said engineering is a career that would allow them to work in a lot of different areas, 68% said they were interested in a career in engineering compared to 12% of young people

who disagreed. The differences were smaller, but still sizeable, by young people’s view of engineers as important for improving the environment. Overall young people’s views about the contribution of engineers to the environment were very positive, with just 5% of young people disagreeing with the statement and 72% agreeing. Of those who disagreed, 20% said they were interested in a career in engineering, compared to 62% of those who agreed.

Figure 4.14 Interest in a career in engineering by image of engineering



Source – EngineeringUK Engineering Brand Monitor 2021

Q - How much do you agree or disagree with the following statements regarding engineering?: I see lots of examples of engineering in my everyday life; Engineering is a career that would allow me to work in lots of different areas; Engineers are important for improving the environment. Percentages presented represent the proportions reporting ‘agree’ or ‘strongly agree’.

Those who chose innovative, creative, a good communicator, leadership skills, and a quick learner as characteristics important for engineers to do their job well were more likely to also say they were interested in a career in engineering than those who had not. On the other hand, lower proportions of young people who chose practical, numerate or analytical as important said they were interested in a career in engineering, compared to those who did not choose these characteristics.

Figure 4.15 Young people who chose the following characteristics were...

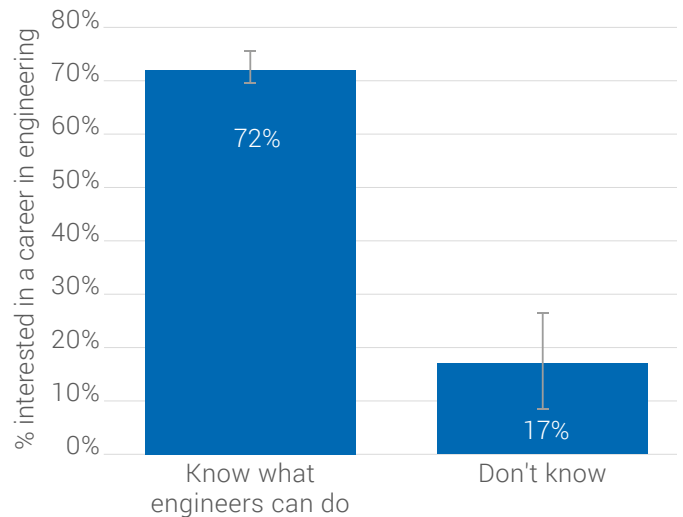
Most likely to say being an engineer fits well with who they are

Least likely to say being an engineer fits well with who they are

Innovative	Practical
Leadership skills	Numerate
A good communicator	Analytical
Creative	Systematic

Higher reported knowledge of what engineers do in their jobs was associated with a higher reported likelihood of interest in an engineering career. Fewer than 1 in 5 young people who disagreed that they know what engineers can do in their jobs said they were interested in a career in engineering (17%), compared to nearly three-quarters of young people who said they agreed they know what engineers can do (72%).

Figure 4.16 Proportion of young people who said they were interested in a career in engineering by knowledge of what engineers can do in their jobs



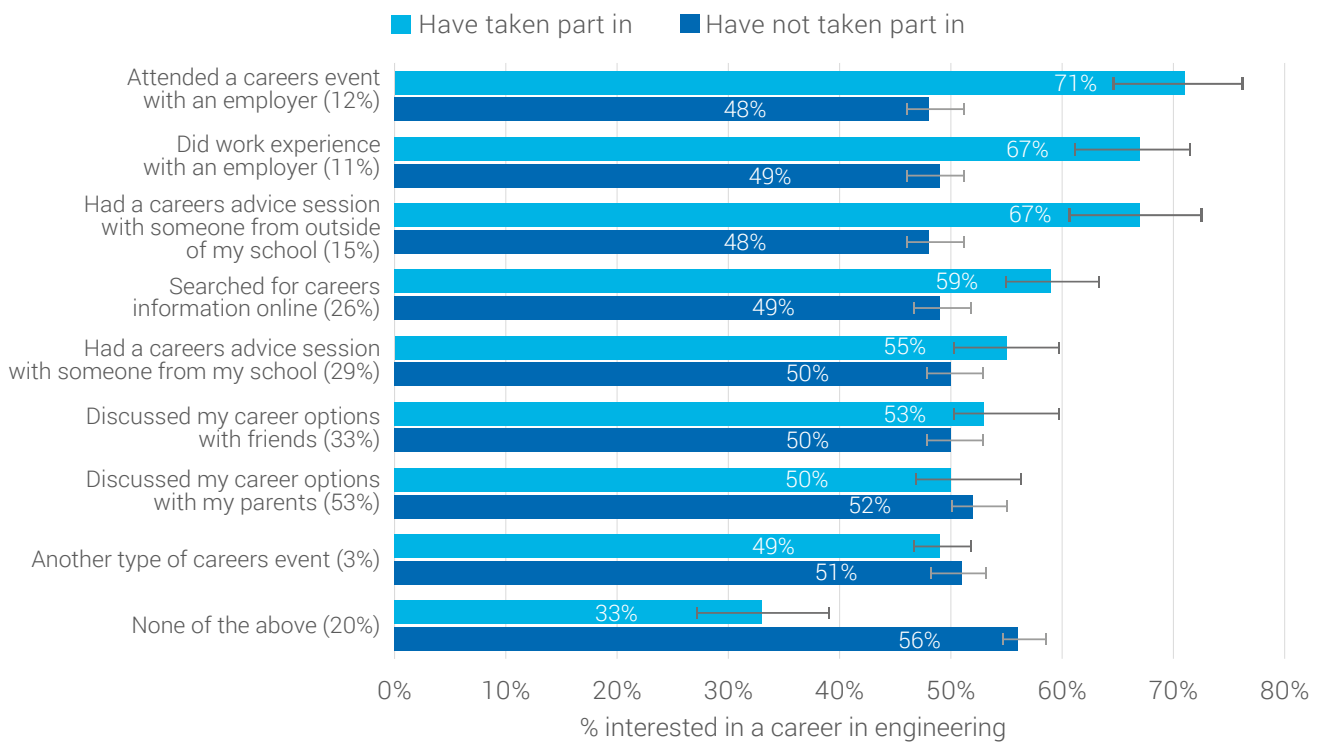
Source – EngineeringUK Engineering Brand Monitor 2021

Q1 - How much do you agree or disagree with the following statements: In general, I know about the different types of things the following people can do in their jobs: scientists, engineers, people working in technology. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree.'

Q2 - How interested are you in a future career that involves any of the following?: engineering. Responses were on a 5-point Likert scale from 'not at all interested' to 'very interested.'

Higher proportions of young people who said they had attended a careers event with an employer, done work experience with an employer, had a careers advice session, or had searched for careers information online, said they were interested in a career in engineering than those who had not.

Figure 4.17 Percent young people interested in a career in engineering by careers activities³³



Source – EngineeringUK Engineering Brand Monitor 2021

Q1 - In the past 12 months, have you taken part in any of the following: Please select all that apply. Options included: discussed my career options with my parents; searched for careers information online; discussed my career options with friends; had a careers advice session (either online or in person) with someone from my school; had a careers advice session with someone from outside of my school (for example, an independent careers adviser) either online or in person; attended a careers event with an employer, either online or in person (for example, a tour of a workplace or a careers fair); did work experience with an employer (either in person or online); another type of careers event (either in person or online); none of the above

Q2 - How interested are you in a future career that involves any of the following?: engineering. Responses were on a 5-point Likert scale from 'not at all interested' to 'very interested.'

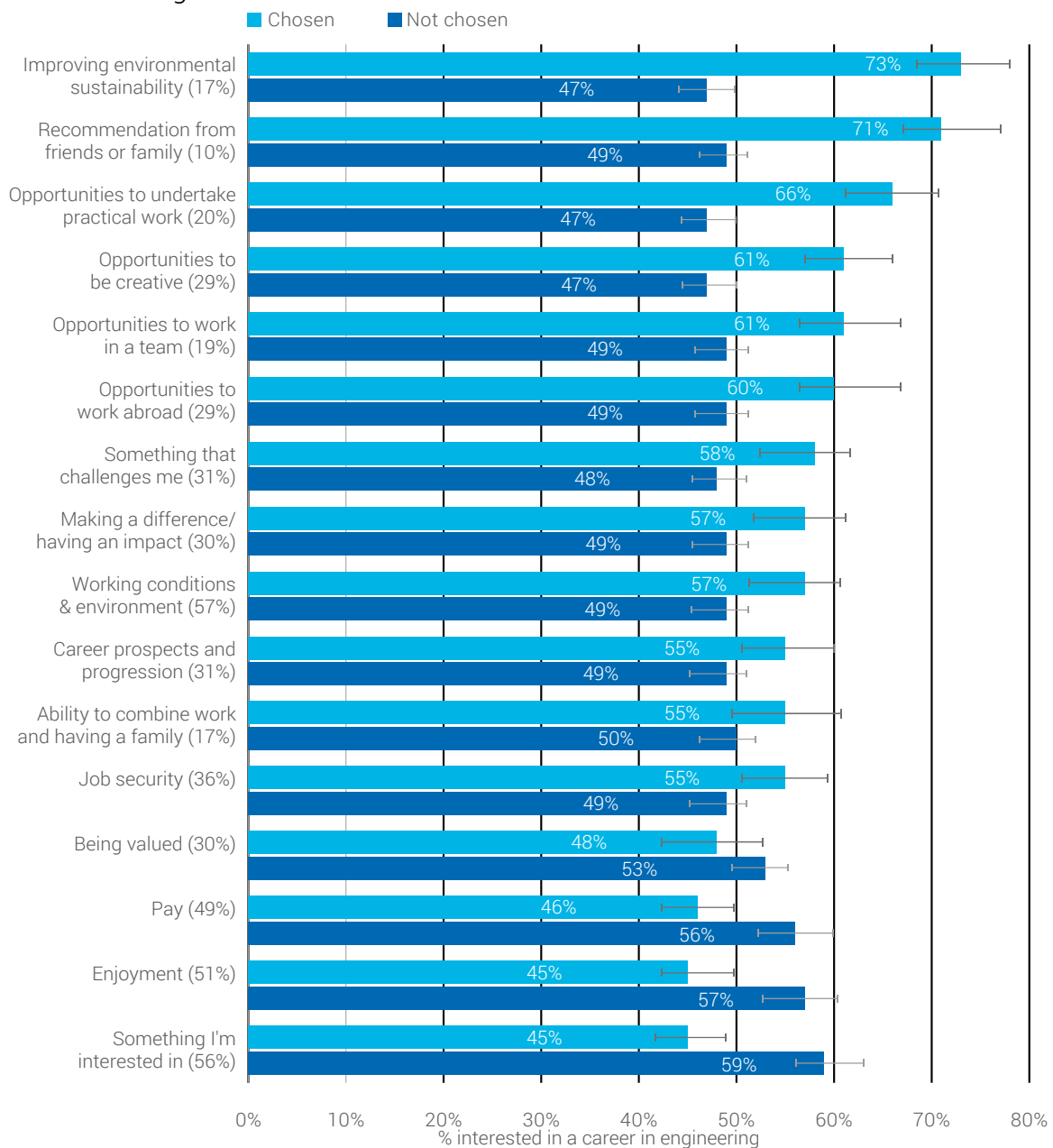
Young people were also asked about the factors that would be important to them in deciding on a career. There were a number of significant differences in reported likelihood of pursuing a career in engineering based on the factors young people listed as important to them. Higher proportions of young people who chose improving environmental sustainability, recommendations from friends or family, opportunities to undertake practical work said that they were interested in a career

in engineering. On the other hand, lower proportions of young people who chose something I am interested in, enjoyment, or pay said they were interested in a career in engineering (compared to young people who did not choose these factors).

This is a potentially concerning finding given that these were the factors chosen by the young people in our research as most important when deciding on a career.

³³ The numbers in brackets refer to the proportion of children in the total sample who took part in each activity

Figure 4.18 Percentage of young people interested in a career in engineering, by factors important in deciding on a career³⁴



Source – EngineeringUK Engineering Brand Monitor 2021

Q1 - Which of the following factors do you think would be important to you when deciding upon a career? Please select all that apply. Options included: pay, working conditions & environment, working hours (9 to 5), opportunities to work abroad, enjoyment, something I'm interested in, something that challenges me, making a difference/having an impact, career prospects and progression, being valued, job security, recommendation from friends or family, opportunities to undertake practical work, opportunities to work in a team, opportunities to be creative, ability to combine work and having a family, improving environmental sustainability, other (write-in), don't know

Q2 - How interested are you in a future career that involves any of the following?: engineering. Responses were on a 5-point Likert scale from 'not at all interested' to 'very interested.'

³⁴ The numbers in brackets refer to the proportion of children in the total sample who chose each factor

5. Motivation

5.1 Overview

Of course, young people need not only the capability and the opportunity to pursue a career in engineering, but also the motivation to do so. In the EBM, we operationalised this concept in 2 different ways: by measuring the extent to which young people see engineering as suitable for themselves (inclusivity) and the extent to which they want to pursue engineering (desirability).

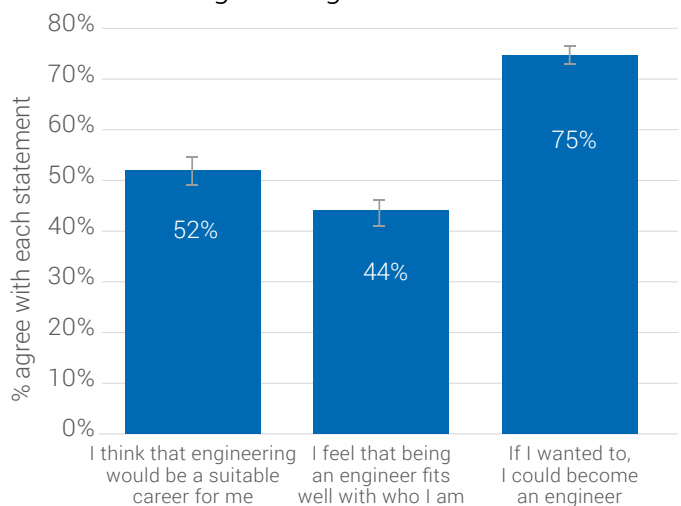
Two of the 4 outcomes already covered in this report are also measures of motivation; the perception that being an engineer fits with how young people see themselves and interest in a career in engineering. An overview and demographic breakdowns of responses to these outcomes have already been covered in this report in section 2, therefore this section focuses on tenets of motivation not yet explored as outcomes. This includes:

- Inclusivity: young people’s overall views of inclusivity of engineering, including attitudes towards gender, engineering participation and ability.
- Young people’s overall interest in a career in engineering compared to their interest in careers in other areas of STEM.

5.2 Inclusivity

Young people were asked a number of questions that aimed to test whether they felt that being an engineer ‘fit’ with how they saw themselves, or whether engineering was seen as a career for other young people. Overall, 52% of young people³⁵ said that they think engineering would be a suitable career for them, 44% said that being an engineer fits well with who they are, and 75% of young people said that if they wanted to, they could become an engineer.

Figure 5.1 Young people’s responses to questions about inclusivity and engineering



Source – EngineeringUK Engineering Brand Monitor 2021

Q - How much do you agree or disagree with the following statements?: I think that engineering would be a suitable career for me; I feel that being an engineer fits well with who I am; If I wanted to, I could become an engineer. Responses were on a 5-point Likert scale from ‘strongly disagree’ strongly agree.’ Percentages presented represent the proportions reporting ‘agree’ or ‘strongly agree.’

³⁵ Many factors come into this question of ‘fit.’ Our cognitive testing revealed that children often focus on their academic self-concept in answering questions about whether engineering would be a suitable career for them. However, views about why you may feel more suited to one career over another may be difficult to understand and articulate. We know that the portrayal of scientists, and particularly engineers, in media as well as textbooks is often that of an older, white man who is unusually academically gifted. A recent US study revealed the extent that this has persisted over the years, with 67% of scientists represented in the top biology textbooks being men. See Wood, S. et al. ‘A scientist like me: demographic analysis of biology textbooks reveals both progress and long-term lags’. Proceedings of the Royal Society, 2020.

Beliefs about gender and engineering

The largest and most persistent inequality in participation in engineering careers is between men and women. Currently, just 16.5% of people working in engineering in the UK are women, and 19.1% of engineering students in UK higher education in the academic year 2018/19 were women.³⁶

We wanted to gain an understanding of what young people, and their parents, thought were the reasons for these disparities; whether they believed that women face more barriers to succeeding in engineering careers than men and were therefore put off by the profession; or whether they believed that the disparities are a consequence of innate differences in abilities and preferences between the genders.

Consequently, young people were asked 2 questions: How much do you agree or disagree with the following statements (on a 5-point Likert scale from 'strongly disagree' to 'strongly agree')?

- Girls face more barriers that make it harder for them to get ahead in engineering than boys
- Boys would make better engineers than girls

For parents, the questions were phrased slightly differently, and context was provided to frame the questions: How much do you agree or disagree with the following statements?

- Women face more barriers that make it harder for them to get ahead in engineering than men
- There are natural differences between men and women that make men better suited to a career in engineering

This is a difficult construct to measure in social surveys and a topic for which people are not always comfortable expressing their true views. The phrasing of these questions

was modelled on questions used by the Pew Research Centre to assess attitudes about race and gender.³⁷ We intended for the questions to be neutral, and for options to be reasonable, to avoid social-desirability bias (where respondents give answers they feel would be viewed more favourably to others or would be more socially desirable).

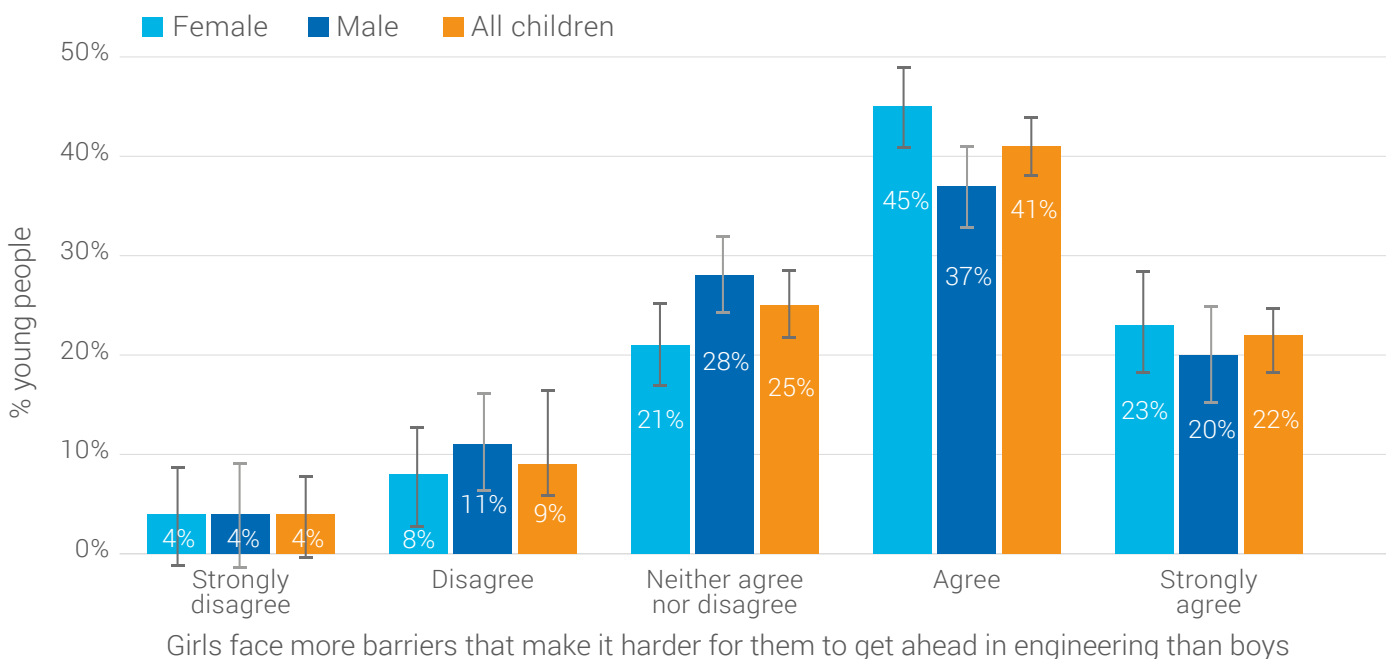
There are a number of ways responses could be interpreted. We did not specify what was meant by barriers, or offer any examples, and left this open to respondents' interpretation. We also did not specify in which ways boys would make better engineers or were more naturally suited to a career in engineering. Our cognitive testing suggested parents and young people considered both ability and preferences in thinking through their answers to questions about gender differences in suitability for engineering (either both at the same time or one or the other).

Overall, 63% of young people either agreed (41%) or strongly agreed (21.5%) that girls face more barriers that make it harder for them to get ahead in engineering than boys. Girls were significantly more likely to agree with this statement, with 68% of girls agreeing compared to 57% of boys. Higher proportions of ethnic minority young people, disabled young people, young people from higher socioeconomic backgrounds, and young people with at least one parent working in a STEM job also agreed with this statement.

³⁶ Advance HE. 'Equality in higher education: students statistical report 2020' [online], accessed 18 August 2021.

³⁷ Pew Research Centre. 'Voters' Attitudes About Race and Gender Are Even More Divided Than in 2016' 2020 [online], accessed 26 August 2021.

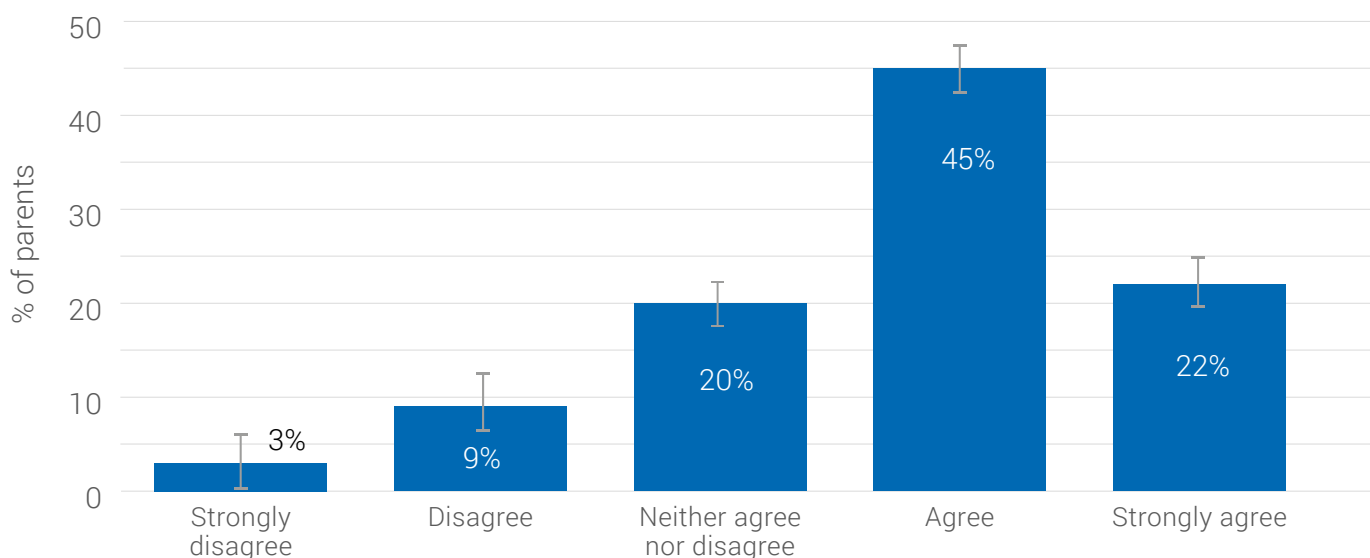
Figure 5.2 Young people's beliefs about whether girls face more barriers that make it harder for them to get ahead in engineering than boys, by gender



Source – EngineeringUK Engineering Brand Monitor 2021

Q - How much do you agree or disagree with the following statements?: Girls face more barriers that make it harder for them to get ahead in engineering than boys. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree,' or 'don't know'.

Figure 5.3 Parents' beliefs about whether women face more barriers that make it harder for them to get ahead in engineering than men



Source – EngineeringUK Engineering Brand Monitor 2021

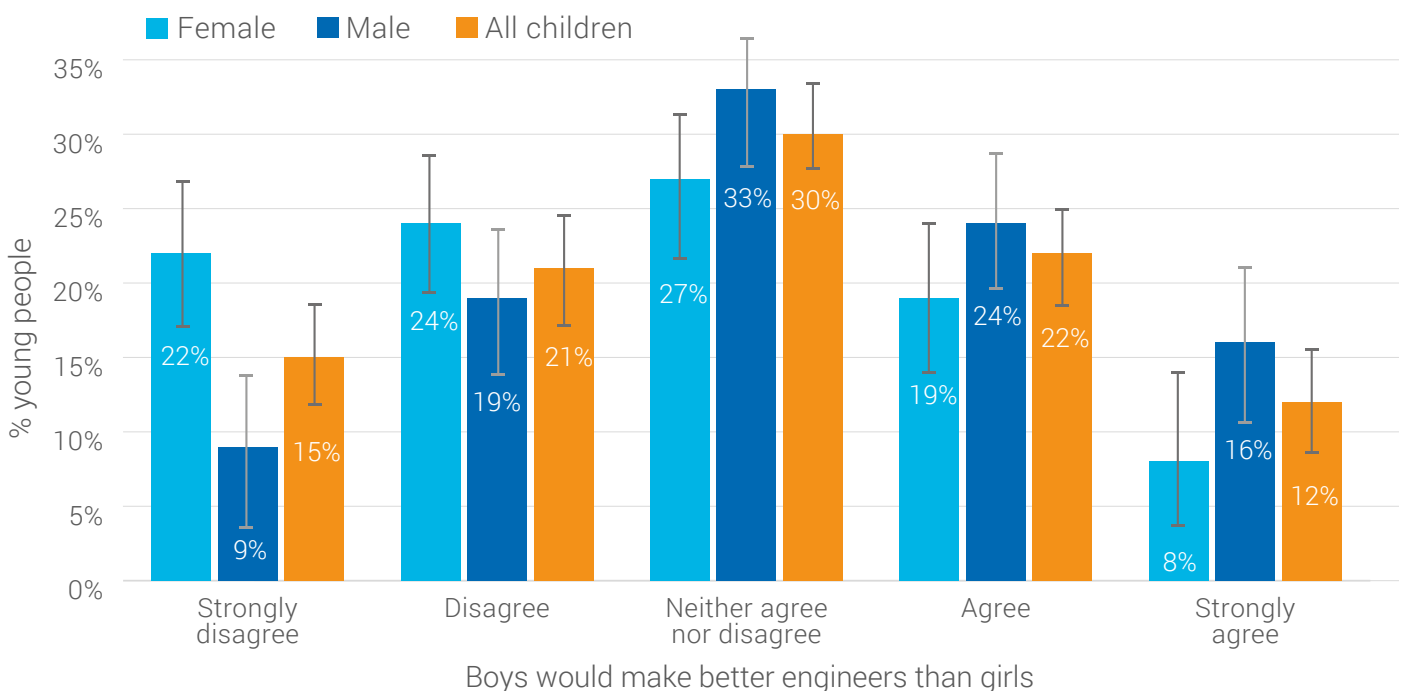
Q - How much do you agree or disagree with the following statements?: Women face more barriers that make it harder for them to get ahead in engineering than men. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree.'

Agreement with the next statement – that boys would make better engineers than girls – was much lower than for the question about barriers. Nonetheless, over a third (34%) of young people either agreed (22%) or strongly agreed (12%) that boys would make better engineers. Overall agreement was much higher among boys, with 40% of boys agreeing compared to 27% of girls. Young people based in England (compared to those in Wales or Scotland), those who were younger, those who were non-disabled, those from lower socio-economic backgrounds, and those who had at least one parent who worked in a STEM job were more likely to agree that boys would make better engineers than girls.

Similar proportions of parents agreed that there are natural differences between men and women that make men better suited to a career in engineering at 37% overall. Overall, over a third of both parents and their children believed that either:

- Boys would make better engineers than girls (young people)
- There are natural differences between men and women that make men better suited to a career in engineering (parents)

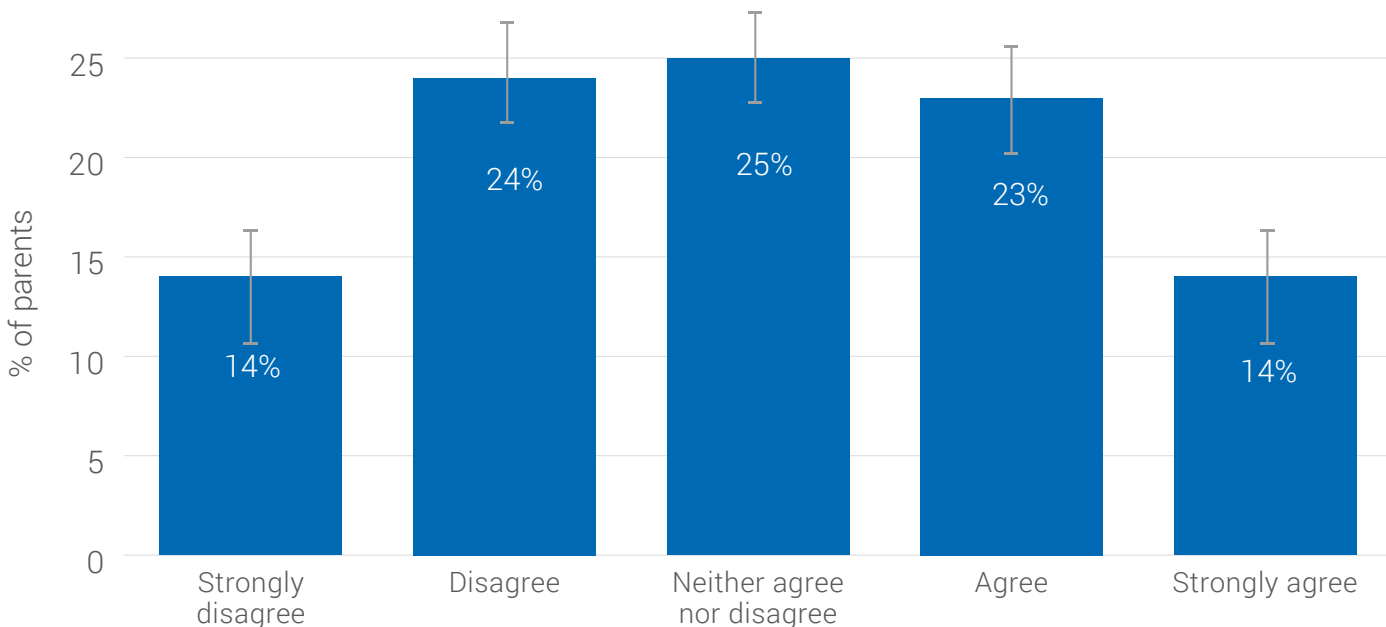
Figure 5.4 Young people’s beliefs about whether boys would make better engineers than girls, by gender



Source – EngineeringUK Engineering Brand Monitor 2021

Q - How much do you agree or disagree with the following statements?: Boys would make better engineers than girls. Responses were on a 5-point Likert scale from 'strongly disagree' disagree to 'strongly agree', or 'don't know'.

Figure 5.5 Parents' beliefs about whether there are natural differences between men and women that make men better suited to a career in engineering



Source – EngineeringUK Engineering Brand Monitor 2021

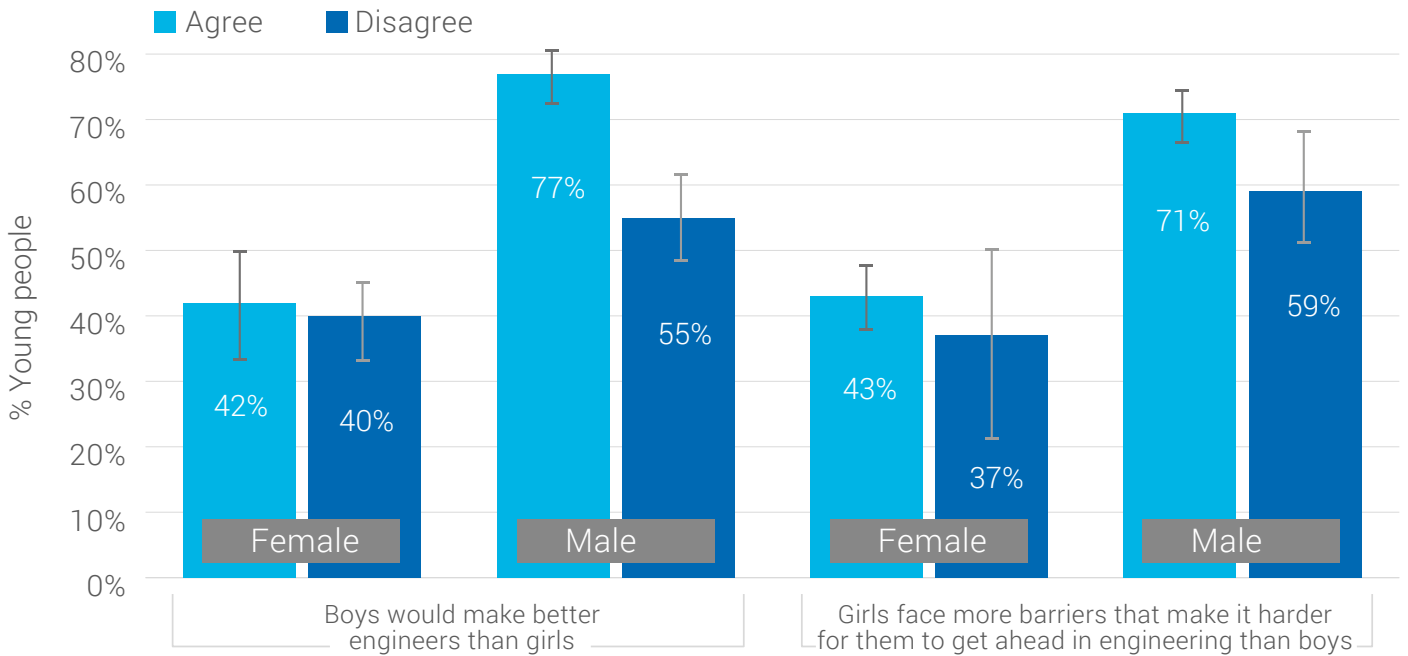
Q - How much do you agree or disagree with the following statements?: There are natural differences between men and women that make men better suited to a career in engineering. Responses were on a 5-point Likert scale from 'strongly disagree' disagree to 'strongly agree.'

Links between beliefs about gender and engineering, and interest in a career in engineering

For girls, their interest in a career in engineering was not affected by whether or not they believed girls face more barriers than boys that make it harder for them to get ahead in engineering, or that boys make better engineers than girls. For boys, however, there were significant differences in interest in engineering

careers by beliefs about gender. Higher proportions of boys who agreed that 'boys would make better engineers than girls' said they were interested in a career in engineering (77%), compared to boys who disagreed (55%). While differences were smaller, significantly higher proportions of boys who said girls face more barriers than boys were interested in a career in engineering (71%), compared to those who disagreed (59%).

Figure 5.6 Young people's interest in a career in engineering, by their beliefs about gender and engineering



Source – EngineeringUK Engineering Brand Monitor 2021

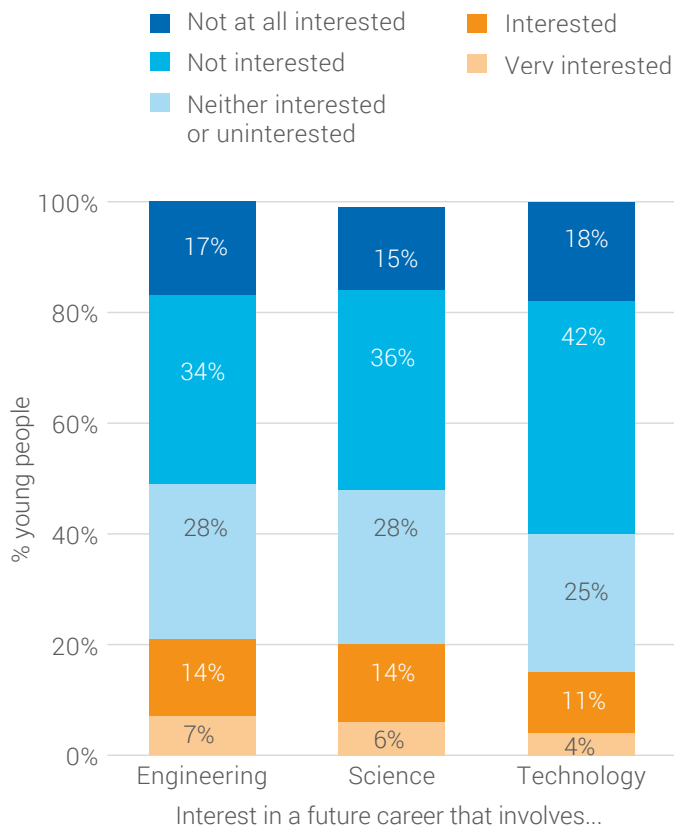
- Q1** - How much do you agree or disagree with the following statements?: Boys would make better engineers than girls.
- Q2** - How much do you agree or disagree with the following statements?: Girls face more barriers that make it harder for them to get ahead in engineering than boys. Responses were on a 5-point Likert scale from 'strongly disagree' disagree to 'strongly agree,' or 'don't know'.
- Q3** - How interested are you in a future career that involves any of the following?: engineering. Responses were on a 5-point Likert scale from 'not at all interested' to 'very interested.' Percentages presented represent the proportions reporting 'interested' or 'very interested.'

These results could indicate that boys who aspire to a career in engineering think themselves to be better suited to engineering, and attribute this at least in part to their gender. However, it could also be the case that boys who have strong beliefs about differences between men and women are more drawn to careers that match their beliefs about gender norms.

5.3. Desirability

To measure desirability – or the extent that young people perceive engineering to be an appealing career choice for them – we asked young people how interested they were in a future career that involved engineering, science or technology. Overall results were positive, with 51% of young people saying they are interested or very interested in a career involving engineering. This was similar to the overall proportions of young people who said they are interested in a career in science more generally. A significantly higher proportion of young people, however, said they were interested in a career that involved technology (59%).

Figure 5.7 Young people's responses to questions about inclusivity and engineering



Source – EngineeringUK Engineering Brand Monitor 2021

Q - How interested are you in a future career that involves any of the following?: engineering, science, or technology. Responses were on a 5-point Likert scale from 'not at all interested' to 'very interested.' Percentages presented represent the proportions reporting 'interested' or 'very interested.'

6. Parent influences

Parents have an important influence on their children, both directly through advice around education and career pathways, and indirectly through the transmission of interests, preferences and values. For the first time this year, the Engineering Brand Monitor survey was conducted in a way that allowed parent and child responses to be linked, enabling us to assess the relationship between young people's views on STEM and that of their parents.

Parent knowledge and interests make up one of the key tenets of 'science capital.' Science capital refers to the science-related knowledge, attitudes, experiences and resources a child has, and has been linked to STEM careers aspirations and participation.³⁸ Young people can develop science capital through, for example, exposure to STEM activities at an early age, regularly discussing STEM with their family, or engaging with TV and/or books with a STEM focus.

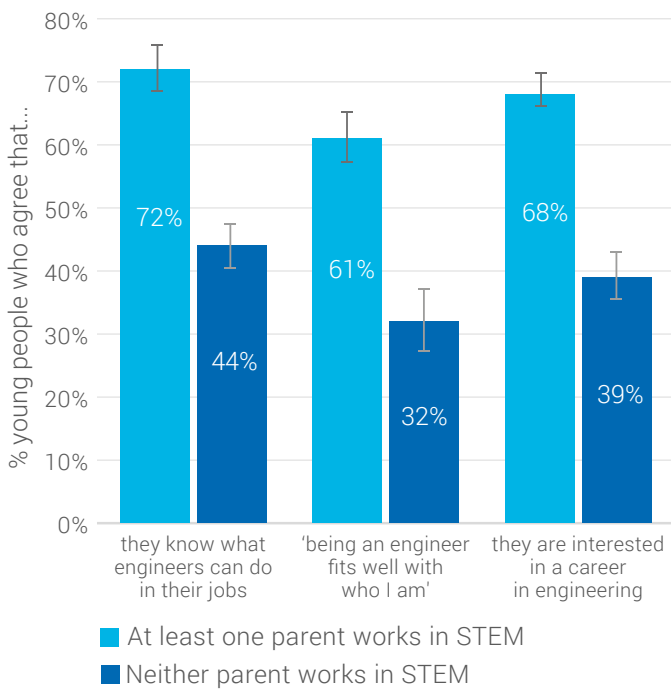
6.1 Parents' job type

One of the primary ways parents can influence young people's preferences and aspirations is through their own affinity for science and mathematics. Along with questions explored in section 2 around parents' income and education status, parents were also asked whether they or their child's other parent (if applicable) worked in a STEM field. Previous research has confirmed that parents' occupation (principally whether they work in a STEM field or not) goes some way to predicting young people's own occupational choices.³⁹ Findings from our survey substantiate this research; young people who had at least one parent who worked in a STEM field had more positive responses against all outcomes compared to those who did not. They were more likely to say they know what engineers can do in their jobs, had a more positive view of engineering, were more likely to see engineering as a career that 'fits who they are', and were more likely to say they were interested in a career in engineering.

³⁸ Archer, L. et al. 'ASPIRES 2: Young people's science and career aspirations, age 10 to 19', London: UCL Institute of Education, 2020.

³⁹ van der Vleuten. et al. 'Intergenerational transmission of gender segregation: How parents' occupational field affects gender differences in field of study choices', British Educational Research Journal, 2018.

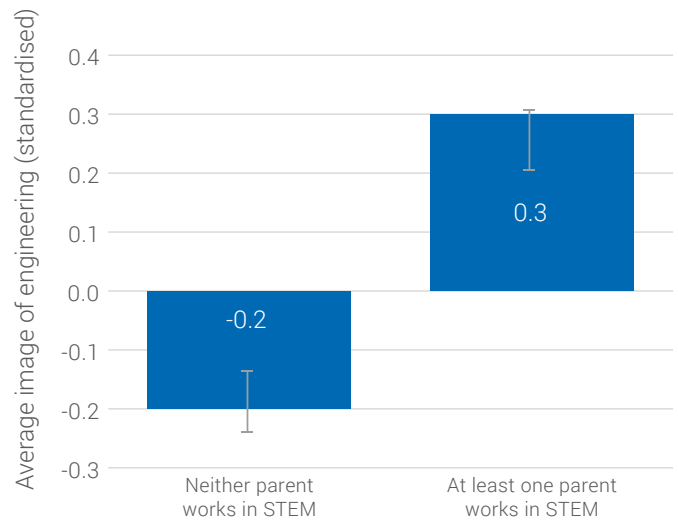
Figure 6.1 Proportion of young people who agreed that they know what engineers can do in their jobs, 'being an engineer fits well with who I am' and they are interested in a career in engineering, by whether their parents work in STEM or not



Source – EngineeringUK Engineering Brand Monitor 2021

- Q1** - Do you, or one of your child's other primary caregiver(s), work in any of the following fields? Please select all that apply. Options included: science, technology, engineering, mathematics, medicine or none of the above.
- Q2** - How much do you agree or disagree with the following statements: In general, I know about the different types of things the following people can do in their jobs: engineers. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree'.
- Q3** - How much do you agree or disagree with the following statements?: I feel that being an engineer fits well with who I am; Responses were on a 5-point Likert scale from 'strongly disagree' strongly agree.' Percentages presented represent the proportions reporting 'agree' or 'strongly agree.'
- Q4** - How interested are you in a future career that involves any of the following?: engineering. Responses were on a 5-point Likert scale from 'not at all interested' to 'very interested.'

Figure 6.2 Young people's average image of engineering by whether their parents work in STEM or not



Source – EngineeringUK Engineering Brand Monitor 2021

Q - Do you, or one of your child's other primary caregiver(s), work in any of the following fields? Please select all that apply. Options included: science, technology, engineering, mathematics, medicine or none of the above.

Standardised scores were calculated by combining responses to 4 questions: I see lots of examples of engineering in my everyday life; Engineering is a career that would allow me to work in lots of different areas; Engineers are important for improving the environment; A job in engineering would be interesting. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Numbers represent the mean scores of young people from each group.

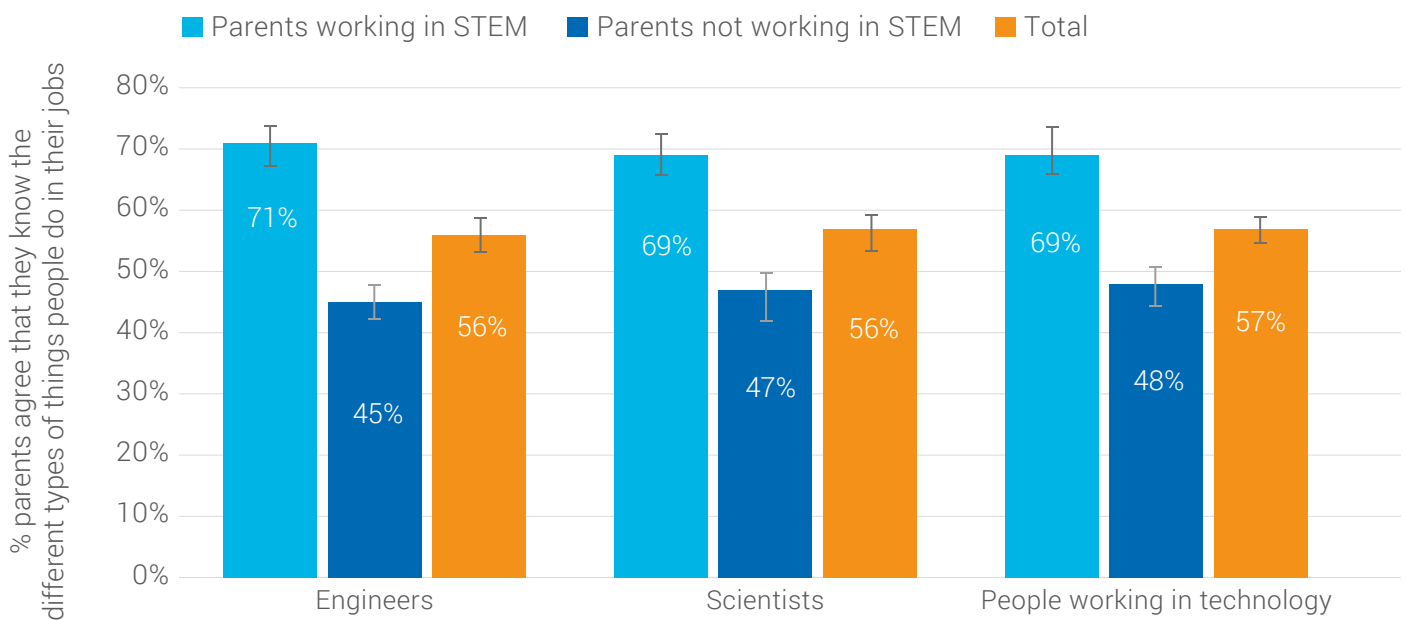
6.2 Parents' knowledge about engineering careers

The link between parents' job type and young people's perceptions of, and aspirations towards, engineering, are likely at least partly to be driven by the increased knowledge these parents would have about STEM and engineering careers. When asked directly how much they know about the different types of things engineers can do in their jobs, just over

half of parents agreed that they know about the different types of things engineers could do in their jobs (56%). Results were similar when parents were asked about their knowledge of what scientists and people working in technology do, suggesting that this lack of careers knowledge is not unique to engineering careers, but across STEM careers in general.

There were, however, significant differences in responses of parents working in STEM compared to those not working in STEM, with 71% of parents working in STEM agreeing that they know the kind of things engineers can do in their jobs compared with 45% of parents not working in STEM.

Figure 6.3 Percentage of parents who agreed that they know about the different types of things the following people can do in their jobs, by working in STEM status



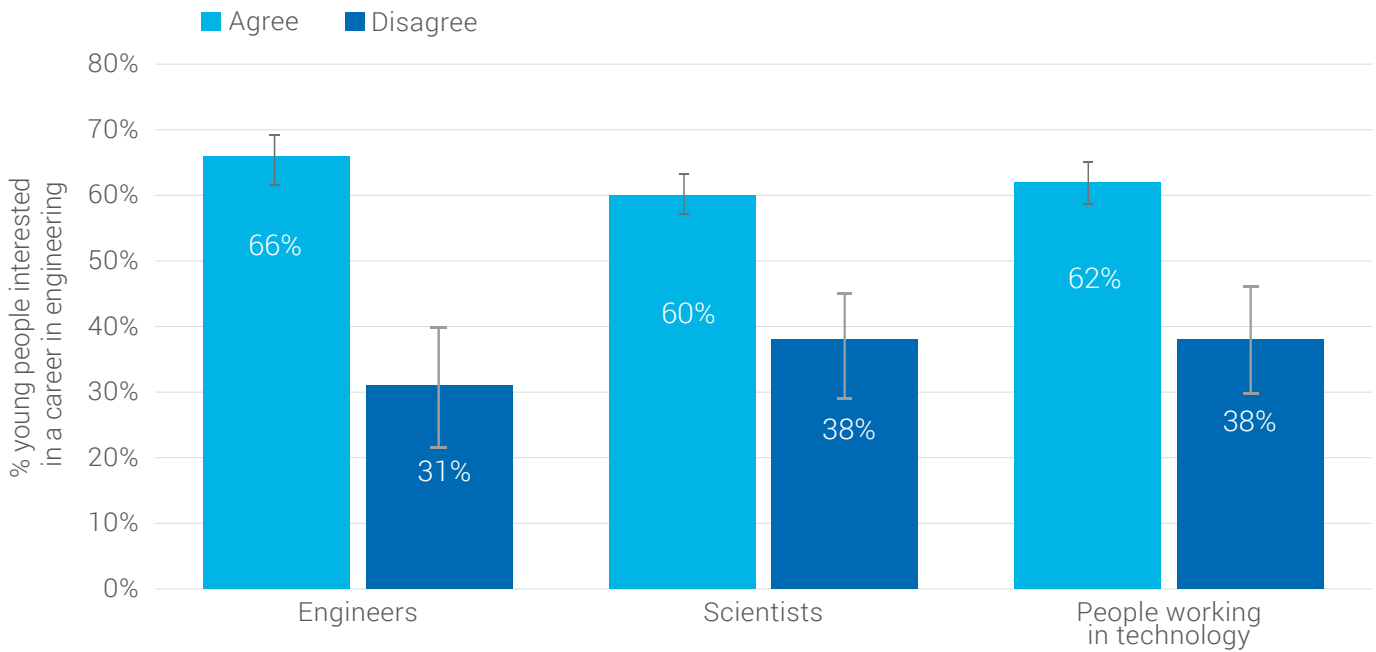
Source – EngineeringUK Engineering Brand Monitor 2021

Q - How much do you agree or disagree with the following statements: In general, I know about the different types of things the following people can do in their jobs: engineers, scientists, people working in technology. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree'.

There was a clear link between parental knowledge of engineering and their children's interest in the profession. Of those young people whose parents disagreed that they

know what engineers can do in their jobs, just 31% said they were interested in a career in engineering, compared to 66% of young people whose parents knew what engineers could do.

Figure 6.4 Young people's interest in a career in engineering, by parents' knowledge about what the following people can do in their jobs



Source – EngineeringUK Engineering Brand Monitor 2021

Q1 - How much do you agree or disagree with the following statements: In general, I know about the different types of things the following people can do in their jobs: engineers, scientists, people working in technology. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree'.

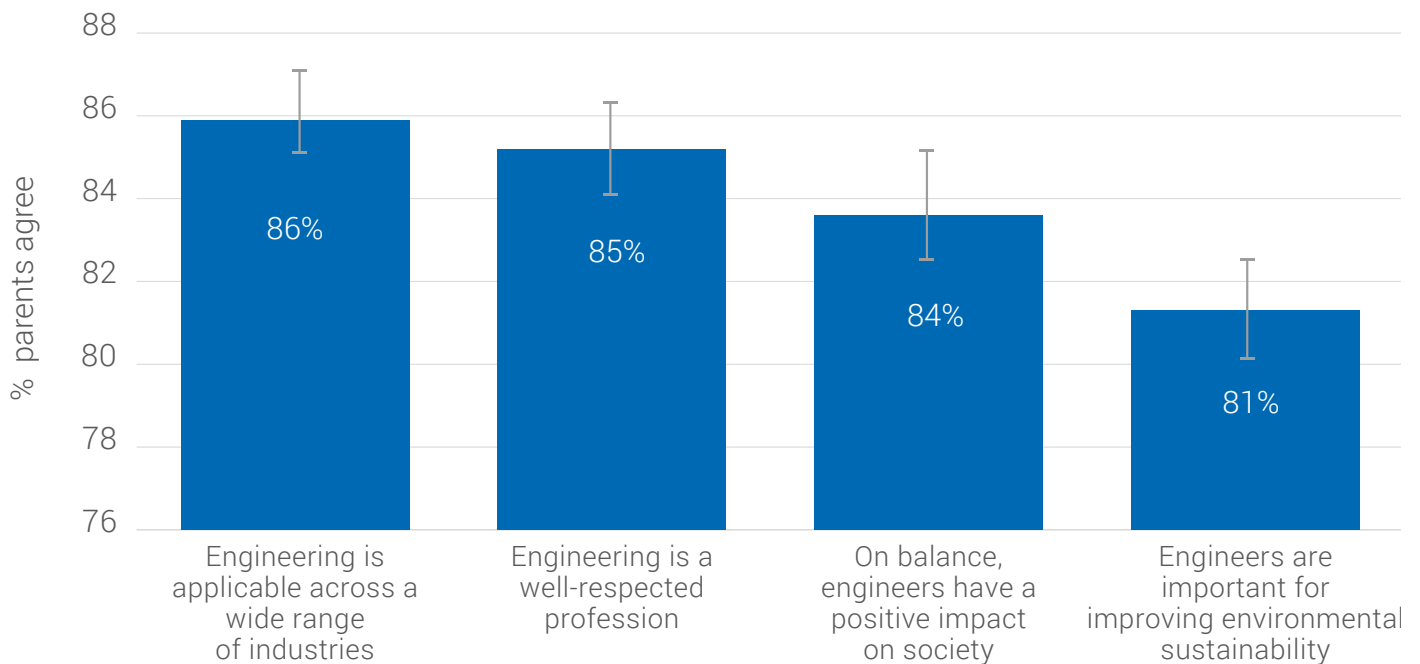
Q2 - How interested are you in a future career that involves any of the following?: engineering. Responses were on a 5-point Likert scale from 'not at all interested' to 'very interested.'

6.3 Parents' image of engineering

Parents were also asked a suite of questions about their own image of engineering, both in general and as a career, including the extent they agreed or disagreed that:

- Engineering is applicable across a range of industries
- Engineering is a well-respected profession
- On balance, engineers have a positive impact on society
- Engineers are important for improving environmental sustainability

Responses were overwhelmingly positive, with over 4 in 5 parents agreeing with each statement.

Figure 6.5 Parents' positive image of engineering

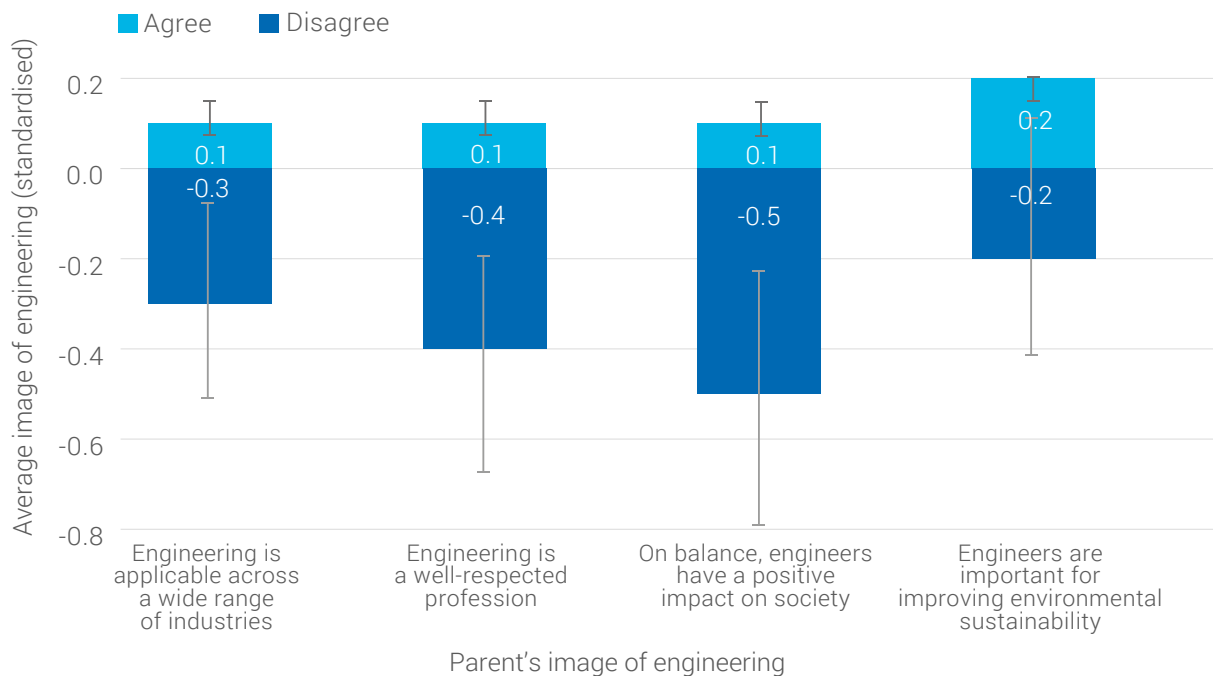
Source – EngineeringUK Engineering Brand Monitor 2021

Q - How much do you agree or disagree with the following statements regarding engineering?: Engineering is applicable across a wide range of industries; Engineering is a well-respected profession; On balance, engineers have a positive impact on society; Engineers are important for improving environmental sustainability. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree'.

There is a clear link between parental knowledge of engineering and their children's interest in the profession.

Young people's image of engineering was strongly associated with their parents'. The effect was particularly stark when focusing on young people whose parents disagreed that engineering is applicable across a range of industries; that engineering is a well-respected profession; that on balance, engineers have a positive impact on society; or that engineers are important for improving environmental sustainability. For example, young people whose parents disagreed that on balance, engineers have a positive impact on society had an average image of engineering of -0.5, meaning they had more a more negative image of engineering than 70% of their peers.

Figure 6.6 Young people's average image of engineering by young people's parents' image of engineering



Source – EngineeringUK Engineering Brand Monitor 2021

Q - How much do you agree or disagree with the following statements regarding engineering?: Engineering is applicable across a wide range of industries; Engineering is a well-respected profession; On balance, engineers have a positive impact on society; Engineers are important for improving environmental sustainability. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree' or don't know. Numbers represent the mean scores of young people whose parents' responded 'agree' or 'strongly agree.'

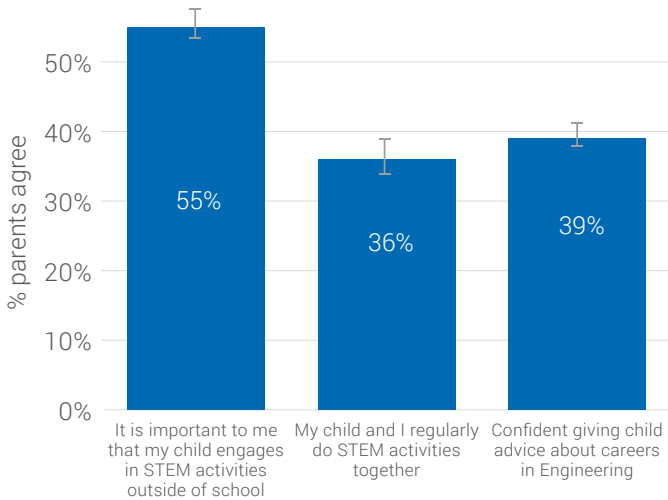
Standardised scores were calculated by combining responses to 4 questions: I see lots of examples of engineering in my everyday life; Engineering is a career that would allow me to work in lots of different areas; Engineers are important for improving the environment; A job in engineering would be interesting. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Numbers represent the mean scores of young people from each group.

6.4 Parents' engagement with careers activities

Parents' engagement with STEM activities and careers advice can be vital in fostering young people's aspirations for the future. Just 55% of parents agreed that it was important to them that their child engages with STEM activities outside of school. Even fewer parents said that they and their child regularly do STEM activities together (36%), and just 39% said that they are confident giving their child advice about careers in engineering.

This highlights a large inequality in the knowledge and engagement of parents concerning STEM activities. While some young people can rely on their parents to provide accurate information about engineering careers, and pathways to access these careers, others will be more reliant on teachers, school activities and outreach to help foster their aspirations.

Figure 6.7 Parents' engagement with careers activities and advice



Source – EngineeringUK Engineering Brand Monitor 2021

Q1 - How much do you agree or disagree with the following statements?: It is important to me that my child engages in STEM activities outside of school; My child and I regularly do STEM activities together. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree'.

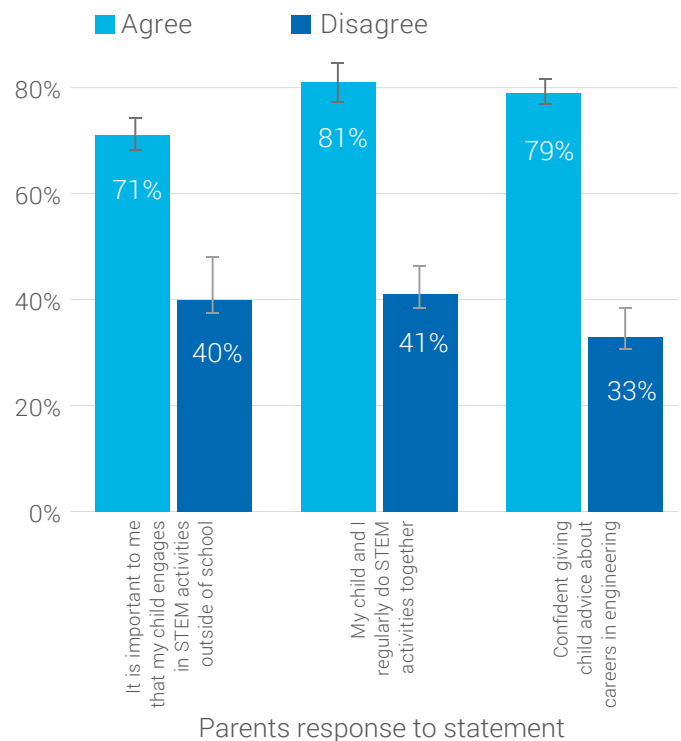
Q2 - Generally, how confident do you feel in giving your child advice about careers in the following areas?: Engineering. Responses were on a 5-point Likert scale from 'not at all confident' to 'very confident'. Percentages presented represent the proportions reporting 'fairly confident' or 'very confident'.

Young people's own knowledge about engineering was strongly associated with parents' engagement with, and confidence around careers advice and activities. These associations were particularly large compared to associations with parents' more general positive image of engineering.

Higher proportions of young people whose parents said they think it's important that their child engages in STEM activities outside of school, that they and their child regularly do STEM activities together, and that they were confident giving their child careers advice in engineering, said they know what engineers do. The largest differences were between young people whose parents were confident

giving careers advice to their children about engineering, and those whose parents were not confident. 79% of young people whose parents were confident said they know what engineers do, compared to just 33% of young people whose parents were not confident.

Figure 6.8 Proportion of young people who agreed that they know what engineers can do in their jobs by parents' engagement with careers activities and advice



Source – EngineeringUK Engineering Brand Monitor 2021

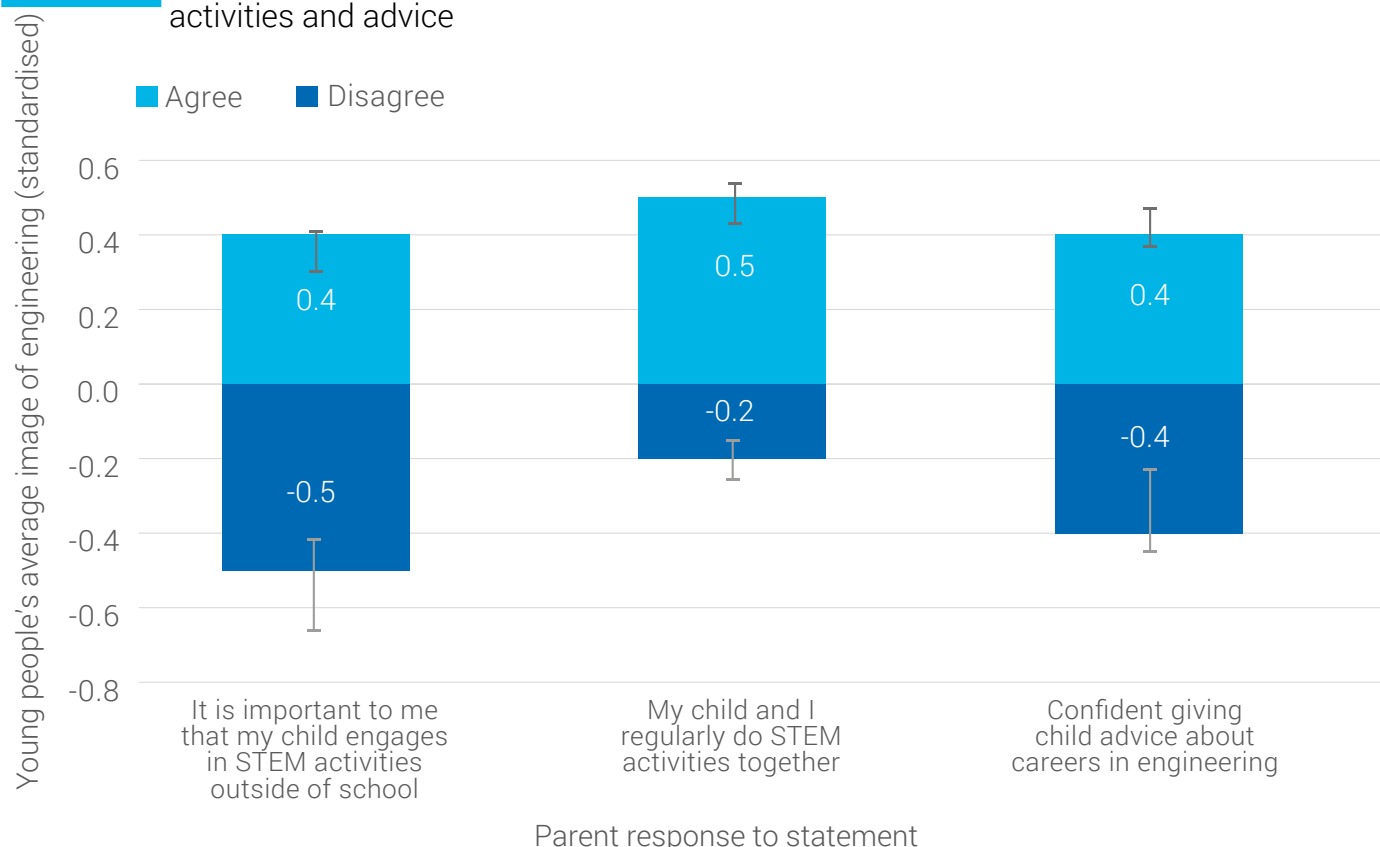
Q1 - How much do you agree or disagree with the following statements?: It is important to me that my child engages in STEM activities outside of school; My child and I regularly do STEM activities together. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree'.

Q2 - Generally, how confident do you feel in giving your child advice about careers in the following areas?: Engineering. Responses were on a 5-point Likert scale from 'not at all confident' to 'very confident'. Percentages presented represent the proportions reporting 'fairly confident' or 'very confident'.

Young people whose parents agreed that it was important that their child engages in STEM activities outside of school, that they and their child regularly do STEM activities together, and that they were confident giving careers advice to their child about engineering, had more

positive images of engineering on average. On the other hand, young people whose parents disagreed with any of these statements had more negative images of engineering than average.

Figure 6.9 Young people's average image of engineering by parents' engagement with careers activities and advice



Source – EngineeringUK Engineering Brand Monitor 2021

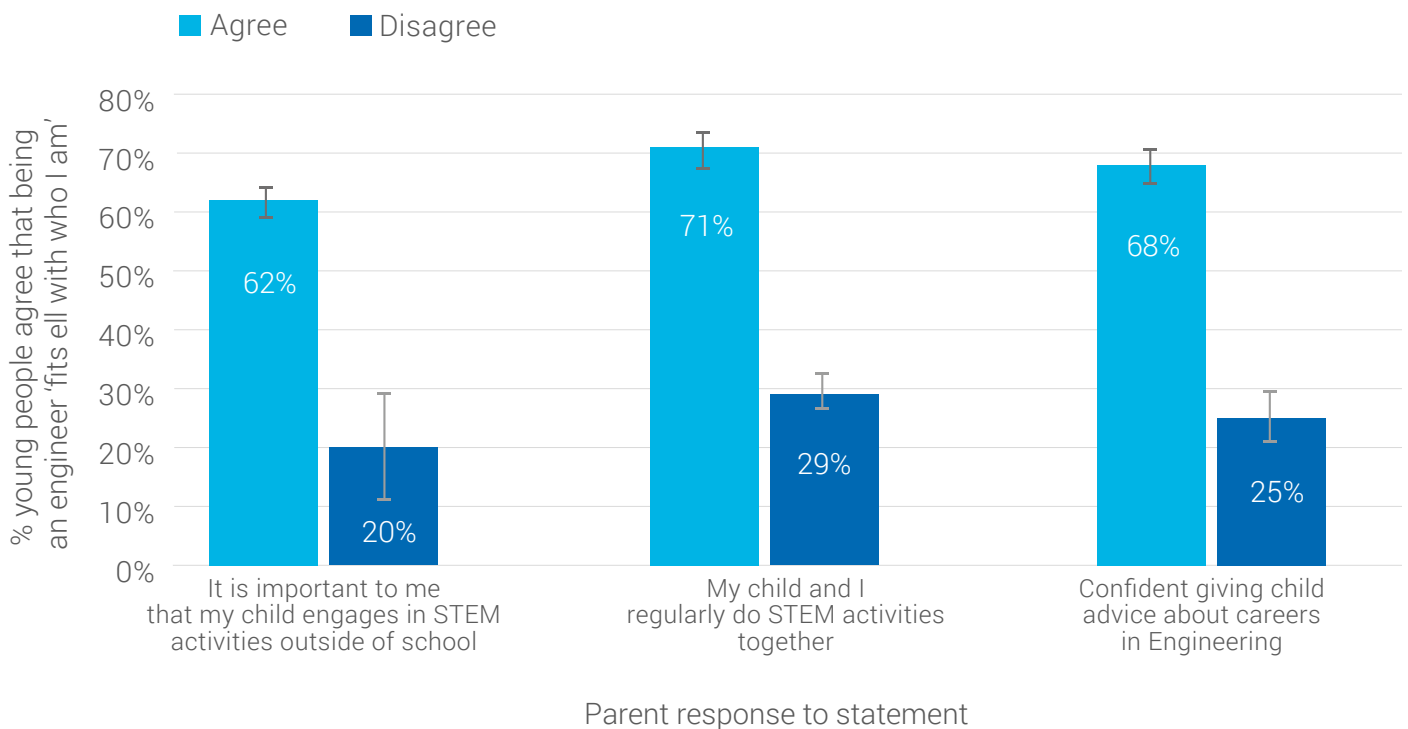
Q1 - How much do you agree or disagree with the following statements?: It is important to me that my child engages in STEM activities outside of school; My child and I regularly do STEM activities together. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Numbers represent the mean scores of young people whose parents' responded 'agree' or 'strongly agree.' Q2 - Generally, how confident do you feel in giving your child advice about careers in the following areas?: Engineering. Responses were on a 5-point Likert scale from 'not at all confident' to 'very confident'. Numbers presented represent the mean scores for young people whose parents' responded 'fairly confident' or 'very confident'.

Standardised scores were calculated by combining responses to 4 questions: I see lots of examples of engineering in my everyday life; Engineering is a career that would allow me to work in lots of different areas; Engineers are important for improving the environment; A job in engineering would be interesting. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Numbers represent the mean scores of young people from each group.

Parental engagement with STEM careers activities was also strongly associated with young people's perceptions of their fit with engineering. Of the 3 questions about parents' engagement with STEM careers advice and activities, the largest difference was seen by parents' confidence in giving careers advice

about engineering. 68% of young people whose parent said they were confident giving advice about engineering careers said that being an engineer fit well with who they are, compared to 25% of young people whose parent was not confident.

Figure 6.10 Proportion of young people who said that 'being an engineer fits well with who I am' by parents' engagement with careers activities and advice



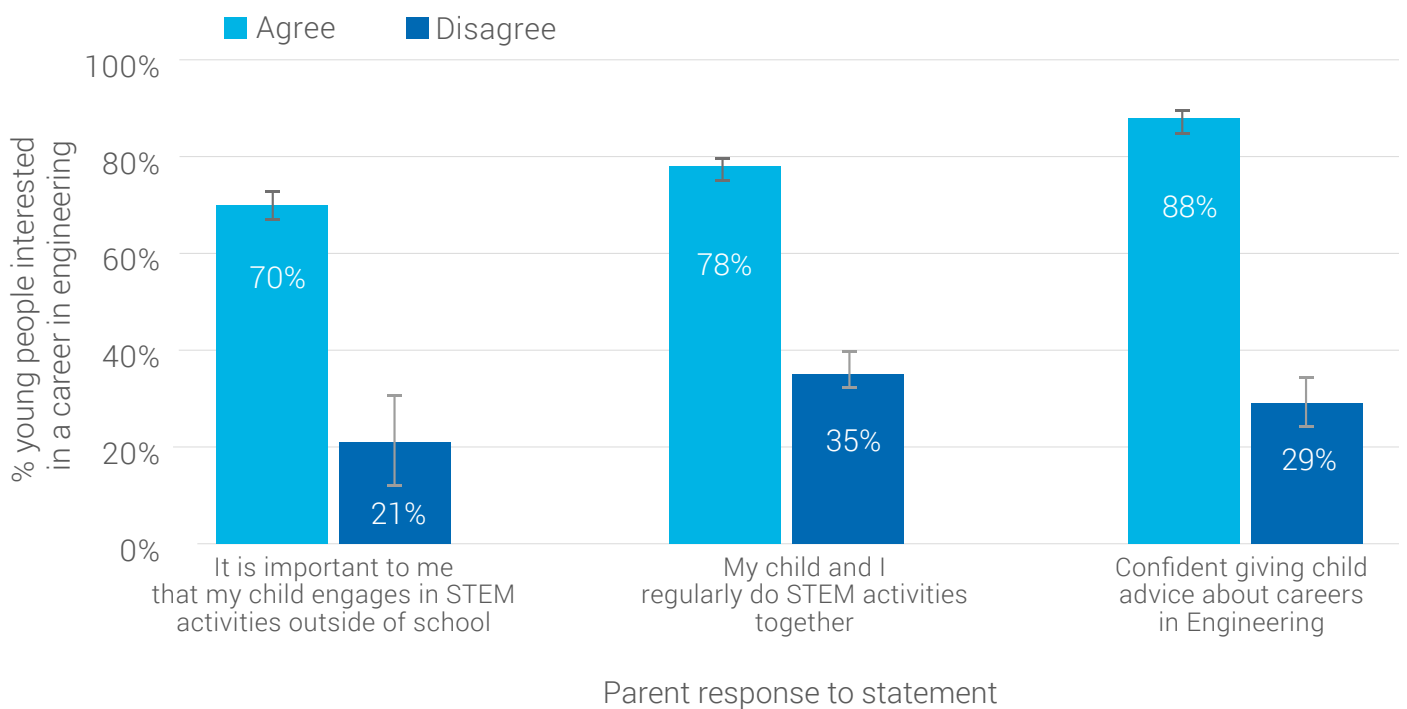
Source – EngineeringUK Engineering Brand Monitor 2021

- Q1** - How much do you agree or disagree with the following statements?: It is important to me that my child engages in STEM activities outside of school; My child and I regularly do STEM activities together. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree,' or don't know. Percentages presented represent the proportions reporting 'agree' or 'strongly agree'.
- Q2** - Generally, how confident do you feel in giving your child advice about careers in the following areas?: Engineering. Responses were on a 5-point Likert scale from 'not at all confident' to 'very confident'. Percentages presented represent the proportions reporting 'fairly confident' or 'very confident'.
- Q3** - How much do you agree or disagree with the following statements?: I feel that being an engineer fits well with who I am; Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree'.

Parent engagement with STEM careers activities was also strongly associated with their children’s interest in engineering as a career. 70% of young people whose parents felt it was important that their child engages with STEM activities outside of school, and 78% of young people whose parents said they regularly do STEM activities with their child, said they were interested in a career in

engineering. Nearly 9 in 10 young people (88%) whose parents said they were confident giving their child advice about careers in engineering said they were interested in a career in engineering, compared to 29% whose parents were not confident, revealing how important it is that information and advice about careers is extended to parents as well as young people.

Figure 6.11 Young people’s interest in a career in engineering by parents’ engagement with careers activities and advice



Source – EngineeringUK Engineering Brand Monitor 2021

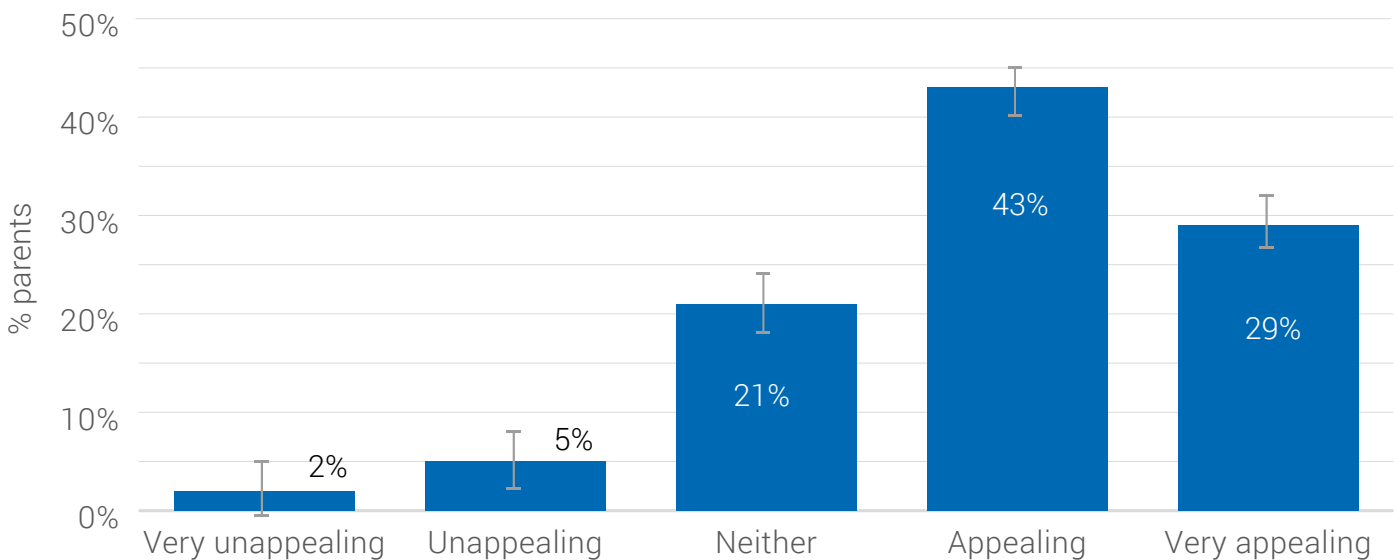
- Q1** - How much do you agree or disagree with the following statements?: It is important to me that my child engages in STEM activities outside of school; My child and I regularly do STEM activities together. Responses were on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Percentages presented represent the proportions reporting 'agree' or 'strongly agree'.
- Q2** - Generally, how confident do you feel in giving your child advice about careers in the following areas?: Engineering. Responses were on a 5-point Likert scale from 'not at all confident' to 'very confident'. Percentages presented represent the proportions reporting 'fairly confident' or 'very confident'.
- Q3** - How interested are you in a future career that involves any of the following?: engineering. Responses were on a 5-point Likert scale from 'not at all interested' to 'very interested.' Percentages presented represent the proportions reporting 'interested' or 'very interested.'

6.5 Appeal for parents of an engineering career for their child

While knowledge about engineering careers and engagement with STEM activities was relatively low among parents, the appeal of an engineering career for their child was high.

Very few parents said they found the idea of their child pursuing a career in engineering unappealing (7%). 72% of parents said they found the idea appealing or very appealing, and 21% said they found the idea neither appealing nor unappealing.⁴⁰

Figure 6.12 How appealing parents find the idea of their child pursuing a career in engineering



Source – EngineeringUK Engineering Brand Monitor 2021

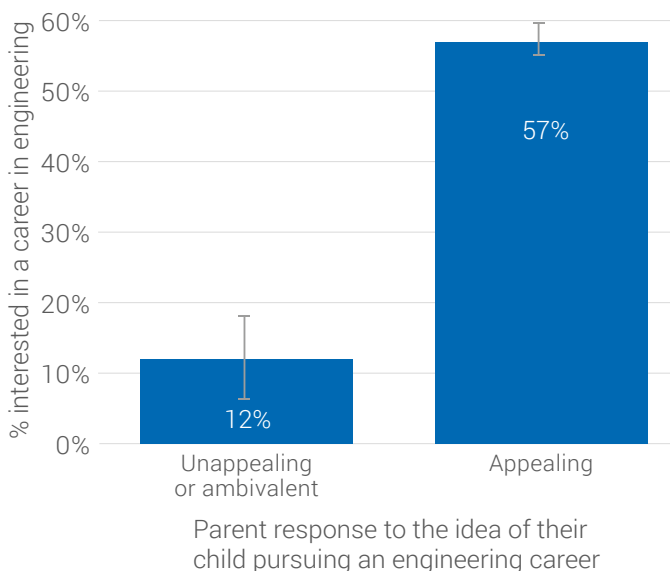
Q - How appealing do you find the idea of your child pursuing a career in engineering? Responses were on a 5-point Likert scale from 'very unappealing' to 'very appealing'.

While the majority of parents said they found the idea of their child pursuing a career in engineering appealing, parents' views around their children's career choices were strongly correlated with the extent young people felt that an engineering career fits with who they were. Of those young people whose parents said they found the idea of their child pursuing a career in engineering unappealing or were ambivalent about the idea, just 12% said that an engineering career fits well with who they are, compared to 57% of young people whose

parents said they found the idea appealing. However, we are unable to conclude the direction of the relationship between these 2 measures; this finding could indicate a parent finding engineering unappealing for their child might lead to that child not seeing it as fitting well with who they are, or that a child not seeing it as a fitting well with who they are might lead to a parent reporting it to be an unappealing prospect.

⁴⁰ Our cognitive testing revealed that many of the parents who choose neither when responding to this question considered whether they felt their children had expressed an interest in engineering.

Figure 6.13 Proportion of young people who said that 'being an engineer fits well with who I am' by whether their parent felt them pursuing a career in engineering was appealing

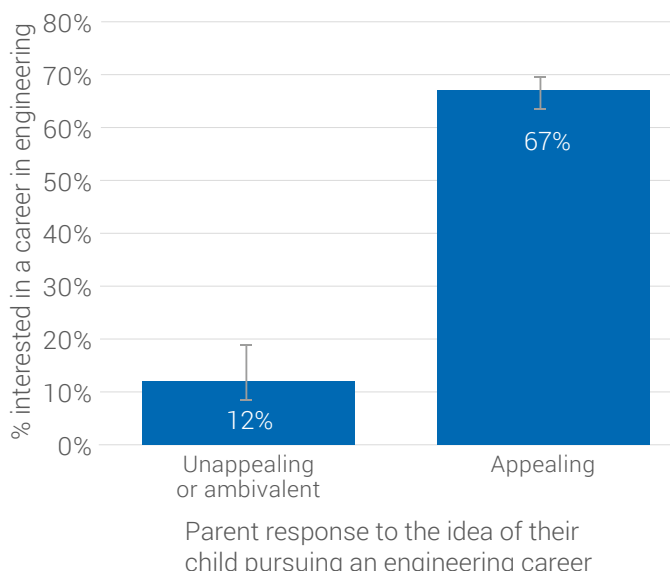


Source – EngineeringUK Engineering Brand Monitor 2021

- Q1** - How appealing do you find the idea of your child pursuing a career in engineering? Responses were on a 5-point Likert scale from 'very unappealing' to 'very appealing'.
- Q2** - How much do you agree or disagree with the following statements?: I feel that being an engineer fits well with who I am; Responses were on a 5-point Likert scale from 'strongly disagree' strongly agree.' Percentages presented represent the proportions reporting 'agree' or 'strongly agree.'

Parents' desire for their children to pursue engineering was also strongly linked to young people's own interest. Over two-thirds of young people (67%) whose parents said they found the idea of their child pursuing a career in engineering appealing were interested in a career in engineering, compared to just 12% of young people whose parents found the idea unappealing or were ambivalent.

Figure 6.14 Young people's interest in a career in engineering by whether their parent felt them pursuing a career in engineering was appealing

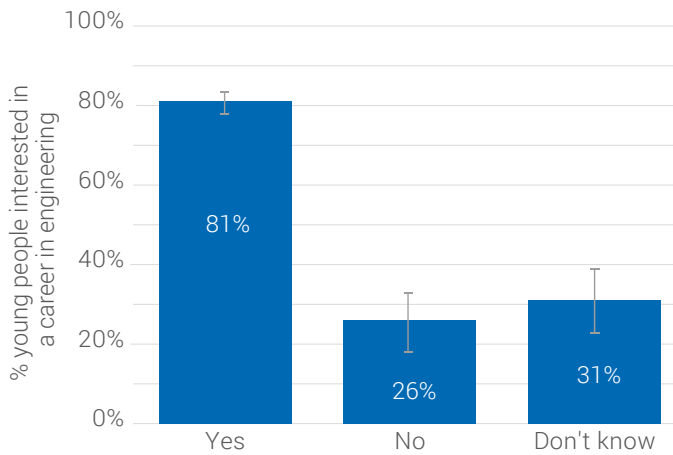


Source – EngineeringUK Engineering Brand Monitor 2021

- Q1** - How appealing do you find the idea of your child pursuing a career in engineering? Responses were on a 5-point Likert scale from 'very unappealing' to 'very appealing'.
- Q2** - How interested are you in a future career that involves any of the following?: engineering. Responses were on a 5-point Likert scale from 'not at all interested' to 'very interested.'

Parents were also asked if they would ever suggest a career in engineering to their child. The majority of young people whose parent said 'yes' said they were interested in a career in engineering (81%) compared to just over a quarter (26%) of young people whose parent said 'no.'

Figure 6.15 Young people's interest in a career in engineering by whether their parent would suggest a career in engineering to them



Source – EngineeringUK Engineering Brand Monitor 2021

- Q1** - Would you ever suggest to your child that they consider a career in engineering?
- Q2** - How interested are you in a future career that involves any of the following?: engineering. Responses were on a 5-point Likert scale from 'not at all interested' to 'very interested.'

Who we are

Established in 2001, EngineeringUK is a not-for-profit organisation, funded predominantly via the professional registration fees of individual engineers, as well as the support of a range of businesses, trusts and foundations, and a corporate membership scheme. Our ambition is to inform and inspire young people and grow the number and diversity of tomorrow's engineers.

We work locally, regionally and nationally with a wide range of organisations across business and industry, education, professional institutions and the third sector to understand the engineering skills required by engineering companies and in the wider economy, and work in partnership to develop and promote effective initiatives to inspire young people to consider a career in engineering.

www.engineeringuk.com

Driven by data

We base everything we do on evidence and we share our analysis and insight widely.

For more than 20 years, we've published a comprehensive report on the state of engineering in the UK – providing a detailed examination of engineering's economic contribution and the composition of its workforce, as well as the extent to which the supply through the education and training pipeline is likely to meet future needs and demand for engineering skills.

Our briefings summarise the latest evidence on key research and policy areas and our interactive Engineering Insights dashboards allow you to explore research and data on issues important to the engineering sector.

The Engineering Brand Monitor, which establishes the national benchmark for public perceptions of engineers and engineering,

is an annual survey of young people, STEM secondary school teachers and parents on their knowledge, perceptions and understanding of STEM and engineering.

We evaluate all our activity to help ensure our engagements with young people have as much impact as possible. It is through this evaluation that we have identified the degree to which we are winning hearts and changing minds through our programmes, with positive impacts on young people's understanding of engineering, perceptions of a career in it, and the extent to which they view engineering as a career for both boys and girls. And we have learnt that if young people meet an engineer and know they have done so, they come away with higher levels of knowledge of what people working in engineering do and higher levels of perceived desirability of engineering careers.