EngineeringUK

Engineering Brand Monitor 2019

Findings from the Engineering Brand Monitor, an annual survey of young people aged 7 to 19, STEM secondary school teachers and the general public aged 20 on their perceptions, understanding, and knowledge of STEM and engineering

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Foreword

For young people, the experiences of today shape their chances of becoming our future inventors, creators, and leaders of the economy. That's why understanding the degree to which they and their key influencers are engaged with STEM (science, technology, engineering and maths) – and the factors that could encourage further engagement – is integral to our ability to inspire tomorrow's engineers.

I'm delighted to share with you a summary of findings from the 2019 Engineering Brand Monitor (EBM), EngineeringUK's annual survey on knowledge, perceptions and understanding of STEM and engineering. Reaching more than 2,500 young people, 1,000 STEM secondary school teachers and 1,800 members of the general public, the survey provides unique insight into how STEM is viewed by these groups, and whether these views differ by personal characteristics such as age, gender and ethnicity or have changed over time.

This year's results provide cause for some optimism. For example:

- Over half of 11 to 19 year olds who would consider a career in engineering said they know what to do next in order to become an engineer.
- Engineering is highly regarded by STEM secondary school teachers and parents, with the vast majority indicating that they would recommend it as a potential career path for their students or children.
- There has been a statistically significant increase in the proportion of 16 to 19 year olds who would consider a career in engineering compared with 2016.

Nevertheless, it is also clear that there is much work needed to improve young people's knowledge, perceptions, and understanding of engineering, particularly among girls.

- We consistently found that engineering lagged behind other STEM subjects with respect to young people's knowledge of what those working in the industry do and the extent to which they perceive engineering positively and believe it to be a desirable career. Moreover, with few exceptions, these metrics have not seen significant change since the EBM began recording these questions in 2015.

- Narrow stereotypes of the profession persist. Nearly a third of young people report engineering as an undesirable career, see it as 'too complicated/difficult' or 'boring or dull', and one fifth view it as 'too technical' or 'dirty, greasy or messy'. Poor knowledge of engineering extended to the general public, the majority of whom see engineers as working in traditional industries such as construction, oil and gas, and manufacturing, with far fewer aware of its role in other sectors such as transport or research and development.

- Clear gender differences were also found across the board, with girls being less likely than boys to know about engineering, to view it positively, to consider a career in the industry or know what to do next in order to become an engineer. They are also less likely to believe they could become an engineer if they wanted to.

Our analysis clearly shows that young people who know more about what engineers do are more likely to perceive the profession positively and to consider a career in the industry. There is also compelling evidence that STEM outreach can and does work: young people attending a STEM careers activity in the past 12 months were over 3 times as likely to consider a career in engineering than those who had not. Yet only just over a quarter of young people we surveyed reported having attended such an activity. These results underscore the vital role the engineering community has in informing, engaging, and inspiring young people and their key influencers.

It is critical that we strengthen our efforts and reach in sharing the full breadth and variety a career in the profession can offer. In particular, our evidence suggests the following:

1) STEM outreach should emphasise the wide-ranging societal contributions that engineers make to the UK and beyond. Our research found that young people commonly placed high importance on 'having an impact' and 'being valued' when deciding upon a career.
2) Compelling and accurate salary and labour market statistics should be a key component in careers advice and guidance. Salary ranks as an important factor for young people in their career choices, over and above even 'enjoyment', 'job security' and 'something that challenges me'.
3) The engineering community must work hard to instil confidence in girls and young women that they are capable of becoming an engineer and improve their knowledge, perceptions and desirability of engineering. Across most key metrics, girls continued to lag behind boys including, perhaps most alarmingly, in the extent to which they believed themselves to be capable of becoming an engineer.
4) As well as inspiring young people to take up engineering pathways, accurate and detailed careers information must be provided to parents, guardians and teachers. These adults are the most common sources of careers information for young people, yet the majority reported a lack of confidence in giving careers advice in engineering careers. Parents are also far less likely than teachers to identify the range of skills needed to become an engineer.
5) We must ensure that key influencers see engineering as a profession they would recommend equally to both genders to address female underrepresentation within engineering. Despite a majority of young people believing engineering to be suitable for both boys and girls, the evidence showed that parents of girls are less likely to recommend an engineering career to their children than parents of boys.
6) STEM outreach efforts must focus on increasing the impact of activity as well as its reach. While we have seen a significant rise in the number of young people reporting they have attended a STEM careers activity in the past 12 months compared to previous years, we have not observed a corresponding increase in positive views or knowledge of engineering. As a community, we must cultivate a greater understanding of how engagement activities can affect positive change through robust research and a shared evidence base.

Fortunately, we are heading in the right direction. There is a groundswell of support across business and industry, education, professional institutions and the third sector to work more collaboratively together and develop and promote effective initiatives that inspire young people from all backgrounds to choose pathways into engineering.

We are determined that EngineeringUK plays its part in growing our collective impact. For instance, we are working with partners to build a new digital platform that will help teachers find experiences and careers resources that bring STEM to life with real-world engineering examples. And we are developing a shared theory of change to help us all better plan and understand how activities can influence young people's decisions to study STEM and pursue engineering careers. We are also a strategic partner in the Royal Academy of Engineering This is Engineering campaign which presents positive and compelling images of engineering to young people and their influencers.

I hope that you will join us in testing how the findings from the Engineering Brand Monitor can help us improve our activities to be more impactful and ultimately grow the talented and diverse engineering workforce essential to our future.

Hilary Leevers
Chief Executive
EngineeringUK

Executive summary

This report summarises findings from EngineeringUK's Engineering Brand Monitor (EBM), an annual survey of young people, STEM secondary school teachers and the general public on their knowledge, perceptions and understanding of STEM and engineering.

It also examines whether these views, knowledge and perceptions differ by personal characteristics such as age, gender and ethnicity. It further investigates whether respondents who attended a STEM careers activity in the past 12 months were more likely to report more positive views and perceptions of engineering or greater knowledge of the profession.

Knowledge of engineering

It is clear that improving overall knowledge of engineering is key to attracting more students into the profession, with those reporting they know a lot or quite a lot about what people working in engineering do more likely to hold positive views of engineering and view a career in the profession as desirable – yet under a quarter of those aged 11 to 19 surveyed held this level of knowledge in 2019.

- 24% of all students aged 11 to 19 said they knew a lot or quite a lot about what people working in engineering did.

Knowledge of pay, in particular, was found to be a key influencing factor in young people's career decision making choices. Many students cited pay as an important factor in their career choice and those who believed engineers to be well-paid were more likely to view a career in engineering as desirable. Once again, however, we found young people's knowledge lacking in this area, with the majority of 16 to 19 year olds underestimating the starting graduate salary of an engineer.

- 59% of 11 to 16 year olds who thought engineers were well-paid viewed engineering positively, compared with just 40% of those who thought engineers were averagely paid, and 30% of those who thought they were not well-paid.
- 66% of all 11 to 19 year olds said pay would be an important factor in career choice.

- 56% of 16 to 19 year olds underestimated the starting graduate salary of an engineer at under £24,999 (the average starting salary is £27,021).

Perceptions of engineering

Half of all students aged 7 to 19 viewed engineering positively, notably lower than the proportion reporting positive views of science, technology and maths.

- 50% of students aged 11 to 19 held positive views of engineering, as did 50% of 7 to 11 year olds
- In contrast, 68% of students aged 11 to 19 had positive views of technology, 63% had positive views of science and 56% had positive views of maths

Our analysis suggests there is a strong positive association between knowledge of engineering and perceptions of the profession, with those who knew more about what engineers did far more likely to have positive perceptions of engineering.

- Overall, 82% of 11 to 19 year olds who said they knew a lot or quite a lot about what engineers did had positive views of engineering, compared with just 40% of those who said they didn't know a lot (either 'know almost nothing', 'know a little' or 'know something)'
- Even after controlling for gender and the degree to which they enjoyed STEM subjects in school, those reporting high levels of knowledge of engineering were 4.4 times as likely as those that didn't to view engineering positively.

Desirability of engineering

Engineering also significantly lagged behind science and technology in terms of perceived desirability as a career.

- 41% of all students aged 11 to 19 believed a career in engineering to be desirable, compared with 49% reporting the same for a career in science and 46% for a career in technology.
- 59% of students aged 7 to 11 said they would like 'a little' or 'very much" to become an engineer when they were older.

Consideration of a career in engineering

Half of all students aged 11 to 19 in 2019 said they would consider a career in engineering, although there were large differences in responses by gender across all age groups.

- 50% of all students aged 11 to 19 would consider a career in engineering.

It was also apparent that consideration differed by age, with a higher proportion of respondents aged 11 to 16 stating they would consider a career in engineering than those aged 16 to 19. This is perhaps a reflection that younger students are more likely to be open to different career pathways at that age than older students. However, the proportion of 16 to 19 year olds that would consider engineering has increased significantly since 2016.

- 53% of students aged 11 to 16 would consider a career in engineering, compared with only 45% of those aged 16 to 19. This compares to just 37% of 16 to 19 year olds in 2016.

Whether students reported a high level of knowledge impacted whether they would consider a career in engineering, showing that it is imperative first and foremast to improve understanding of what engineering entails:

- 82% of those who said they knew quite a lot or a lot about what engineers did would consider a career in engineering, compared with just 40% of those who knew almost nothing, a little or something about what engineers did.

Knowledge of next steps to become an engineer

Overall, less than half of all students aged 11 to 19 said they knew what to do next to become an engineer. However, outcomes were more positive for those who said they had considered a career in engineering.

- 37% of all students aged 11 to 19 agreed with the statement 'I know what to do next to become an engineer' and 42% disagreed. The remainder did not know.
- 58% of students who had considered a career in engineering knew what to do next to become an engineer.

Information, advice and guidance

When students were asked where they would consider going for careers advice, the most common responses were teachers, careers advisers and parents/carers.

- 61% of 11 to 19 year olds would consider going to parents/carers for careers advice, 59% would consider going to careers advisers, and 56% would consider going to teachers.

Older students were also slightly more likely than younger students to go to careers advisers for advice, whereas younger students would be more likely to go to parents/guardians. This may reflect the increasing independence of older students and suggests that careers advice should be targeted suitably.

- 63% of students aged 11 to 16 would go to parents/carers for careers advice, and 57% of those aged 16 to 19 would go to parents/carers.
- 57% of students aged 11 to 16 would go to careers advisers for careers advice and 63% of those aged 16 to 19 would go to careers advisers.

Factors important in career choice

In addition to questions around careers advice, students were also asked what factors they believed were important when deciding on a career. The most common response was 'something I'm interested in' followed by 'pay'.

- The most important factors in deciding on a career for 11 to 19 year olds in 2019 were:
    - 'something I'm interested in' (68%)
    - 'pay' (66%)
    - 'enjoyment' (65%)
    - 'working conditions and environment' (43%)
    - 'being valued' (42%)
    - 'making a difference/having an impact' (42%)
    - 'job security' (41%)
    - 'something that challenges me' (38%)

Key influencers

Encouragingly, given the strong potential influence parents and teachers can have on young people's educational and career decisions, the majority of both STEM secondary school teachers and parents surveyed reported positive views of engineering and saw the profession as desirable for their students or children.

- 90% of STEM secondary teachers and 69% of parents held positive views of engineering.
- 80% of STEM secondary teachers and 68% of parents believed a career in engineering would be desirable for their students or children.

However, it is evident that there is work to be done to raise teachers' and parents' knowledge of engineering and their confidence in giving related careers advice. Less than a third of both STEM secondary teachers and parents reported having a high level of knowledge of what engineers do and the majority expressed a lack of confidence in giving their students and/or children careers advice on the profession. Despite this, an overwhelming majority of both groups would recommend a career in engineering for their students or children.

- Only 30% of STEM secondary school teachers and 27% of parents surveyed reported they knew quite a lot or a lot about what engineers do.
- 45% of teachers and 32% of parents felt confident giving careers advice in engineering. This compared with 58% and 36% respectively for science, and 37% and 41% respectively for technology.
- 96% of teachers and 83% of parents would recommend a career in engineering for their students or children.

The general public – including parents – were also asked which industries they believed engineers worked in, with a lower proportion of respondents being aware that engineers worked in industries such as transport and research and development, as opposed to traditional industries such as oil and gas.

- While a large majority knew that engineers worked in engineering (82%), construction (73%), oil and gas (70%) and manufacturing (68%), fewer respondents were aware of the role engineers play in transport (58%) or research and development (55%).

Finally, parents were far less likely than teachers to identify the range of skills required to be an engineer.

- Parents were less likely than teachers to say engineers needed to be 'numerate' (57% of parents compared to 91% of teachers), 'inventive/innovative' (64% of parents compared to 83% of teachers) and 'a good communicator' (47% of parents compared to 69% of teachers).

Gender

There were clear gender differences in knowledge and perceptions of engineering, with boys much more likely than girls to report a high level of knowledge about engineering, and to hold positive views of the profession.

- 30% of boys aged 11 to 19 said they knew a lot or quite a lot about what people working in engineering did, compared with only 18% of girls.
- 60% of boys aged 11 to 19 and 40% of girls indicated they held positive or very positive views of engineering.

Despite the majority of students aged 11 to 19 believing engineering to be suitable for both boys and girls (84%), it is evident that girls were significantly less likely than boys to view themselves as capable of becoming an engineer if they wanted to, to see the profession as a desirable career, and to consider it as a career choice. Perhaps reflective of this, girls were also less likely to know what to do next to become an engineer. For students aged 11 to 19:

- 69% of boys and 54% of girls felt they were capable of becoming an engineer if they wanted to.
- 49% of boys viewed a career in engineering as quite or very desirable, compared with 32% of girls.
- 62% of boys and just 37% of girls would consider a career in engineering.
- 42% of boys and 31% of girls knew what to do next in order to become an engineer.

Even amongst those who saw the profession as undesirable, there were clear gender differences in the reasons provided, with girls more likely than boys to say that engineering was 'too technical', and 'dirty/greasy/messy'.

- Of those aged 11 to 19 who reported a career in engineering to be undesirable, just over one fifth of girls felt it was because engineering was 'too technical' (22%) or 'dirty/greasy/messy' (23%), compared with 16% and 12% of boys, respectively.

These gender differences were apparent amongst even the youngest respondent age group (7 to 11), suggesting that gendered views of the profession emerge early on in life.

- Of students aged 7 to 11, 59% of boys viewed engineering positively, compared with just 41% of girls.
- Of students aged 7 to 11, 70% of boys said they would like 'a little' or 'very much' to become an engineer when they were older, compared with just 49% of girls.

The disparity of views among boys and girls may be reinforced by parents – the survey results showed that those with male children would be more likely to recommend a career in engineering than those with female children.

- 87% of parents with only male children would recommend a career in engineering for their children, compared with 81% of those with only female children.
- 93% of dads with only male children would recommend a career in engineering for their children, compared with just 71% of mums with only female children.

Ethnicity

Across most of the key indicators, there was no difference in responses between white young people surveyed as compared with those from a minority ethnic background[1]. However, black and minority ethnic (BME) students aged 11 to 19 were more likely than white students aged 11 to 19 to report they know what to do next to become an engineer.

- 42% of BME students aged 11 to 19 said they knew what to do next in order to become an engineer, compared with 35% of white students.

Students from a minority ethnic background were also more likely than white students to place 'doctor' or 'lawyer' as their top job choice, whereas white students were more likely than those from minority ethnic backgrounds to choose 'vet' or 'childcare (nursery worker/child minder)'.

STEM participation

Respondents who had taken part in a STEM careers activity in the past 12 months were more likely than those who had not to:

- Report a higher knowledge of what engineers do.
- To believe an engineering career was desirable.
- To see themselves capable of becoming an engineer if they wanted to.

This is very encouraging for the engineering sector, suggesting that such activities are important and effective ways for the community to cultivate its talent pipeline.

- 44% of those attending an activity in the past 12 months said they knew quite a lot or a lot about what people working in engineering do, compared with 17% of those that hadn't.

- 66% of those attending an activity in the past 12 months viewed engineering positively, compared with just 44% of those that hadn't.

- 55% of those that had attended an activity in the past 12 months viewed engineering as desirable, compared with 36% of those that hadn't.

- 78% of those attending STEM activities in the past 12 months said they were capable of becoming an engineer, compared with just 56% of those that hadn't.

That said, STEM outreach efforts must not only focus on increasing reach but also the quality of activity. The proportion of young people reporting having attended a STEM careers activity in the past 12 months has increased significantly since 2016 (the first year in which the question was asked in the EBM) from 19% to 27% in 2019. However, an analogous increase in all our key benchmark indicators has not been observed, suggesting more should be done to cultivate a greater understanding of – and focus investment on – what works.

[1]In this report, students from a minority ethnic background are those stating their ethnicity as: Mixed; Asian or Asian British; Black or Black British; Other ethnic groups.

1. Introduction

Since 2010, EngineeringUK has run the Engineering Brand Monitor (EBM), an annual survey of young people aged 7 to 19, STEM secondary school teachers and the general public aged 20+ on their perceptions, understanding, and knowledge of STEM and engineering.

This report examines results from the survey, with a specific focus on young people's reported knowledge, views and desirability of engineering and the extent to which they would consider a career in the profession and know what to do next to become an engineer. Parent and STEM secondary school teacher views on engineering are also covered to shed light on the extent to which these key sources of careers advice are well informed about the profession, would recommend engineering to their children/students, and feel confident providing careers advice to that end.

The report aims to inform the engineering sector's understanding of its potential talent pipeline, the role key influencers can play, and areas in which it can hone its efforts to further improve perceptions, understanding and knowledge of the profession.

Specifically, it will examine the extent to which young people aged 7-19, STEM secondary school teachers, and parents report:

- Knowing what people who work in engineering do.
- Having positive views of engineering (sometimes referred to as perceptions of engineering).
- Seeing an engineering career as desirable (either for themselves or for their students/children).
- Having considered and/or would consider a career in engineering.
- Knowing what the next steps are to become an engineer (or in the case of parents/teachers, their belief that their children/students possess this knowledge).

For the purposes of this report, these five areas are collectively referred to as 'key benchmark indicators'. Since the EBM's inception in 2010, these have widely been used by EngineeringUK and the engineering sector to assess understanding, knowledge and perceptions of the profession. A summary of these results for each of the survey groups can be found in the Annex.

Within the report, we aim to answer several questions:

- What are the overall results for the key benchmark indicators for young people, STEM secondary teachers and the public?
- Are there any differences in knowledge, views and desirability of engineering in comparison to other STEM subjects?
- Do results for the key benchmark indicators differ by age, gender or ethnicity?
- What effect, if any, does attendance of a STEM careers activity in the past 12 months have on young people's understanding, knowledge and perceptions of engineering?

Throughout this report, the age groups of students are discussed primarily in four categories – 7 to 11 year olds, 11 to 14 year olds, 14 to 16 year olds and 16 to 19 year olds. These age groups correspond to the school year groups of students in the following way:

- 7 to 11 year olds comprise of year 3, year 4, year 5 and year 6 students– also known as Key Stage 2
- 11 to 14 year olds are year 7, year 8 and year 9, or Key Stage 3
- The 14 to 16 cohort is year 10 and year 11, or Key Stage 4
- The 16 to 19 cohort is year 12 and year 13 – also known as Key Stage 5[2]

A member of the public is classified as a parent if they have a child aged between 7 and 19 years old (in line with the school years mentioned in the introduction).

Methodology

In 2019, IFF Research was commissioned to survey young people aged 7 to 19, members of the general public aged 20+, and STEM secondary school teachers on EngineeringUK's behalf.

Between January and March 2019, young people and members of the general public were recruited to participate via online survey panels, with 3,721 valid responses received in total.

In the same time frame, STEM secondary school teachers were invited to participate via a Sprint mailing list (totalling around 21,000 teachers) and e-newsletters from EngineeringUK and STEM Learning, with a total of 1,023 completed surveys received. We define a STEM secondary teacher as those teaching STEM subjects[3] in either a secondary school or a 6th form equivalent (such as A levels at a Further Education college).

Post-hoc weighting based on known characteristics of the population drawn from Office for National Statistics mid-2017 estimates was used in order to make the student and general public surveys representative, with the former weighted based on region, age of student and gender and the latter by region, gender, social grade and age.

Teachers data was not weighted due to detailed characteristics data being unavailable for teachers in Scotland and Northern Ireland.

Further information about the demographic composition of respondents and the target population proportions used in the weighting can be found in the annex.

[2] The years cited above are the school years in English and Welsh schools, but there is a slightly different breakdown for those in Scotland and Northern Ireland. For Northern Irish students, 7 to 11 year olds are comprised of year 4, year 5, year 6 and year 7 students. 11 to 14 students are year 8 to year 10 students, 14 to 16 year olds are year 11 to year 12 and 16-19 year olds are year 13 and year 14 students. In Scotland, 7 to 11 year olds are P3 to P6, 11 to 14 year olds are P7, S1 and S2; 14 to 16 year olds are S3 and S4, and 16-19 year olds are S5 and S6.
[3] In this report, STEM subjects are: Core and additional science; physics; chemistry; biology; design and technology; maths; engineering.

Limitations

It should be noted that, as in the case with all surveys where a sample is used, sampling error will be present – that is, there is likely to be a difference between results from those who took part in our survey compared with the overall population of interest. Where possible, we provide confidence intervals[4] in the report, displaying the range of values that is likely to contain the true value for the entire population.

Likewise, bias may also be present due to the use of online panels in obtaining the sample. For example, it is possible that those in panels are more likely to be knowledgeable about and/or have access to the internet or motivated by the incentives offered. A sample approach also means that it can be difficult to detect statistically significant[5] differences when performing subgroup analysis – such as by ethnicity, age and gender.

A further limitation arises when we seek to examine the effect of one variable upon another (such as attendance at a STEM event on knowledge of engineering). The data in the EBM has been captured at a single time point, meaning that we cannot say – with any certainty – that one variable necessarily affects the second. In the example above, we do not know whether the 'knowledge' came before the attendance at a STEM event, so we are referring to associations or positive correlations between indicators, rather than causations.

Parent data within the EBM has been weighted according to characteristics breakdowns found in the overall public in the UK, which means that the responses have not been adjusted to match the parent population specifically. This means that the views of older people may be overrepresented in the parent data.

Finally, it should be noted that all responses are 'self-reported', meaning that respondents are asked to identify their own knowledge of engineering, for example, but it is not otherwise assessed. It may be that a participant believes they know a lot about engineering, but since the questionnaire does not objectively test participant's knowledge (by asking specific questions about what engineering entails, for example), there may be some bias in the results.

Analysis of ethnic differences

Throughout this report, we compare results for white and black minority ethnic respondents. The term 'BME' includes those who identify as Asian or Asian British, Black or Black British, Mixed, or an 'other' ethnic group and is widely used to identify high level patterns of difference in relation to ethnicity.

EngineeringUK recognises the limitations of this definition, particularly because minority ethnic respondents are not a homogenous group. However, the relatively small sample sizes involved restricts our ability to examine whether any observed differences are statistically significant at the more detailed ethnic group level.

Time series data

In this report, time series data for the key benchmark indicators is presented from 2015 onwards. This is because in 2015, both the questionnaire and sampling approach went through a dramatic overhaul, meaning it is difficult to directly compare results before and after that year. In addition, the time series do not include 2018 as EngineeringUK did not run a full Engineering Brand Monitor in that year.

For each instance in which findings over time are presented, we report both individual year-on-year changes (where applicable and statistically significant), and changes observed over either the full time period, or over a multiple-year period (for example, if there has been any statistically significant change between 2016 and 2019). This is useful as it allows us to observe trends which may not be picked up in a single year, but where STEM activity may have been effective over a longer period.

For information about the number of respondents in the EBM in previous years, please see the annex.

[4] In this report, the confidence intervals are taken at the 95% certainty level. That is, we would be certain that the true value for the population lies within our range of values with 95% confidence.
[5] By statistically significant difference, we mean that any differences observed between groups in the survey is likely to be a true difference in responses observed within the actual population, and not due to sampling error. Throughout this report, we refer to statistical significance at the 95% level. This means that we can say – with 95% certainty – that the observed differences are due to differences in opinions, knowledge, or perceptions between the different groups within the overall population.

2. Knowledge of engineering

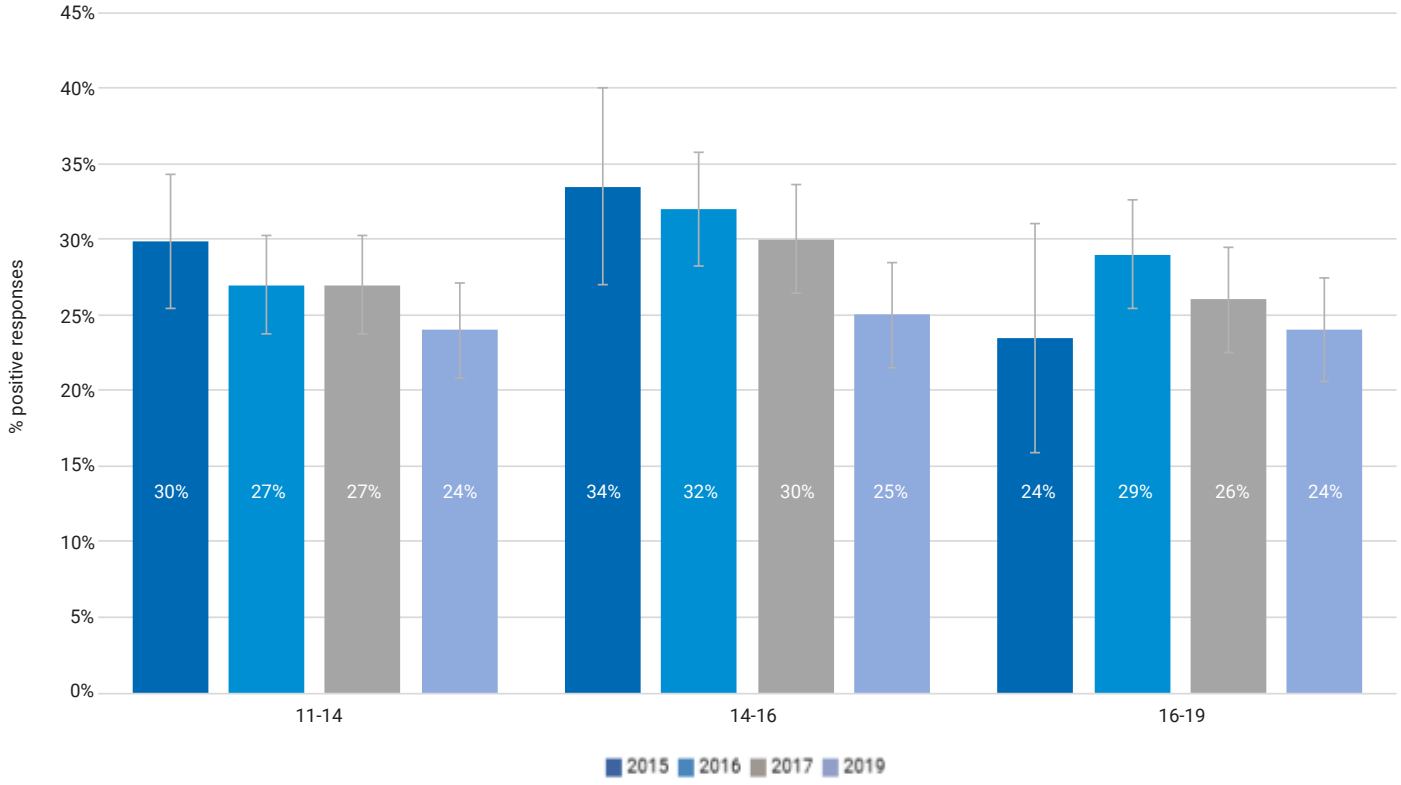
Knowledge of a profession is an essential first step to young people making informed decisions as to whether it is a career for them. Throughout this report, we observe the association with higher levels of knowledge and other key benchmark indicators, so this chapter aims to understand what the existing levels of engineering knowledge is among young people.

Asked how much they knew about what people in engineering do on a scale from 1 to 5 (with 1 corresponding to 'know almost nothing' and 5 corresponding to 'know a lot'), just 24% of young people aged 11 to 19 reported having a high level of knowledge (4 – know quite a lot or 5 – a lot).

Nominally, this represents a decline in young people's knowledge of what engineers do from previous years. However, caution is advised in interpreting this data. As can be seen in **Figure 1**, confidence intervals – that is, the range of values that are believed to contain, with 95% probability, the true value – relating to this question overlap across years. This means that we cannot conclude the differences observed in the proportions reporting knowledge of what those who work in engineering do are statistically significant over the 2015 to 2019 time period.

Thus, although 24% of 11 to 14 year olds surveyed reported a high level of knowledge in what people working in engineering do in 2019, the reality is that the true value of this is likely to fall between 22.2% and 26.0% (the upper and lower bounds of its confidence interval). Likewise, the true value in 2017 is likely to be between 23.7% and 30.3%. Because these ranges overlap, it is not possible to conclude that the drop observed between 2017 and 2019 reflects a real decline or is simply due to natural variability inherent in any survey where a sample, rather than a census of the full population, is used.

Figure 1 Knowledge of engineering among young people aged 11 to 19 over time - UK



Source – EngineeringUK Engineering Brand Monitor, 2015-2019

Q – 'How much do you know about what people working in engineering do?' Percentages presented represent the proportions reporting '4 – quite a lot' or '5 – a lot' on a 5-point Likert scale, with 1 representing 'know almost nothing' and 5 representing 'know a lot'.

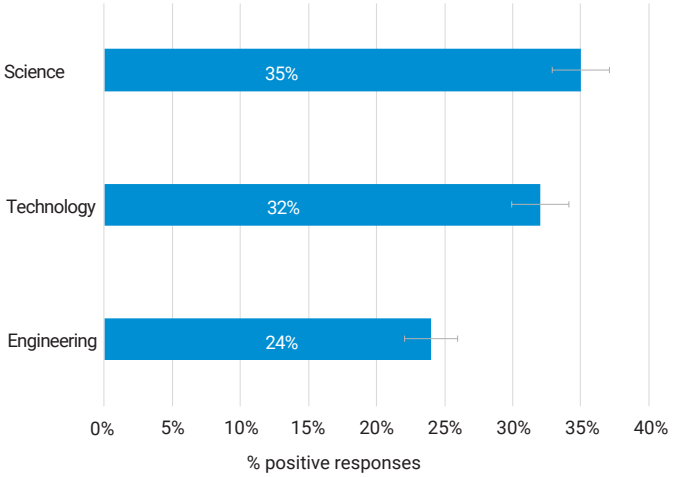
Comparison with other STEM areas

Young people surveyed were also asked to indicate the degree to which they knew about what people in science and technology do.

It is clear from these results that more can be done to raise understanding of STEM careers, with the proportions of young people reporting a high degree of knowledge for either science, technology and engineering relatively low (ranging between 24% to 35%; see **Figure 2**). However, that engineering fares worst of the three subjects – and this has been found to be the case in every EBM since it began in 2010 – suggests lack of knowledge is a particularly acute and persistent problem for engineering.

Young people's reported knowledge of what engineers do lags behind that of science and technology.

Figure 2 Knowledge of STEM careers among young people aged 11 to 19 in 2019 - UK



Source – EngineeringUK Engineering Brand Monitor 2019

Q – 'How much would you say you know about what people working in the following areas do?' Percentages presented represent the proportions reporting '4 – know quite a lot' or '5 – know a lot' on a 5-point Likert scale, with 1 representing 'know almost nothing' and 5 representing 'know a lot'.

Differences in knowledge of engineering careers by age, gender, and ethnicity

While knowledge of engineering as a profession was limited across both genders, girls' understanding lagged behind that of boys in every age group surveyed (**Figure 3**). Asked how much they knew about what engineers did, 18% of girls aged 11 to 19 reported they knew 'a lot' or just 'quite a lot' compared with 30% of their male peers.

However, no statistically significant differences in reported knowledge of what engineers do were found in respect of age or ethnicity.

Just 18% of girls aged 11 to 19 had a high level of knowledge of engineering careers compared with 30% of boys.

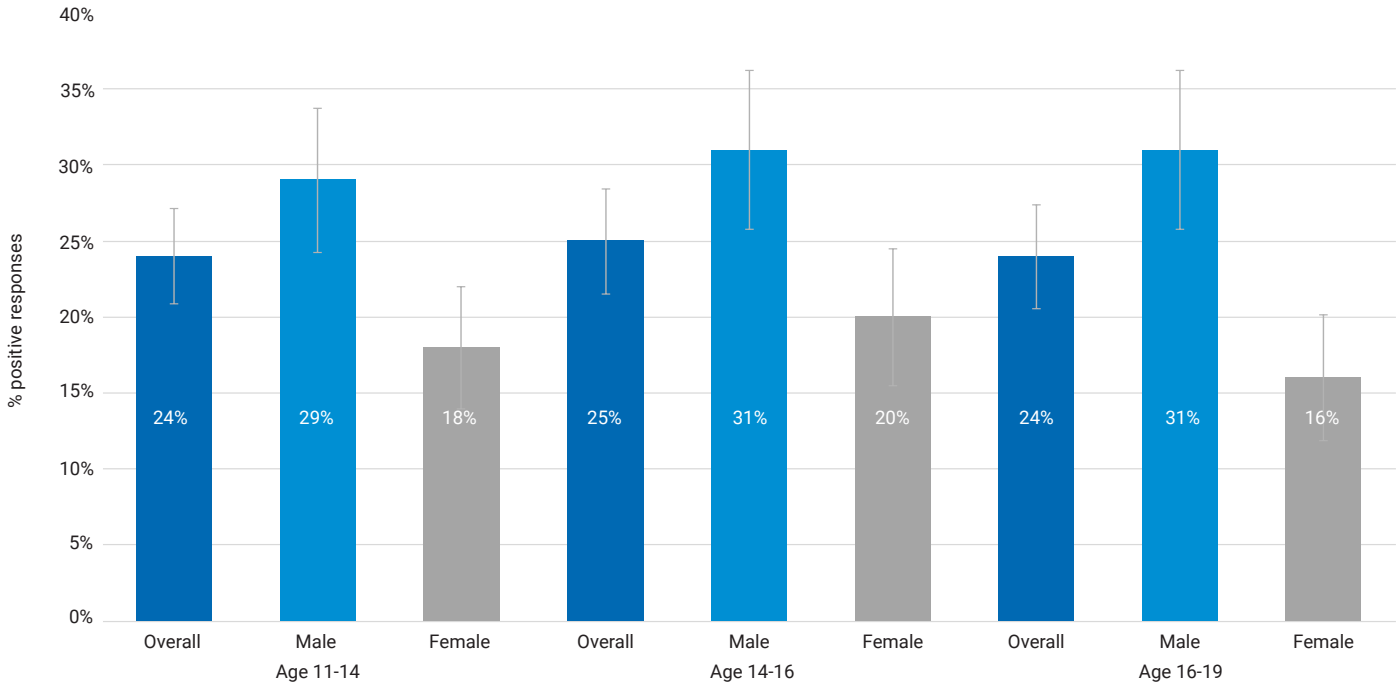
Differences in knowledge of engineering by attendance of STEM careers activities

Encouragingly, there was a clear association between attending a STEM careers activity and a young person's knowledge of what an engineer does. 44% of respondents that had attended a STEM careers activity in the past 12 months said they knew quite a lot or a lot about what engineers do, in contrast to only 17% of respondents that had not done so.

Even when controlling for gender and taking into account the fact that students attending STEM careers activities may be more likely to be science-oriented (by controlling for enjoyment of science, technology and maths), those who had attended an activity were 3.5 times more likely to say they knew quite a lot or a lot about what engineers do than those who had not.

Further, the more STEM careers activities young people attended, the more likely they were to report a high level of knowledge of what engineers do. Controlling for gender and enjoyment of STEM subjects, those who had attended more than one activity were 8 times as likely as those who had not attended any to report knowing quite a lot or a lot about what engineers do (and 2.7 times as likely as those only attending one activity).

Figure 3 Knowledge of what people who work in engineering do among young people aged 11 to 19 in 2019, by age group and gender – UK



Source: EngineeringUK Engineering Brand Monitor 2019

Q – 'How much do you know about what people working in engineering do?' Percentages presented represent the proportions reporting '4 – know quite a lot' or '5 – know a lot' on a 5-point Likert scale, with 1 representing 'know almost nothing' and 5 representing 'know a lot'.

What proportion of young people have attended a STEM careers activity in the past 12 months?

Young people who have attended a STEM careers activity are not only more likely to know what an engineer does, but also – as is detailed later in this report – more likely to perceive engineering as a desirable profession, and one they would consider as a career choice.

Yet among the young people aged 11 to 19 we surveyed, just 27% reported having taken part in at least one STEM careers activity during the past 12 months. And of those who reported having attended a STEM careers activity in the past 12 months, the vast majority had only attended one event (24%).

Are more young people participating in STEM careers activities than in previous years – and if so, how has this improved knowledge, perceptions, and understanding of engineering?

The proportion of young people reporting having attended a STEM careers activity in the past 12 months has increased significantly since 2016 (the first year in which the question was asked in the EBM). In 2016, just 19% of 11 to 19 year olds reported having done so, compared to 24% in 2017 and 27% in 2019.

Less encouragingly, an analogous increase in all our key benchmark indicators has not been observed, suggesting STEM outreach efforts must not only focus on increasing reach but also the quality of activity. As a community, we must cultivate a greater understanding of how engagement activities can and do meaningfully affect positive change through robust research and a shared evidence base.

Young people who had attended two or more STEM careers activities were 8 times more likely than those who hadn't attended any to have a high level of knowledge about engineering.

3. Perceptions of engineering

Whether or not young people hold positive perceptions of engineering can influence their likelihood of considering a career in the profession in later life. Within this chapter we examine how positively, or negatively young people view engineering, and whether other factors – including knowledge of the sector and how much engineers are paid – affect these viewpoints.

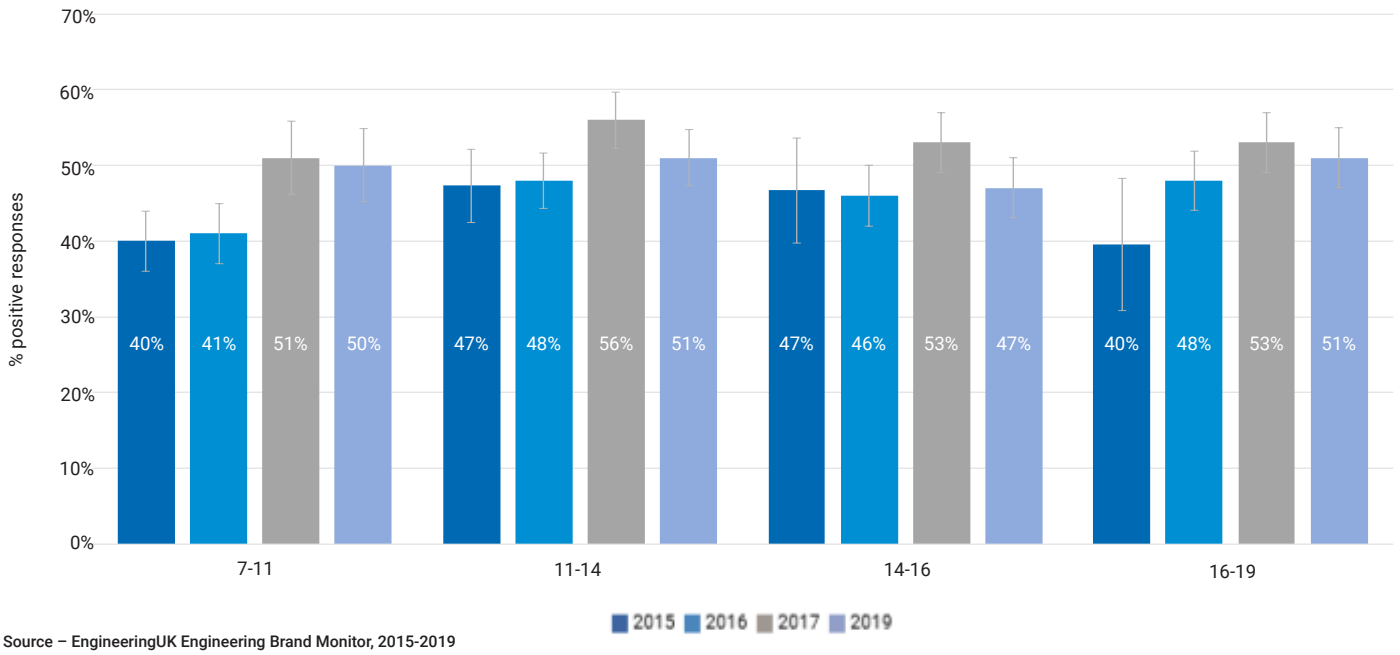
In order to measure perceptions, we asked young people aged 7 to 19 how positive or negative their view on engineering was on a scale from 1 to 5, with 1 being 'very negative' and 5 being 'very positive'. Altogether, 50% reported having positive or very positive views in 2019.

Although ostensibly the proportions of young people reporting positive views of engineering in 2019 represents a decline from 2017, as **Figure 4** shows, these declines are not statistically significant. Because the confidence intervals overlap, the differences cannot be taken to be meaningful changes over time.

However, a statistically significant increase in both the proportions of 7 to 11 year olds and 11 to 14 year olds reporting positive views of engineering was observed between 2016 and 2017.

By and large, the degree to which young people report positive views of engineering has not changed significantly over time.

Figure 4 Views of engineering among young people aged 7 to 19 over time – UK



Source – EngineeringUK Engineering Brand Monitor, 2015-2019

Q – 'How positive or negative is your view on engineering?' Percentages presented represent the proportions reporting '4 - quite positive' or '5 - very positive' on a 5-point Likert scale, with 1 representing 'very negative' and 5 representing 'very positive'.

Comparison with other STEM areas

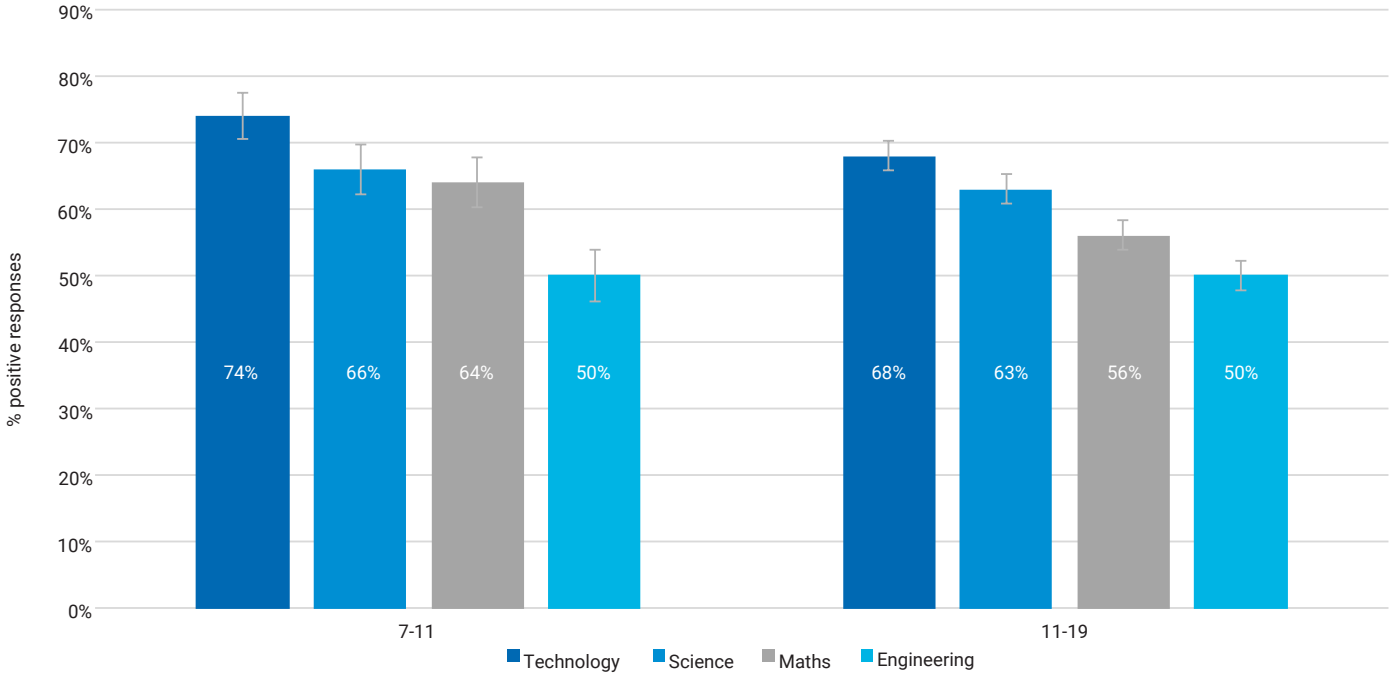
To understand how engineering fares against other related subjects in terms of young people's perceptions, we also asked students to indicate how positively or negatively they viewed science, technology and mathematics.

As was found to be the case with knowledge of what engineers do, the proportion of young people reporting positive views of engineering was lower than for any other STEM subject. For both respondents aged 7 to 11 and those aged 11 to 19, technology was viewed in the most positive light, followed by science, maths and, finally, engineering (**Figure 5**).

As is explored in Chapter 4, it is apparent that many young people hold negative associations with engineering (for example, seeing it as boring or dull). Concerted effort to dispel these conceptions through such campaigns as *This is Engineering*[6] is critical if the engineering sector is to raise perceptions of the profession.

Engineering is perceived more negatively than other STEM subjects by young people.

Figure 5 Views of STEM subjects among young people aged 7 to 19 in 2019, by age – UK



Source – EngineeringUK Engineering Brand Monitor 2019

Q – 'How positive or negative is your view on each of the following?' Percentages presented represent the proportions reporting '4 – quite positive' or '5 – very positive' on a 5-point Likert scale, with 1 representing 'very negative' and 5 representing 'very positive'.

[6] This is engineering is a national campaign to bring engineering to life for young people, by highlighting the variety of careers available in the industry. For more information, see www.thisisengineering.org.uk

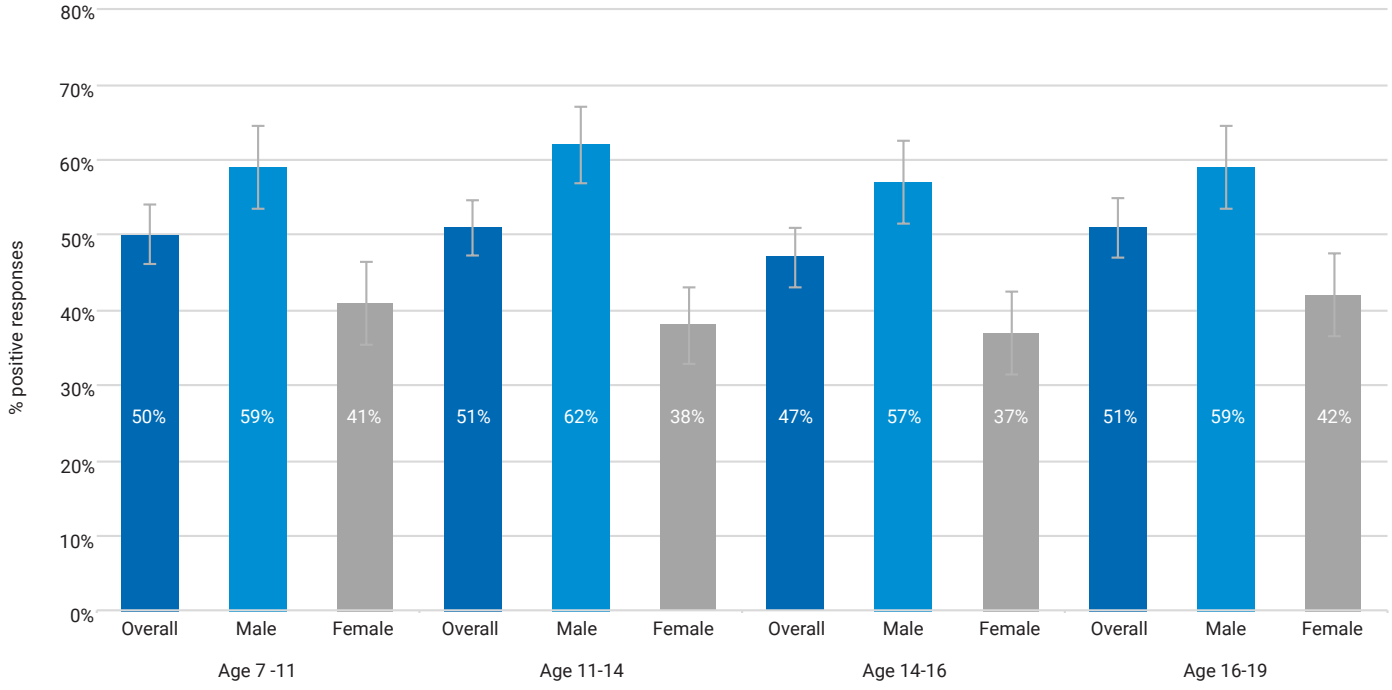
Differences in perceptions of engineering by age, gender and ethnicity

Moreover, across all age groups the proportion reporting positive views of engineering was markedly lower among girls than boys (**Figure 6**). These gender differences were pronounced amongst even the youngest respondents (aged 7 to 11), suggesting that views are entrenched from an early age. Also notable is that this percentage point difference peaks at 11 to 14 year olds (24 percentage point difference), at the very age group in which young people make critical educational choices. Gender differences in views and desirability of technology and science careers were far narrower, suggesting engineering faces additional challenges beyond those documented in STEM.

There were no significant differences in responses between either different age groups or ethnic groups.

Even among the youngest respondents - 7 to 11 year olds - boys were far more likely than girls to view engineering positively.

Figure 6 Views of engineering among young people aged 7 to 19 in 2019, by age and gender UK



Source – EngineeringUK Engineering Brand Monitor 2019

Q – 'How positive or negative is your view on: Engineering?' Percentages presented represent the proportions reporting '4 – quite positive' or '5 – very positive' on a 5-point Likert scale, with 1 representing 'very negative' and 5 representing 'very positive'.

What effect does knowledge of what engineers do and how much they are paid have on young people's perceptions of the profession?

Students who said they knew more about what engineers did were far more likely to have positive perceptions of engineering, even when taking into account gender and whether they enjoyed STEM subjects at school. We control for these factors as students who enjoy STEM subjects may be more likely to view engineering positively, so by taking this into account we can isolate the effect of knowledge on students' perceptions regardless of which subjects they enjoy.

When controlling for gender, and whether they enjoyed STEM subjects at school, students who reported a high level of knowledge about what engineers do were 4.4 times as likely to hold positive views of engineering as those who did not – 82% of 11 to 19 year olds who knew quite a lot or a lot about engineers had positive viewpoints, compared with 40% of those who didn't.

Ensuring young people are well informed of the salaries they can expect to receive as an engineer in comparison to other professions may also help to elevate perceptions of the profession. We found that those who believed engineers to be well paid were statistically significantly more likely to hold positive views of engineering (59%) than those who thought it was averagely paid (40%) or not well paid (30%).

Differences in perceptions of engineering by attendance at STEM careers activities

Those who had attended a STEM careers activity in the past 12 months were found to have statistically significantly more positive views of engineering than those who had not (66% compared with 44%).

Suitability of engineering for boys and girls

Throughout the Engineering Brand Monitor, there are clear gender differences not only in reported perceptions and knowledge of engineering but also, as can be seen in later chapters of this report, perceived desirability of becoming an engineer and ability to become one should they wish. Girls were much less likely than boys to report a high level of knowledge about engineering (Chapter 2), to hold positive views of the profession (Chapter 3), to view themselves as capable of becoming an engineer if they wanted to (Chapter 6), to see the profession as a desirable career (Chapter 4), and to consider it as a career choice (Chapter 6).

In an attempt to delve into these gender differences further, students were asked whether engineering was suitable for both boys and girls. Interestingly, the vast majority of those aged 11 to 19 agreed that this was the case (84%), and there were no significant differences between boys and girls except at age 16 to 19 (girls were more likely to agree in this age group). This suggests that most students are aware that, at least in principle, the profession is open to everyone, regardless of gender – and the barriers to girls pursuing engineering occur when they consider the profession at either a more subconscious or personal level.

4. Desirability of engineering

Whether young people believe a career in engineering is desirable is a reliable indicator of how much work the sector has to do in order to improve the engineering talent pipeline. This chapter examines how desirable or undesirable young people believe engineering to be, along with their reasons for holding such opinions.

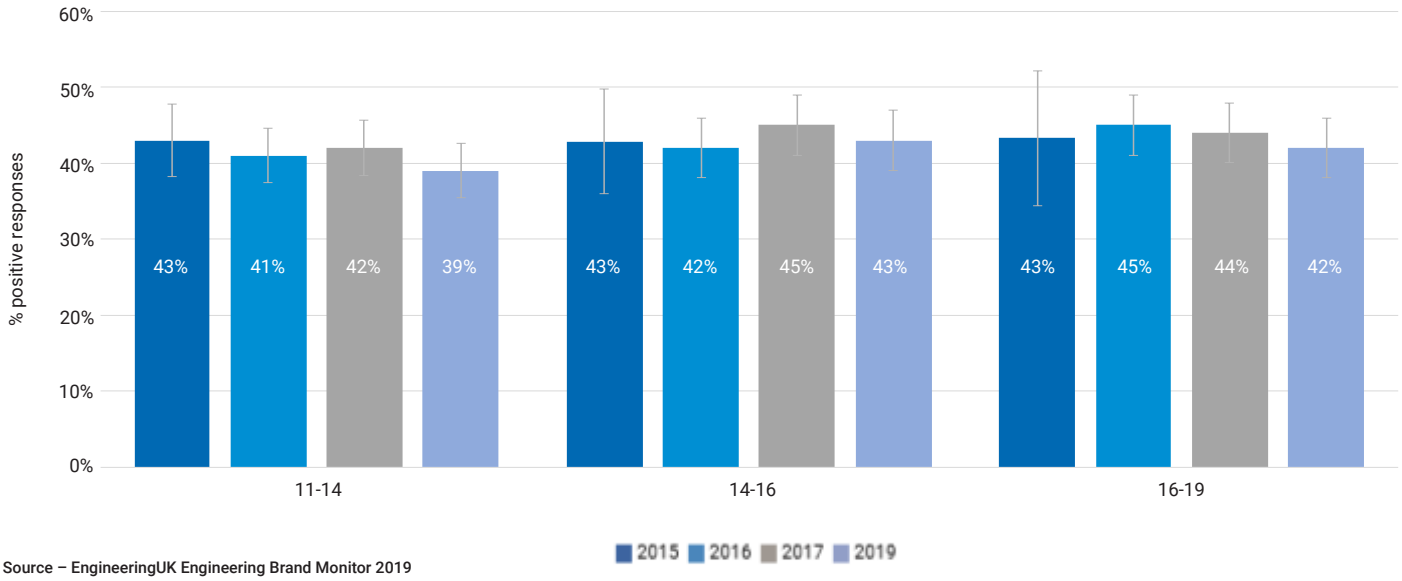
In order to assess the degree to which young people find a career in the profession appealing, students aged 11 to 19 were asked how 'desirable' they believed a career in engineering to be. In 2019, 41% of respondents aged 11 to 19 stated a career in engineering would be 'quite desirable' or 'very desirable'.

Although the proportions nominally have declined across all age group between 2017 and 2019, these are not statistically significant. Similar to the changes observed in knowledge over time (Figure 1), the decreases seen here are likely due to the variability in responses to a survey where a sample is used.

This is encouraging in that it means any decreases observed do not necessarily reflect the fact that young people are less likely to feel an engineering career is desirable in 2019 than in previous years. However, by the same token, it also means that engineering careers have not *increased* in desirability, demonstrating that there is scope for the engineering sector to step up its efforts in this area.

The proportion of young people that viewed engineering as a desirable career has not changed significantly over time.

Figure 7 Desirability of engineering among young people aged 11 to 19 over time – UK



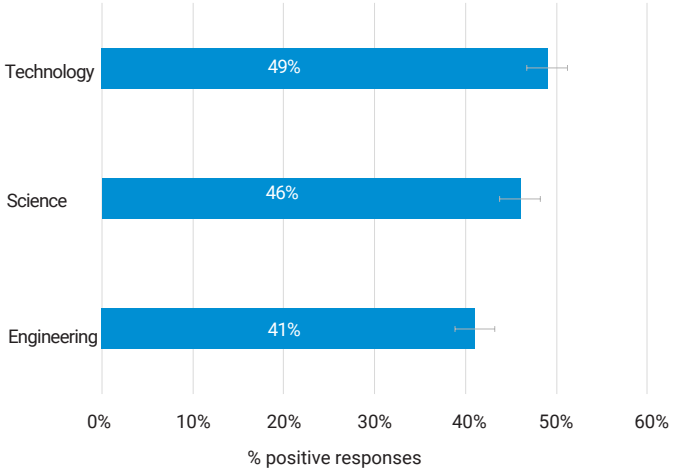
Source – EngineeringUK Engineering Brand Monitor 2019

Q – 'How desirable do you believe a career in engineering to be?' Percentages presented represent the proportions reporting '4 – quite desirable' or '5 – very desirable' on a 5-point Likert scale, with 1 representing 'not at all desirable' and 5 representing 'very desirable'.

Comparison with other STEM areas

As with the other key indicators, we also asked young people aged 11 to 19 about the desirability of a career in science and technology (**Figure 8**). Although the differences are small, they are statistically significant, and engineering was still seen as less desirable than both technology and science, in keeping with the other benchmark indicators. These results reinforce the message that engineering must be a key area of focus for the STEM outreach community in terms of raising knowledge, perceptions, and aspirations.

Figure 8 Desirability of engineering in relation to other STEM areas among young people aged 11 to 19 in 2019 – UK



Source – EngineeringUK Engineering Brand Monitor 2019

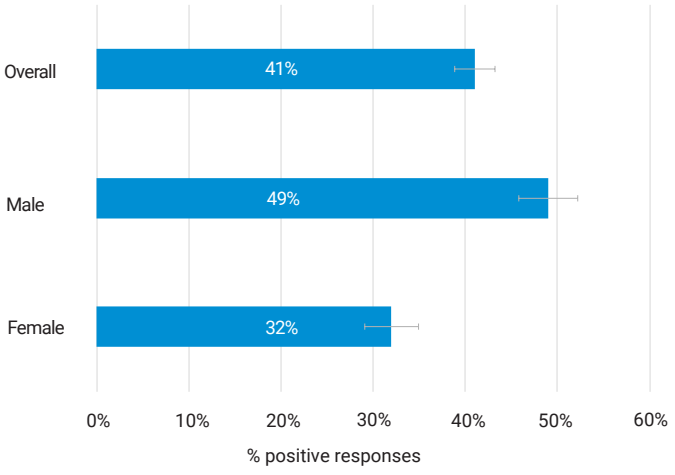
Q – 'How desirable do you believe a career in the following areas to be: science; technology; engineering?' Percentages presented represent the proportions reporting '4 – quite desirable' or '5 – very desirable' on a 5-point Likert scale with 1 representing 'not at all desirable' and 5 representing 'very desirable'.

Differences in desirability of engineering by age, gender and ethnicity

Consistent with other key benchmark indicators, there was a marked gender difference in reported desirability of an engineering career, with girls statistically significantly less likely to feel it was desirable than boys surveyed (32% compared with 49%).

No statistically significant differences, however, were found by age or ethnic group.

Figure 9 Views on desirability of engineering among young people aged 11 to 19 in 2019, by gender – UK



Source – EngineeringUK Engineering Brand Monitor 2019

Q – 'How desirable do you believe a career in engineering to be?' Percentages presented represent the proportions reporting '4 – quite desirable' or '5 – very desirable' on a 5-point Likert scale, with 1 representing 'not at all desirable' and 5 representing 'very desirable'.

Differences in desirability of engineering by attendance of STEM careers activities

Respondents who had attended a STEM careers activity in the past 12 months were significantly more likely than those who had not to view engineering as a desirable career (55% compared with 36%).

This is in line with findings for each of the key benchmark indicators and is extremely encouraging for the engineering outreach community.

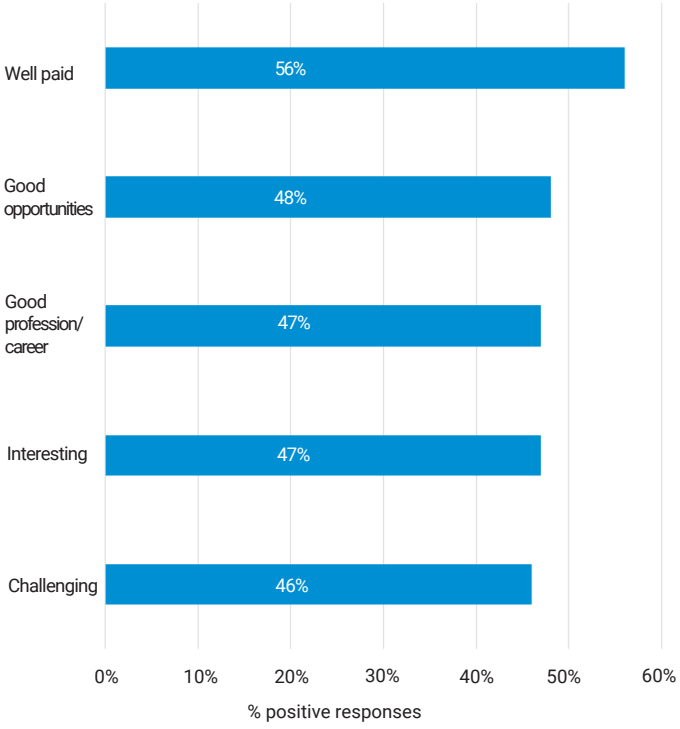
Young people that had attended a STEM careers activity were much more likely to think engineering was a desirable career than non-attendees.

Reasons for desirability of engineering

In order to more fully understand why it was that young people found engineering to be desirable, we asked 11 to 19 year olds to select from a list of reasons they believed that to be the case, with the ability to tick all that applied.

Consistent with other findings highlighting the importance of salary on perceptions of engineering, those that felt engineering was a desirable career were most likely to give 'well-paid' as a reason for desirability (56%). The belief that engineering offered good opportunities (48%), was a good profession/career (47%), or was interesting (47%) or challenging (46%) was also commonly cited as reasons for its desirability as a career option.

Figure 10 Reasons for desirability of engineering by young people aged 11 to 19 in 2019 – UK



Source – EngineeringUK Engineering Brand Monitor 2019

Q – 'Why do you believe a career in engineering is desirable?' Percentages presented represent the proportions including each option in their list of reasons. Base – all those that stated engineering was 'quite desirable' or 'very desirable' (778). Options given: well paid, good opportunities, good profession / career, interesting, challenging, it shapes the future, essential / plays a part in all our lives, enjoyable, respected, creative, rewarding (e.g. socially, intellectually), exciting, fun, can work abroad, job security, varied, aspirational, other, don't know.

What proportion of students aged 7 to 11 would like to be an engineer when they are older?

Although this chapter focuses on the extent to which young people aged 11 to 19 perceive a career in engineering to be desirable, the EBM also asked those aged 7 to 11 how much they would like to be an engineer when they are older.

Whilst young people's career preferences are likely to be highly fluid at this age, it is promising for the sector that in response to this question more than a third (36%) said they would 'a little' and nearly a quarter (24%) said 'very much' so.

Less encouraging is the large gender difference already apparent among 7 to 11 year olds in their desire to become an engineer: 70% of boys reported they would like to become an engineer 'a little' or 'very much', compared with just 49% of girls (a 21 percentage point difference). Observing such gender disparities even within the 7 to 11 age group suggests that outreach aimed at encouraging more women into engineering must begin earlier than secondary school.

Differences in reasons for desirability by age, gender and ethnicity

Among those who found engineering to be a desirable career, there were relatively few statistically significant differences for their reasons in respect of age or gender, with those found relating to the importance of pay. Girls aged 11 to 19 were more likely than their male counterparts to cite pay as a reason for engineering being desirable, and as were 16 to 19 year olds overall compared with 11 to 14 year olds.

No statistically significant differences in reasons given for desirability of engineering were found between white students and those from minority ethnic backgrounds.

Differences in reasons for desirability by attendance of STEM careers activities

Interestingly, those who had attended a STEM careers activity in the past 12 months were less likely than those who had not to include pay as a reason for desirability (51% compared with 59%).

Instead, young people who had attended such activities were more likely to cite engineering careers being enjoyable (42% of attendees compared with 33% of non-attendees) and fun (32% of attendees compared with 25% of non-attendees) as reasons for its desirability.

The fact that activity attendees were more likely to find engineering fun and enjoyable could suggest that STEM activities help them to cultivate a deeper, more rounded understanding of what engineering entails.

Reasons for undesirability of engineering

We also asked young people reporting engineering to be an undesirable career to indicate their reasons for this from a list of given options, with the ability to select all that applied. The most common response given was that they weren't interested in it (53%), followed by interest in other careers (36%). It therefore may be the case that it is not any particularly negative views of engineering that lead to them feeling it is undesirable, but rather that they have set their sights on different career pathways.

Nevertheless, negative perceptions of engineering also featured in many young people's reasons for why they found a career in the profession to be undesirable, with 28% citing it as being 'too complicated or difficult' and the same proportion indicating it as 'boring or dull'. One in five also reported engineering being 'too technical' as a reason for its undesirability. **Figure 11** in the section below displays the full range of reasons given, broken down by gender.

Differences in reasons for undesirability by age, gender and ethnicity

Of those who reported an engineering career to be undesirable, girls aged 11 to 19 were more likely than boys to say it was because they weren't interested in engineering (57% compared with 47%) or that engineering was 'too technical' (22% compared with 16%) or 'dirty, greasy or messy' (23% compared with 12%). It is also worrying that a larger proportion of girls than boys (13% compared with 5%) stated that engineering is a career for men. Although the proportions are low, this is a concerning finding and demonstrates that STEM outreach needs to make clear the attainability of engineering careers to both genders.

Perhaps reflecting that they are more likely to have made decisions about their future, older students were more likely than their younger peers to say they were interested in other careers (42% of 16 to 19 year olds compared with 32% of 11-16 year olds), though they were also more likely to report it being too complicated or difficult (34% compared with 24%).

As with reasons for desirability, there were no significant differences in reasons for undesirability given by white students compared with those from minority ethnic backgrounds.

Figure 11 Reasons that engineering was seen as undesirable among young people aged 11 to 19, by gender – UK

Reason for undesirability	Overall	Male %	Female %
Not interested in it	53%	*47%	*57%
Interested in other careers	36%	33%	37%
Too complicated / difficult	28%	26%	29%
Boring / dull	28%	24%	30%
Too technical	20%	*16%	*22%
Dirty / Greasy / Messy	19%	*12%	*23%
Is a career for men	10%	*5%	*13%
Not well known as a career	7%	5%	8%
Poorly paid	7%	5%	8%
Is a career without much human contact	5%	4%	6%
Dying industry	4%	5%	4%
Is a career without much impact on the world	4%	4%	4%
Negative publicity about it	2%	2%	2%
Don't know	4%	4%	4%

Source – EngineeringUK Engineering Brand Monitor 2019

Q – 'Why do you believe a career in engineering is undesirable?' Percentages presented represent the proportions including each option in their list of reasons. Base – all those that said engineering was 'Not at all desirable' or 'Slightly desirable' (681). Options given: not interested in it, interested in other careers, too complicated / difficult, boring / dull, too technical, dirty / greasy / messy, is a career for men, not well known as a career, poorly paid, is a career without much human content, dying industry, is a career without much impact on the world, negative publicity about it, other, don't know.

Where there is an asterisk in the table, the differences between boys and girls were found to be statistically significant.

5. Factors influencing students career choices

Beyond examining young people's knowledge, perceptions and understanding of engineering, the Engineering Brand Monitor also seeks to gain insight into the career intentions of young people and the factors that influence these decisions more generally. This chapter will examine those wider factors, with a view toward informing STEM outreach and careers activities.

What jobs students would like to do when they finish full time education

Interestingly, when asked to select what job they would most like to do when they finish full time education from a list of more than 20 options, ranging from a hairdresser to an entrepreneur and including an 'other' option, young people aged 11 to 19 were most likely to select engineer (10%), computer games developer (9%), or scientist (6%).

Caution is advised in interpreting this finding, however, as this question is asked within the context of a survey regarding engineering and STEM in general. This means that there is a possibility of survey bias, particularly as students have already been asked several engineering-related questions by the time they are presented with this question. That being said, engineer commonly features as a job choice within wider non-STEM specific research among young people – for example, in Education and Employers' Drawing the future study[7] and joint research by the Centre for Longitudinal Studies and Runnymede Trust.[8]

Differences in job choices by age, gender and ethnicity

This caveat notwithstanding, the results nevertheless are illuminating, particularly in terms of the gender and ethnic differences observed within the jobs students would most like to do when they finish full time education.

As can be seen in **Figure 12**, of those aged 11 to 19, boys were more likely than girls to want to be either an engineer or a computer games developer, whereas girls were more likely than boys to want to be a teacher, lawyer or a vet. Younger boys (11 to 14 year olds) were also more likely to want to be a scientist than their female peers.

We also observed significant differences between those from different ethnic backgrounds, with black and minority ethnic (BME) students aged 11 to 19 more likely to want to be a lawyer and a doctor than their white peers. White students, by contrast, were more likely than those from minority ethnic backgrounds to indicate 'vet' or 'childcare (nursery worker/child minder)' as the job they would most like to do once they finish full time education.

Figure 12 Top 10 Jobs young people age 11 to 19 in 2019 most wanted to do when they finished full-time education, by gender – UK

Job choice	Overall	Male %	Female %
Engineer	10%	*13%	*5%
Computer games developer	9%	*16%	*2%
Scientist	6%	6%	7%
Doctor	5%	5%	6%
Teacher	5%	*3%	*8%
Lawyer	5%	*4%	*6%
Want to set up my own business / entrepreneur	4%	5%	4%
Vet	4%	*2%	*7%
Actor / actress	4%	*2%	*5%
Athlete or professional sports person	3%	*5%	*2%

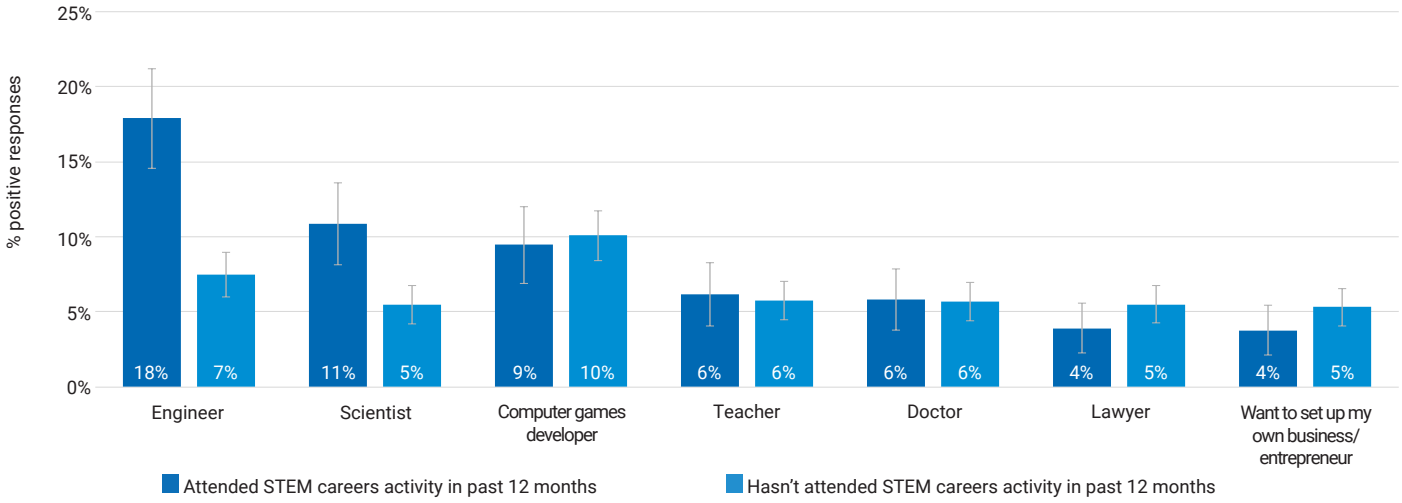
Source – EngineeringUK Engineering Brand Monitor 2019

Q – 'What job would you most like to do when you finish full-time education?' Percentages presented represent the proportions selecting each option as top job choice. Options given: engineer, computer games developer, scientist, doctor, teacher, lawyer, want to set up my own business / entrepreneur, vet, actor/actress, athlete or professional sports person, designer, musician or pop star, nurse, accountant, web designer, architect, armed forces/police, childcare (nursery worker/child minder), inventor, beauty therapist, journalist/writer, creative arts, dentist, psychologist, sales assistant, chef/catering, hairdresser, pilot, designer, architect, other, don't know.

Where there is an asterisk in the table, the differences between boys and girls were found to be statistically significant.

[7] Education and Employers. 'Drawing the future', 2018.
[8] Centre for Longitudinal Studies and the Runnymede Trust. 'Occupational aspirations of children from primary school to teenage years across ethnic groups', 2018

Figure 13 Jobs young people aged 11 to 19 in 2019 would most like to do when they finish full-time education, by whether they attended a STEM careers activity in the past 12 months – UK



Source – EngineeringUK Engineering Brand Monitor 2019

Q – 'What job would you most like to do when you finish full time education?' Percentages presented represent the proportions selecting each option as top job choice. Options given: engineer, computer games developer, scientist, doctor, teacher, lawyer, want to set up my own business / entrepreneur, vet, actor/actress, athlete or professional sports person, designer, musician or pop star, nurse, accountant, web designer, architect, armed forces/ police, childcare (nursery worker/child minder), inventor, beauty therapist, journalist/writer, creative arts, dentist, psychologist, sales assistant, chef/catering, hairdresser, pilot, designer, architect, other, don't know.

Differences in jobs students wanted to do by attendance at STEM careers activities

Also striking are the differences found between those who had attended a STEM career activity in the past 12 months and those who had not (**Figure 13**). The number of students wanting to be either an engineer or a scientist when they finished full-time education was significantly higher for those that attended a STEM careers event in the past 12 months that those who had not.

Moreover, this could not be fully explained by other factors, such as gender and enjoyment of STEM subjects. Even when controlling for these, young people who had attended a STEM careers activity in the past 12 months were 2.5 times as likely as non-attendees to want to be an engineer and 1.8 times more likely to want to be a scientist.

11 to 19 year olds that had been to a STEM careers activity were 2.5 times more likely to put engineer as their top job choice than non-attendees.

Important factors in deciding a career

Key to developing effective STEM outreach is an understanding of what young people consider when making career decisions. To that end, we asked 11 to 19 year olds to indicate the factors most important to them when deciding upon a career, with the ability to tick all that applied from a list of given options.

Perhaps unsurprisingly, 'something I'm interested in' was found to be the most important factor in making a career choice (with 68% of those surveyed selecting this option), closely followed by pay (66%) and enjoyment (65%).

However, young people commonly placed importance on being valued (42%) and making a difference or having an impact (42%), suggesting an emphasis on the societal contributions of engineering may also be an effective way of influencing their decision to pursue the profession.

Figure 14 Factors important in career choice among young people aged 11 to 19 in 2019 – UK

Factor important in career choice	Overall %
Something I'm interested in	68%
Pay	66%
Enjoyment	65%
Working conditions & environment	43%
Being valued	42%
Making a difference / having an impact	42%
Job security	41%
Something that challenges me	38%
Opportunities to be creative	35%
Career prospects and progression	35%
Working hours (9-5)	28%
Opportunities to undertake practical work	24%
Opportunities to work in a team	24%
Opportunities to work abroad	23%
Recommendation from friends or family	12%
Don't know	2%

Source – EngineeringUK Engineering Brand Monitor 2019

Q – 'Which of the following factors do you think would be important to you when deciding upon a career?' Percentages presented represent the proportions including each factor in their list of factors. Options given: something I'm interested in, pay, enjoyment, working conditions and environment, being valued, making a difference/having an impact, job security, something that challenges me, opportunities to be creative, career prospects and progression, working hours (9-5), opportunities to undertake practical wok, opportunities to work in a team, opportunities to work abroad, recommendation from friends or family, other, don't know.

Differences in factors important in career choice by age, gender and ethnicity

Consistently, across all age groups and genders, the most important factors were interest, pay and enjoyment, followed by working conditions and environment, and being valued.

However, 16 to 19 year olds were more likely than younger students to value working conditions and environment, suggesting that practical aspects of working may become important to young people the closer working life becomes a reality for them.

Some differences by gender and ethnicity were also observed, with girls aged 11 to 19 more likely than their male peers to rank interest as important and BME students more likely to value the ability to work abroad than those from a white back-

What proportion of young people know how much engineers are paid?

It is clear that more work is needed to improve young people's understanding of how much engineers earn, given how highly salary ranks as a factor for young people in their career choices.

Asked to guess what the average starting salary of a graduate engineer was, the majority of 16 to 19 year olds underestimated the amount. 56% of respondents aged 16 to 19 said salaries were under £24,999, when the average graduate starting salary for engineering occupations (within the engineering sector) is £27,021[9].

What factors are most important to young people who would like to become an engineer?

The factors reported to be most important to their career decisions were markedly different for those who stated they most wanted to be an engineer when they finished full time education compared to those who had other career aspirations.

Amongst this group, the factors that ranked most highly were:

- Opportunities to work abroad (33% of those who most wanted to become an engineer, compared with 22% of those who had other career aspirations) ;
- Opportunities to undertake practical work (38% compared with 22%)
- and opportunities to work in a team (35% compared with 23%)

This is illuminating, suggesting there might be certain features of the profession that are particularly appealing to those inclined to become an engineer – and raising greater awareness of these opportunities may help to encourage more to pursue an engineering career.

[9] HESA 'Destinations of Leavers from Higher Education 2016/17', 2018

ground.

Careers advice

In order to gain insight into those who can influence young people's careers decisions, we also asked students aged 11 to 19 to indicate from a list of options who they would consider going to for careers advice, ticking all that applied.

Parents and guardians ranked most highly (61%), followed closely behind by careers advisors (59%) and teachers (56%) – suggesting that STEM outreach seeking to influence young people's career choices must consider how to engage and support these critical sources of information.

Figure 15 Where students aged 11 to 19 in 2019 would consider going for careers advice – UK

Sources of careers advice	Proportion of respondents who would go to the following for careers advice (tick all that apply)
Parents / guardians	61%
Careers advisers	59%
Teachers	56%
Internet / online sources	43%
Friends	34%
Other relatives (not your parents)	21%
Other young people	17%
Youth club leaders	9%
Don't know	5%

Source – EngineeringUK Engineering Brand Monitor 2019

Q – 'Who would you consider going to for careers advice?' Percentages presented represent the proportions including each option in their list of sources. Options given: parents/ guardians, careers advisers, teachers, Internet/online sources, friends, other relatives (not your parents), other young people, youth club leaders, don't know.

Differences in careers advice by age, gender and ethnicity

As **Figure 16** shows, older (16 to 19) students were more likely to go to careers advisers than younger (11 to 16) students, perhaps reflecting the increased emphasis on careers advice in the later stages of schooling, and the fact that older students feel more independent from their parents. Older students were also significantly more likely than younger students to use the internet or online sources for careers advice.

In respect of gender, girls were more likely than boys to go to their friends for careers advice, to go to other relatives and to other young people.

There were no differences in sources of careers advice between those students aged 11 to 19 from a minority ethnic background compared with their white peers.

Figure 16 Where young people aged 11 to 19 in 2019 would be likely to go to for careers advice, by age – UK

Sources of careers advice	11 to 16 year olds	16 to 19 year olds
Parents / guardians	*63%	*57%
Careers advisers	*57%	*63%
Teachers	56%	57%
Internet / online sources	*38%	*53%
Friends	32%	36%
Other relatives (not your parents)	21%	21%
Other young people	16%	19%
Youth club leaders	10%	9%
Don't know	5%	5%

Source – EngineeringUK Engineering Brand Monitor 2019

Q – 'Who would you consider going to for careers advice?' Percentages presented represent the proportions including each option in their list of sources. Options - parents/guardians, careers advisers, teachers, Internet/online sources, friends, other relatives (not your parents), other young people, youth club leaders, don't know.

Where there is an asterisk in the table, the differences between the two age groups were found to be statistically significant.

6. Consideration of a career in engineering

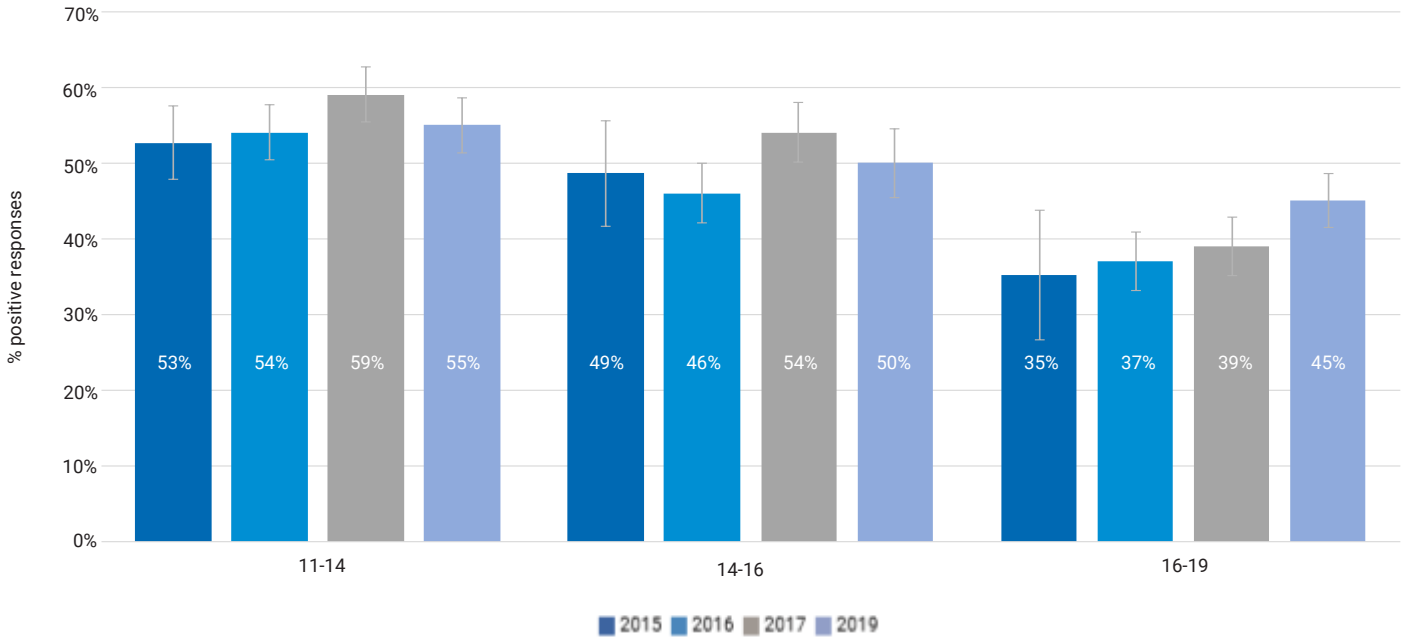
A key benchmark for the engineering community to assess how likely young people are to pursue engineering is whether they would consider it as a career option. Within this chapter we will examine both whether young people would consider engineering, and whether they believe they could become an engineer if they wanted to.

Encouragingly when asked as a yes/no question, 50% of students aged 11 to 19 in 2019 said that they would consider a career in engineering.[10]

This represents a statistically significant increase among 16 to 19 year olds from 2016 levels. A significant increase was also observed among 14 to 16 year olds between 2016 and 2017, though not in 2019. While these increases are modest, they are likely to reflect true rises, meaning more older students would consider going into engineering than three years ago.

The proportion of 16 to 19 year olds who would consider a career in engineering has risen significantly since 2016.

Figure 17 Consideration of a career in engineering among young people aged 11 to 19 over time – UK



Source – EngineeringUK Engineering Brand Monitor – 2015 to 2019

Q – 'Do you think you would ever consider a career in engineering?' Percentages presented represent the proportions reporting 'yes', with the options being 'yes' or 'no'.

[10] For this benchmark, students were not asked the same question of careers in science or technology.

Differences in consideration of a career in engineering by age, gender and ethnicity

Consistent with our other benchmarks, girls were far less likely than boys to consider a career in engineering. This gap was widest among those aged 11 to 14, with just 40% of girls saying they would do so, compared with 68% of boys (**Figure 18**).

We also found that students aged 16 to 19 were less likely than those aged 11 to 14 to consider a career in engineering, perhaps reflecting the fact that they have narrowed down their options by this age.

No significant differences were observed by ethnicity, with BME students as likely as white students to consider a career in engineering.

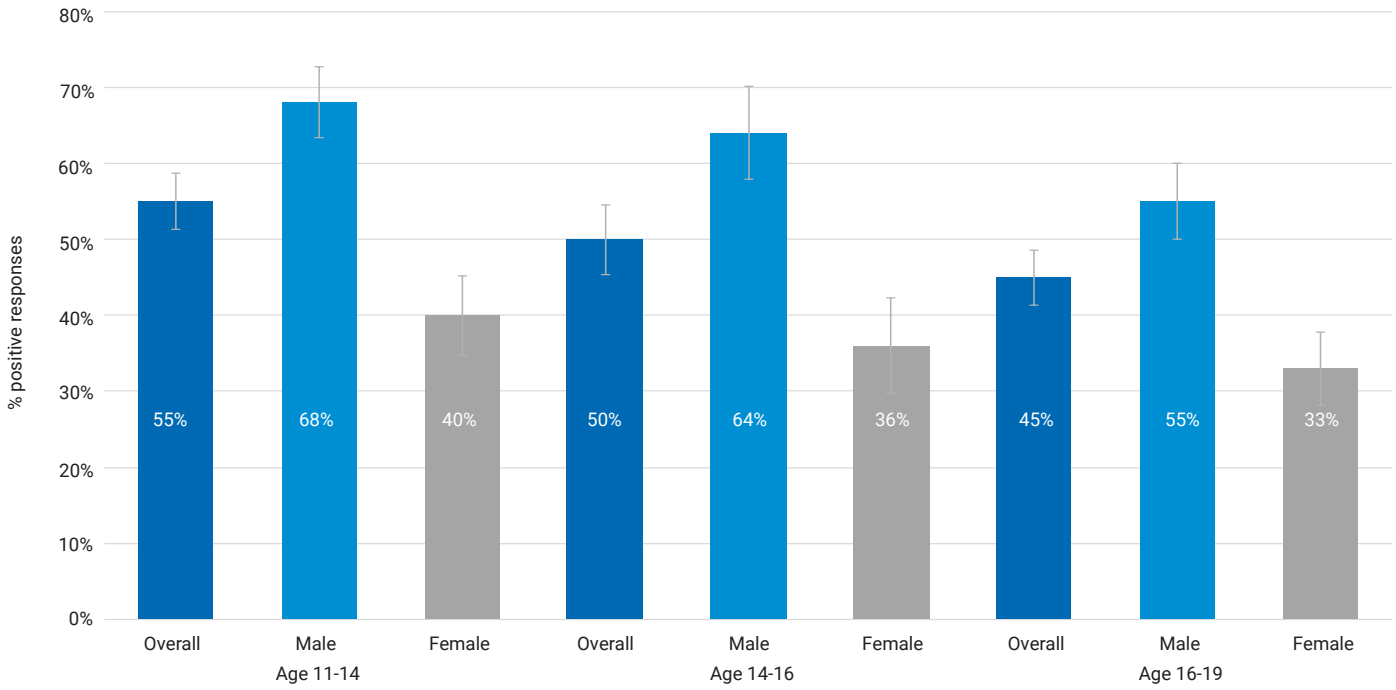
Girls of all ages were far less likely than boys to consider a career in engineering.

Differences in consideration of a career in engineering by attendance of STEM careers activities

It is evident from our results that STEM outreach has a strong positive association with not only young people's knowledge and understanding of engineering, but also on their consideration of an engineering career.

72% of students who had attended a STEM careers activity in the past 12 months said they would consider a career in engineering, compared with just 41% of those who had not. Moreover, this result was still significant when controlling for gender and enjoyment of STEM subjects, with attendees being 3.4 times more likely to consider a career in engineering than non-attendees.

Figure 18 Consideration of a career in engineering by young people aged 11 to 19 in 2019, by age and gender – UK



Source – EngineeringUK Engineering Brand Monitor 2019

Question – 'Do you think you would ever consider a career in engineering?' Percentages presented represent the proportions reporting 'yes', with the options being 'yes' or 'no'.

Where should we target awareness raising around engineering in schools?

Improving knowledge of engineering and enjoyability of STEM is a key way to increase the engineering talent pipeline. Information around engineering could be built into STEM subjects at school to increase numbers in the engineering pipeline.

Our results found that 82% of those who said they knew quite a lot or a lot about engineering would consider a career in engineering, compared with just 40% of those who did not report this level of knowledge.

Those who report enjoying STEM are also far more likely to consider a career in engineering than those who do not. This difference is most pronounced for physics, with 69% of young people that enjoyed physics reporting that they would consider a career in engineering in comparison to just 36% of those that did not enjoy the subject.

Capability of becoming an engineer

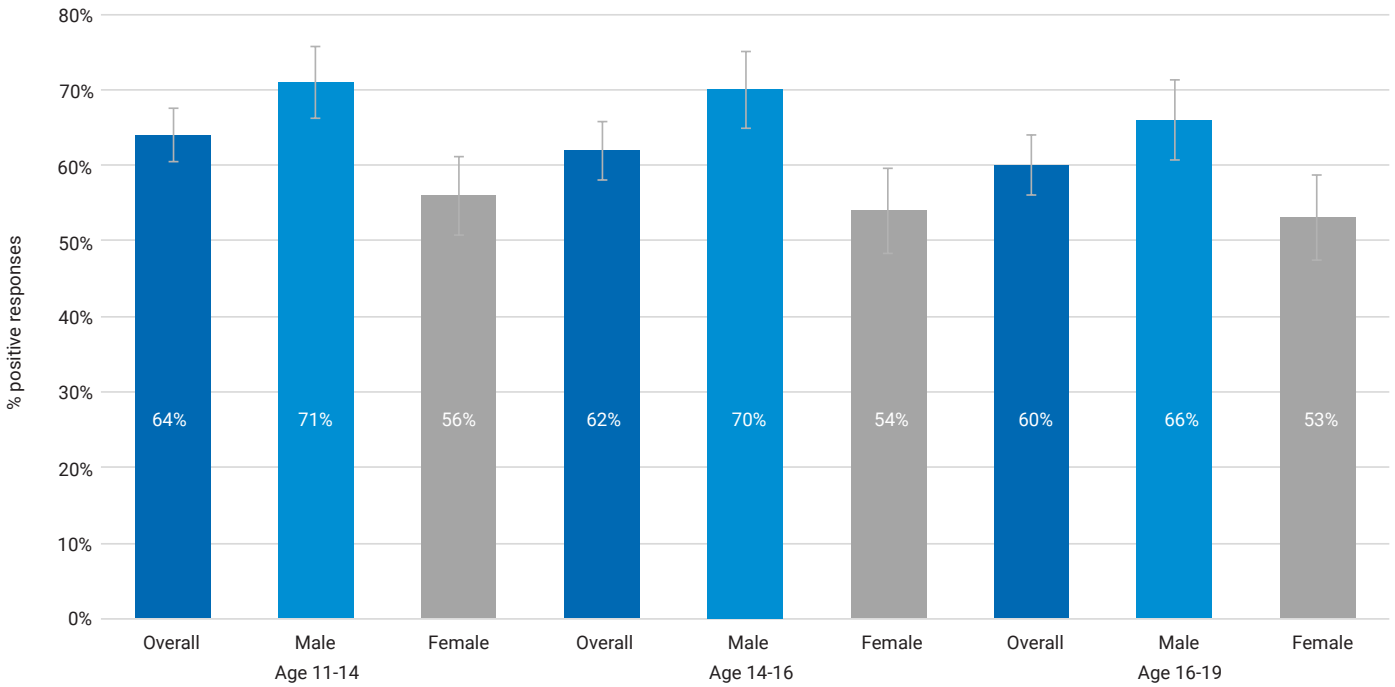
The report so far has investigated students' general perceptions and knowledge of engineering, as well as whether they would consider engineering as a career. However, in order to truly grow the engineering talent pipeline, it may not be sufficient for young people to simply know about engineering, perceive the profession positively or consider a career in it; they must also feel confident that they are able to become an engineer.

In order to gain more insight into this, we asked students whether they thought they could become an engineer if they wanted to - overall, 62% of young people aged 11 to 19 felt they could.

Differences in capability of engineering by age, gender and ethnicity

However, boys across all age groups were significantly more likely than girls to see themselves as being able to become an engineer. Such findings are startling, given that girls on average outperform boys in most STEM subjects at GCSE and

Figure 19 Perceived capability of becoming an engineer among young people age 11 to 19 in 2019, by age and gender – UK



Source – EngineeringUK Engineering Brand Monitor 2019

Question – 'If you wanted to, do you think you could become an engineer?' Percentages presented represent the proportions reporting '3 – yes, probably' or '4 – yes, definitely' on a 4-point Likert scale, with 1 representing 'no, definitely not', and 4 representing 'yes, definitely'. An 'unsure' option was also included.

[11] EngineeringUK. 'Gender disparity in engineering', July 2018

A level[11]. There were no statistically significant differences by age or ethnicity.

Differences in capability of engineering by attendance of STEM careers activities

Reinforcing our other findings relating to the positive effect of STEM outreach, those who had attended a STEM careers event in the past 12 months were much more likely than those who had not to feel they were capable of becoming an engineer if they wanted to (78% compared with 56%).

It was also apparent that knowledge of engineering was positively associated with perceived capability. 84% of students who reported a high degree of knowledge about what engineers do indicated that they could become an engineer if they wanted to, compared with just 55% of those who had not.

Students that knew more about engineering were far more likely to believe they could become an engineer if they wanted to.

Reasons students thought they couldn't become an engineer

To more fully understand the reasons why students thought they could not become an engineer if they wanted to, we gave those that had indicated this the opportunity to elaborate in an open-ended question.

Using a thematic coding approach to analyse responses received, we found that students who felt they could not become an engineer if they wanted to typically cited their lack of ability or knowledge, though a lack of interest in engineering, interest in other subjects, or believing they had not studied the relevant subjects to pursue a career in engineering was also common.

Figure 20 Reasons given for lack of capability of becoming an engineer among young people aged 11 to 19 in 2019 – UK

Coded response	Percentage of respondents
Lack of perceived ability/knowledge	40%
Not interested in engineering	26%
Interested in other careers	10%
Haven't studied the relevant subjects	9%
Boring / Specific negative reason about engineering	6%
Other	3%
Not for me - general	3%
Don't know	2%
Gender reasons	2%

Source – EngineeringUK Engineering Brand Monitor 2019

Q – 'Why do you say that?' Base – all those who answered 'no' to the question 'And if you wanted to, do you think you could become an engineer?' (505). Responses have been coded from free-text answers.

7. Knowledge of next steps to become an engineer

If the engineering talent pipeline is to grow, it is critical that young people understand what is practically required, in terms of educational choices, to do so. Whether young people are aware of how to proceed is key in ensuring the engineering talent pipeline does not lose potential applicants due to making uninformed decisions around the correct steps to take. This chapter outlines whether young people have that knowledge, and whether it is different for those who would consider engineering.

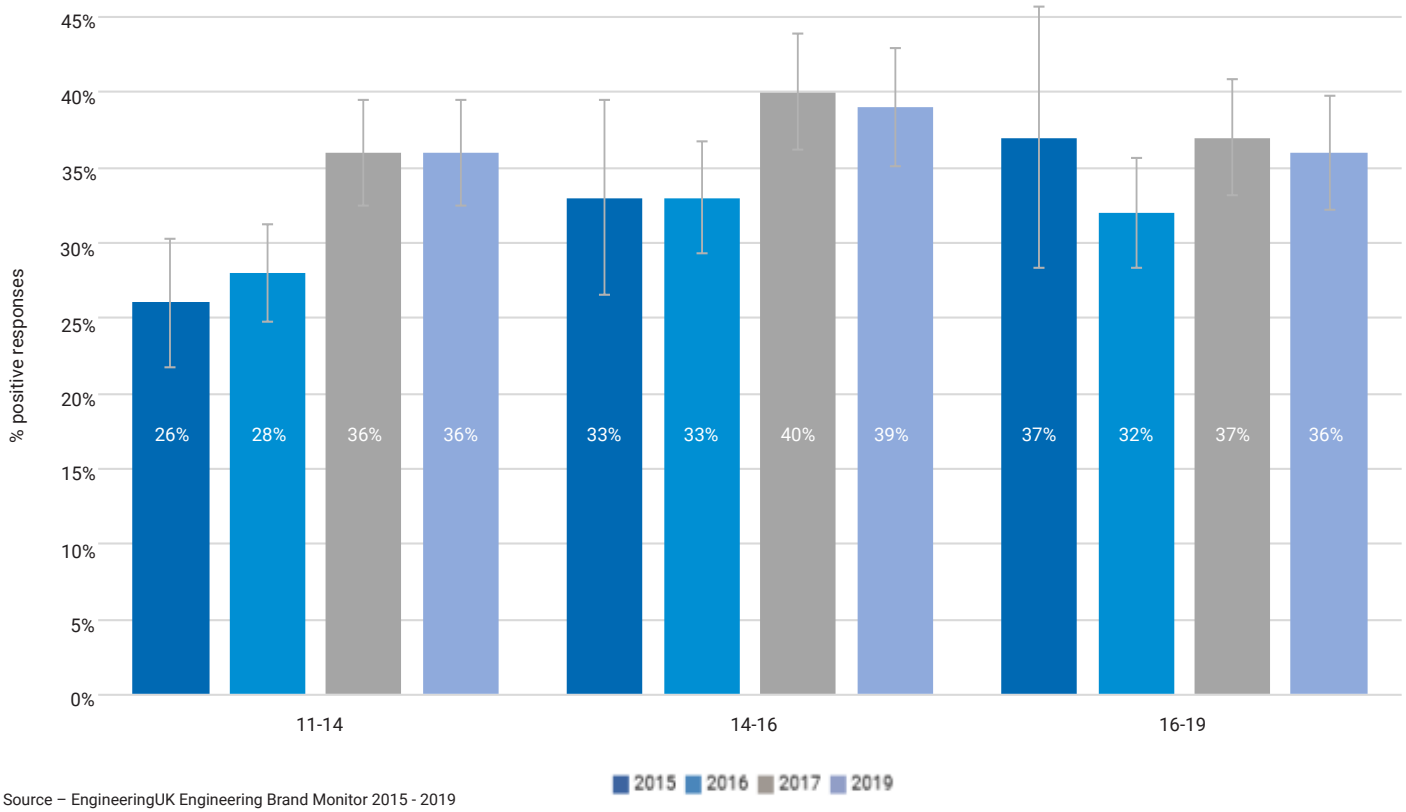
When asked to what extent they agreed with the statement, 'I know what to do next in order to become an engineer', just 37% of 11 to 19 year olds in 2019 agreed or strongly agreed with the statement, with 42% disagreeing or strongly disagreeing. The remainder neither agreed nor disagreed.

As **Figure 21** shows, this proportion has not changed significantly over time for either the 14 to 16 or 16 to 19 age group since 2015. There was, however, a statistically significant increase observed in the proportion of 11 to 14 year olds saying they knew what to do next in order to become an engineer between 2016 and 2017, which has been sustained in 2019.

Comparison with other STEM areas

Students aged 11 to 19 were also asked whether they knew what to do next in order to become a scientist. Contrary to the other benchmark indicators – where knowledge, perceptions and desirability was lower than that of other STEM subjects – the difference between students who knew what to do next to become a scientist and who knew what to do next to become an engineer was not statistically significant.

Figure 21 Knowledge of next steps to become an engineer among young people aged 11 to 19 over time – UK



Source – EngineeringUK Engineering Brand Monitor 2015 - 2019

Q – 'How much do you agree or disagree with the following statement: I know what to do next in order to become an engineer.' Percentages presented represent the proportions reporting '4 – agree a little' or '5 – agree a lot' on a 5-point Likert scale with 1 representing 'disagree a lot' and 5 representing 'agree a lot'.

Differences in knowledge of next steps by age, gender and ethnicity

Responses did not differ significantly across the different age groups, but as with the other benchmark indicators, gender differences were apparent, with 42% of boys aged 11 to 19 saying they knew what to do next to become an engineer, compared with only 31% of girls.

Continuing the trend observed with other benchmarks, the gender gap is smaller for older students; in fact, for this question there was no statistically significant difference between girls and boys aged 16 to 19. However, younger girls were still less likely than boys to know what to do next, showing that there is much room for improvement in educating younger girls about the steps required to become an engineer.

Our results would also suggest that there are differences by ethnicity: 42% of BAME students reported knowing what to do next, in comparison to 35% of white students.

Differences in knowledge of next steps by attendance of STEM careers activities

STEM outreach was positively associated with knowledge of what to do next, with those 11 to 19 year olds who had attended a STEM careers activity in the past 12 months statistically significantly more likely to report knowing what to do next to become an engineer than those who had not (56% compared with 30%).

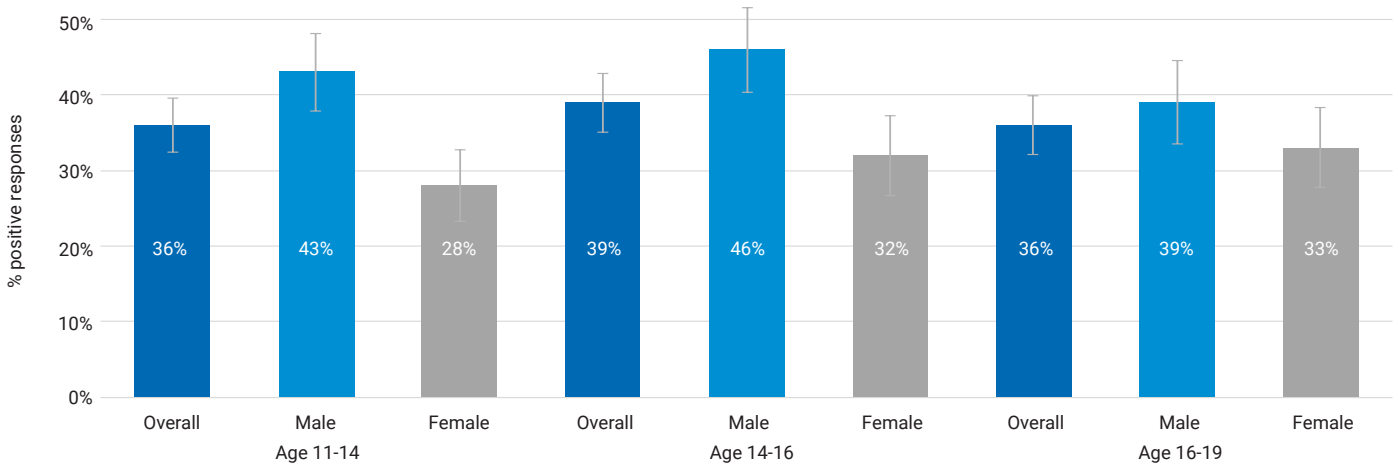
Do young people who are inclined towards an engineering career know what to do next to become one?

Our results suggest vital work is needed to support these prospective engineers in their educational choices.

Of students aged 11 to 19 who reported that they probably or definitely wanted to become an engineer, more than a third disagreed or strongly disagreed with knowing what to do next to become an engineer (35%).

This proportion was even higher amongst those who – in a separate question – indicated they would consider a career in engineering, at 42%.

Figure 22 Knowledge of next steps to become an engineer among young people age 11 to 19 in 2019, by age and gender – UK



Source – EngineeringUK Engineering Brand Monitor 2019

Question – 'How much do you agree or disagree with the following statement: I know what to do next in order to become an engineer?' Percentages presented represent the proportions reporting '4 – agree a little' or '5 – agree a lot' on a 5-point Likert scale with 1 representing 'disagree a lot' and 5 representing 'agree a lot'

8. Teachers and the public

In addition to collecting views from young people, the Engineering Brand Monitor asks STEM secondary school teachers and the general public (including parents) various questions about their knowledge, perceptions and understanding of STEM and engineering. This is because these audiences have a large influence on how young people make their decisions, so it is useful to understand how they view engineering and STEM subjects and their confidence in providing related careers advice.

This chapter will provide a summary of findings on teachers and parents, and in some cases the overall public (of which parents are a part). It should be noted that parents are a subset of the overall public, consisting of around two thirds of the sample.

Key indicators for teachers and the public

Similar to the students surveyed in the Engineering Brand Monitor, teachers and members of the general public were asked how much they know about what people in engineering do; how positively or negatively they view the profession; how desirable they believe a career in it to be; whether they had ever considered a career in engineering themselves; and whether they believe their children or young people are aware of the steps needed to be taken to become an engineer. The questions were framed slightly differently in some cases, with teachers asked questions about their students and the public asked about either their children or young people, depending on their parental status.

Knowledge of engineering

Although the proportions of STEM secondary school teachers and the general public reporting they knew 'quite a lot' or 'a lot' was higher than observed amongst young people, it was nevertheless relatively low, at under a third. Just 30% of STEM secondary school teachers and 27% of parents reported a high level of knowledge on engineering. Among the general public more broadly, it was even lower still (24%).

Perceptions of engineering

Interestingly, given this lack of knowledge, perceptions of engineering were positive amongst the general public (including parents) – and markedly so amongst STEM secondary school teachers. 90% of teachers said they held positive or very positive views about engineering, as did 67% of the general public (and 69% among parents within the general public).

This is an encouraging finding. Given the link between knowledge of engineering and perceptions found with students, there may be scope to increase these positive perceptions even more with an improved knowledge base.

Under a third of both STEM secondary school teachers and parents knew a lot about engineering.

Figure 23 Key benchmark indicators for STEM secondary teachers and the general public in 2019 – UK

		Base	Knowledge of engineering	Perceptions of engineering	Desirability of engineering	Consideration of a career in engineering	Knowledge of next steps to become an engineer
Overall Public	Overall	(1,810)	24%	67%	68%	30%	48%
	Male	(803)	36%	71%	71%	41%	55%
	Female	(1,007)	13%	63%	65%	20%	43%
Parents	Overall	(1,202)	27%	69%	68%	35%	48%
	Male	(586)	41%	75%	71%	45%	55%
	Female	(616)	14%	64%	65%	25%	43%
Non-Parents	Overall	(607)	17%	63%	67%	21%	
	Male	(296)	25%	64%	70%	32%	
	Female	(311)	10%	63%	64%	10%	
Teachers	Overall	(1,023)	30%	90%	80%		54%
	Male	(462)	38%	93%	82%		56%
	Female	(561)	23%	87%	77%		52%

Source – EngineeringUK Engineering Brand Monitor 2019

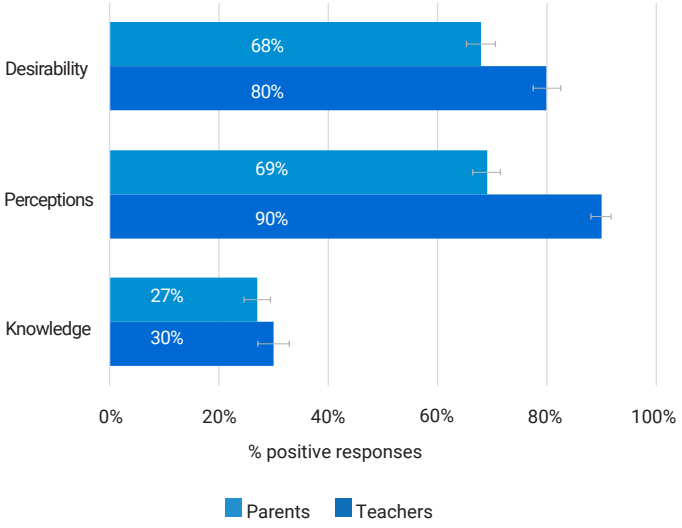
1. Knowledge of engineering: 'How much do you know about what people working in the following areas do? Engineering.' Proportions presented represent the proportions reporting '4 – know quite a lot' or '5 – know a lot' on a 5-point Likert scale, with 1 representing 'know almost nothing' and 5 representing 'know a lot'.
2. Perceptions of engineering: 'How positive or negative is your view on: engineering?' Proportions presented represent the proportions reporting '4 – quite positive' or '5 – very positive' on a 5-point Likert scale, with 1 representing 'very negative' and 5 representing 'very positive'.
3. Desirability of engineering: 'How desirable do you believe a career in engineering to be for your students / children / young people?' Proportions presented represent the proportions reporting '4 – quite desirable' or '5 – very desirable' on a 5-point Likert scale, with 1 representing 'not at all desirable' and 5 representing 'very desirable'.
4. Consideration of a career in engineering: 'Have you ever considered a career in engineering?' Proportions presented represent the proportions reporting 'yes', with the options being 'yes' or 'no'.
5. Knowledge of next steps to become an engineer: 'How much do you agree or disagree with the following statement? My students/children/young people know what to do next in order to become an engineer.' Proportions presented represent proportions reporting '4 – agree a little' or '5 – agree a lot' on a 5-point Likert scale, with 1 representing 'disagree a lot' and 5 representing 'agree a lot'.

Desirability of engineering

STEM secondary school teachers and the public were also asked how desirable they believed a career in engineering to be for their students or children, depending on whether the respondent was a teacher or parent respectively.

Promisingly, a large majority saw it as a desirable career for those that they may influence. 80% of teachers believed a career in engineering to be 'quite' or 'very' desirable for their students and 68% of the public (and the same proportion for parents) believed it to be the case for young people or their children. **Figure 24** below shows the stark contrast between knowledge, and perceptions and desirability of engineering among teachers and parents.

Figure 24 Knowledge, perceptions and desirability of engineering among teachers and parents in 2019 – UK



Source – EngineeringUK Engineering Brand Monitor 2019

Q – 'Which of these characteristics do you think engineers need to do their job well?' Percentages presented represent the proportion of respondents including each characteristic in their answer. Options: practical; well organised; inventive/innovative; numerate; creative; a quick learner; a good communicator; good with people; none of these; don't know.

Consideration of a career in engineering

Although young people are typically the focus of STEM careers outreach activities, it remains of interest to understand whether the public would consider a career in engineering. In the 2019 EBM, members of the public were asked whether they had ever considered a career in engineering, with a yes or no response option. Teachers were not asked this question.

30% of the general public had considered a career in engineering, with 35% of parents saying they had considered one. Whilst it is not possible to ascertain how seriously these respondents had considered engineering as a career or at what point in their lives, the fact that over a third of parents in the sample had done so is encouraging. It may, for example, suggest that they might be inclined to encourage their children to do the same, particularly if given adequate support and guidance to do so.

A large majority of both STEM secondary school teachers and parents said engineering was a desirable career for their students or children.

Knowledge of next steps to become an engineer

To complement students' views on whether they knew what to do next to become an engineer, STEM secondary school teachers and parents were asked to what extent they agreed that their students or children know what to do next in order to become an engineer on a 5-point Likert scale.

Overall, teachers were more likely than parents to agree that their students/children knew what to do next. 54% of teachers agreed or strongly agreed their students knew what to do next to become an engineer, compared with 48% of parents in respect of their own children.

This is higher than the proportion of students aged 11 to 19 that said they knew what to do next to become an engineer, which could indicate that teachers and parents are placing too much confidence in their students or children.

Wider perceptions of engineering among teachers and the public

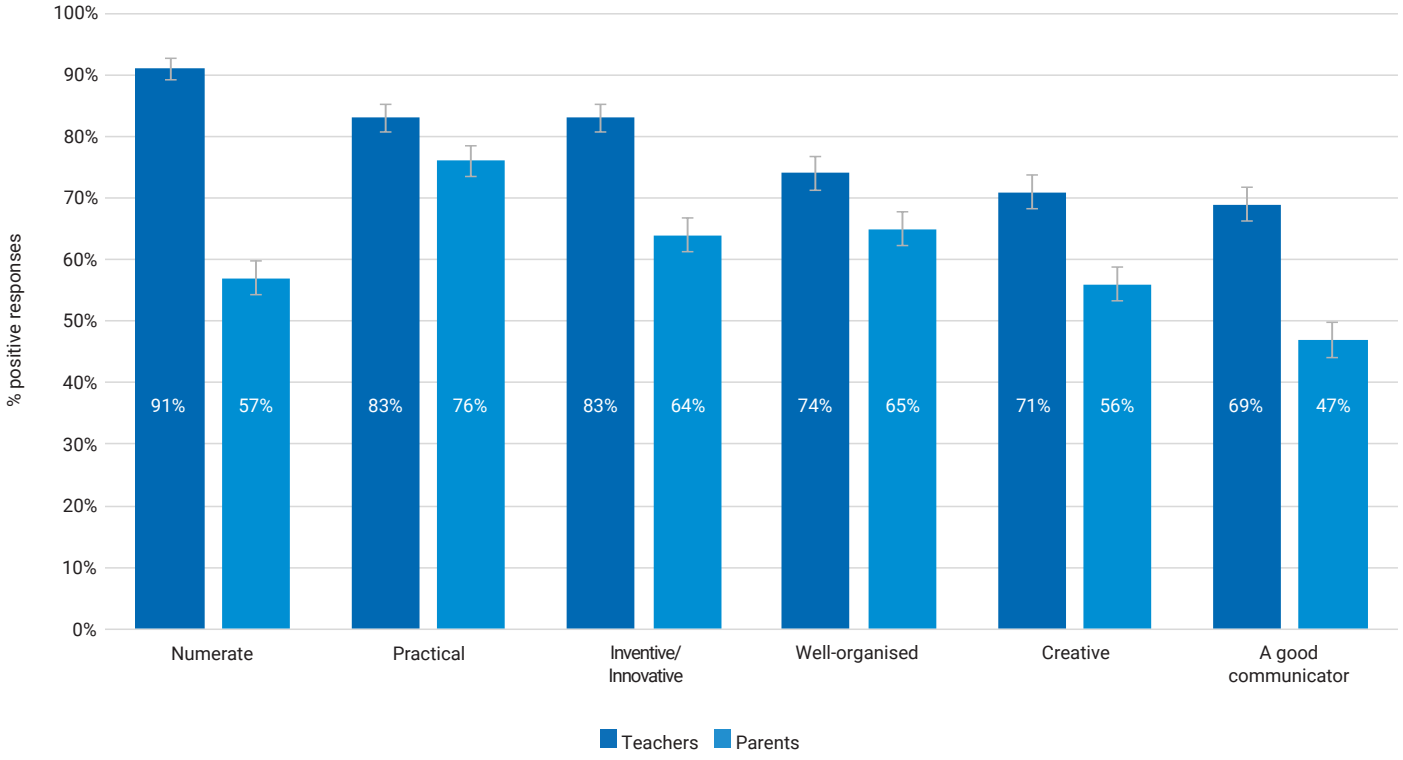
To gain deeper insight into what exactly those that could influence students' career choices believe engineering entails, questions delving deeper into their understanding of the profession were also asked of the general public and STEM secondary school teachers.

Characteristics engineers needed to do their job well

Asked to indicate which characteristics they felt engineers needed to do their job well from a given list (ticking all that applied), a high proportion of both the general public and STEM secondary teachers identified practicality, inventiveness and innovation, being well-organised and creativity.

However, across the board, parents were less likely than STEM secondary teachers to identify characteristics needed for engineers to do their jobs well – particularly numeracy and being a good communicator. This suggests that much more work is needed to educate parents on the range of both hard and soft skills required to be an engineer.

Figure 25 Characteristics that STEM secondary teachers and parents felt that engineers needed to do their job well in 2019 – UK



Source – EngineeringUK Engineering Brand Monitor 2019

1. Knowledge of engineering: 'How much do you know about what people working in the following areas do? Engineering.' Percentages presented represent the proportions reporting '4 – know quite a lot' or '5 – know a lot' on a 5-point Likert scale, with 1 representing 'know almost nothing' and 5 representing 'know quite a lot'.
2. Perceptions of engineering: 'How positive or negative is your view on: engineering?' Percentages presented represent the proportions reporting '4 – quite positive' or '5 – very positive' on a 5-point Likert scale, with 1 representing 'very negative' and 5 representing 'very positive'.
3. Desirability of engineering: 'How desirable do you believe a career in engineering to be for your students / children / young people?' Percentages presented represent the proportions reporting '4 – quite desirable' or '5 – very desirable' on a 5-point Likert scale, with 1 representing 'not at all desirable' and 5 representing 'very desirable'.

Agreement of statements regarding engineering

STEM secondary school teachers and the general public (including parents) were also asked whether they agree with a set of statements regarding engineering and its role in society.

Overwhelmingly, there was agreement that being an engineer was a well-respected profession, and that engineers made a good contribution to society or will have a positive impact on our future, though the proportions that did so were consistently higher amongst teachers than parents (**Figure 26**).

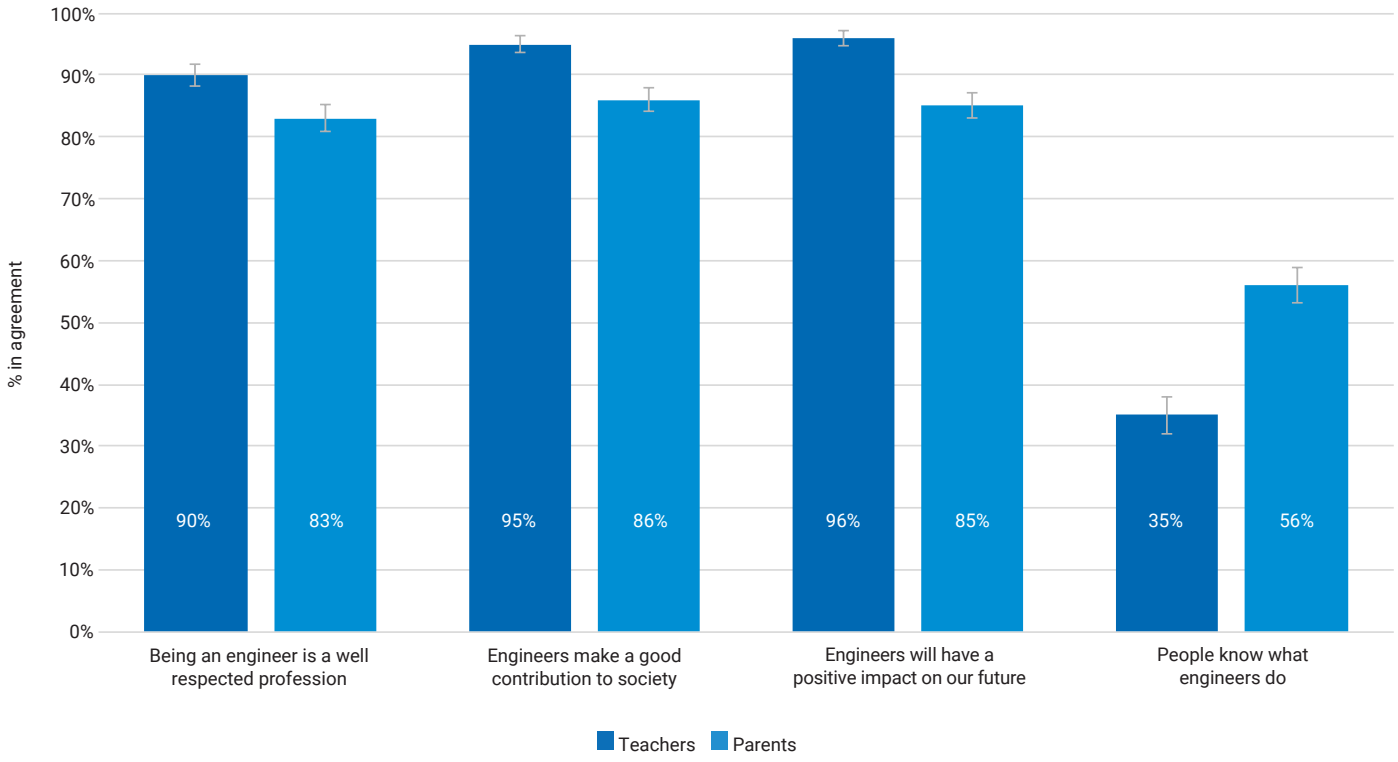
Interestingly, teachers were also less likely than the general public to feel people know what engineers do – suggesting they are aware there is a lack of knowledge and understanding of the profession.

Careers advice

As highlighted in Chapter 5, teachers and parents were seen to be key sources of careers advice by young people. In order to gauge how assured STEM secondary school teachers and parents in fact feel in holding this role, we asked those surveyed how confident they were in providing careers advice on various STEM subjects on a 5-point Likert scale.

It is evident from our results that there is much to do to support teachers and parents alike in providing careers advice on engineering. Less than half of teachers and under a third of parents expressed confidence in giving careers advice on engineering (45% and 32%, respectively – **Figure 27** overleaf) – far lower than the proportions reporting the same for science. This is particularly concerning given that all teachers surveyed teach STEM in secondary school and are therefore likely to be well placed in the eyes of their students to provide engineering careers advice.

Figure 26 Agreement with statements about engineering among STEM secondary teachers and parents in 2019 – UK



Source – EngineeringUK Engineering Brand Monitor 2019

Q – 'How much do you agree or disagree with the following statements about engineering?' Percentages presented represent the proportions reporting '4 – agree a little' or '5 – agree a lot' on a 5-point Likert scale with 1 representing 'disagree a lot' and 5 representing 'agree a lot'.

Recommending a career in engineering

STEM secondary school teachers and members of the general public surveyed were also asked whether they would recommend a career in engineering for their students, children or young people respectively.

Teachers responded overwhelmingly positively, with 96% of all teachers saying they would recommend engineering for their students. Parents were slightly less positive, with 86% of all parents agreeing that they would recommend a career in engineering for their children.

While the proportions that would recommend an engineering career did not differ by gender amongst teachers, it was apparent this was the case amongst parents, with male parents more likely than female parents to recommend a career in engineering to their children (86% of male parents compared to 78% of female parents)

What is more, this was even more pronounced when the gender of the child was also considered.

87% of parents (of both genders) with male children were likely to recommend engineering, compared with 81% of those with female children. This rose to 93% for male parents with only male children, in comparison to only 79% of male parents with only female children.

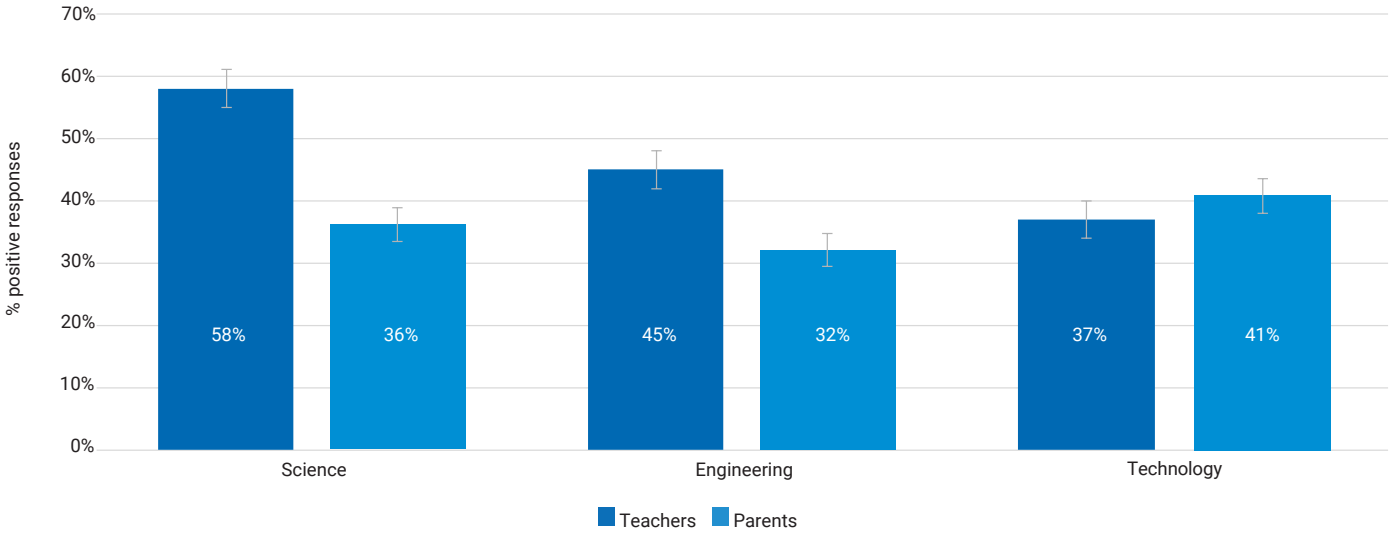
In contrast, only 71% of female parents with female children would recommend a career in engineering. This suggests that gender stereotypes in engineering still hold, and that it will be important to encourage both young people and their parents to see engineering as an appealing career for women.

What industries do the general public believe engineers work in?

Increasingly, engineers play a pivotal role across a range of sectors. In order to gain a sense of whether the public are aware of this broad reach, we asked respondents[12] which industries engineers would be found in.

While a large majority knew that engineers worked in engineering (82%), construction (73%), oil and gas (70%) and manufacturing (68%), fewer respondents were aware of the role engineers play in transport (58%) or research and development (55%), suggesting outreach activities could focus on highlighting the role engineers play in a diverse range of industries. It may be that a larger number of students would be willing to explore engineering avenues if they knew the full scope of options, and parents' views in particular could play a role in student choice.

Figure 27 Confidence in careers advice among STEM secondary teachers and parents in 2019, by different career areas – UK



Source – EngineeringUK Engineering Brand Monitor 2019

Q – 'How confident do you feel giving careers advice in the following areas?' Percentages presented represent the proportions reporting '4 - fairly confident' or '5 - very confident' on a 5-point Likert scale, with 1 representing 'not at all confident' and 5 representing 'very confident'.

[12] Teachers were not asked this question

Engineering Brand Monitor 2019

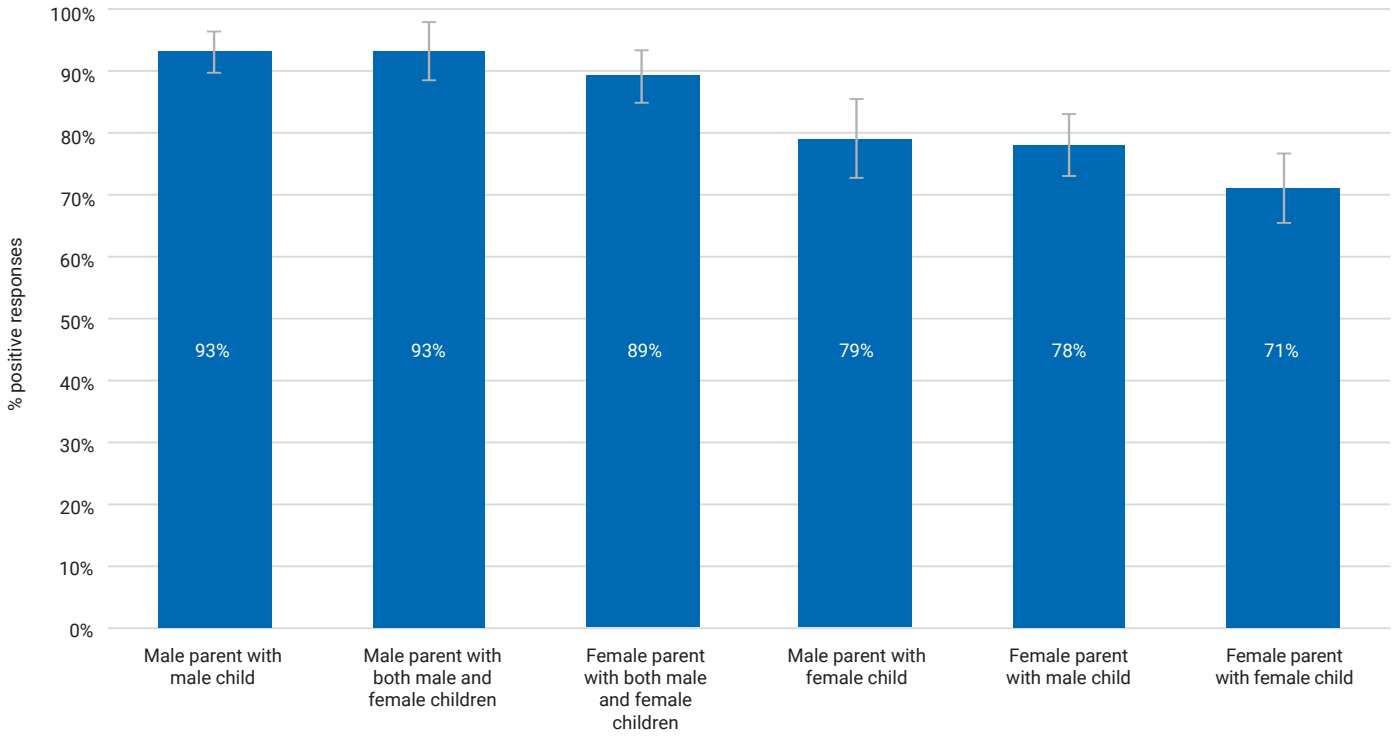
Academic or vocational pathways

In the current economic climate, it is important that the country is sufficiently equipped to meet the demand for engineering skills. This demand can be met by both those with academic qualifications – such as an undergraduate degree – and those with technical qualifications[13].

In recent years, there has been recognition that the skills gap[14] is likely to increase over the next 10 years[15], especially for those with higher levels of qualifications[16]. In response, the UK government has announced a series of changes to the technical education landscape, including the apprenticeship levy[17] and T levels[18]. These changes aim to raise the profile and prestige of technical education and to encourage learners to consider all possible routes into a career.

To gain a sense of how they might perceive the different educational pathways available to their students or children, STEM secondary school teachers and parents were asked whether they would recommend an academic or vocational route into engineering. Overall, 38% of teachers and 34% of parents would recommend an academic route. By contrast, 17% of teachers and 44% of parents would recommend a vocational route. The remainder had no preference.

Figure 28 Recommendations of a career in engineering among parents in 2019, by gender of parent and gender of child – UK



Source – EngineeringUK Engineering Brand Monitor 2019

Q – 'Would you ever recommend that your children consider a career in engineering?' Percentages presented represent the proportions reporting 'yes', with the options being 'yes' and 'no'.

[13] Technical education – sometimes called vocational education – is education that prepares students for work in a specific trade, a craft, as a technician, or in professional vocations such as engineering, accountancy, nursing, medicine, architecture or law. Craft vocations are usually based on manual or practical activities and are traditionally non-academic but related to specific trade or occupation.
[14] DfE, 'Employer Skills Survey 2017', 2018.
[15] UKCES, 'Working Futures 2014 to 2024', 2016.
[16] Working futures projects that there will be a 42% increase in demand for those with a level 4 - 6 qualification. This corresponds to a 'certificate of higher education (L4)', a 'foundation degree (L5)' or a 'bachelor's degree (L6)'.
[17] DfE, 'Apprenticeship funding: how it works', 2019.
[18] DfE, 'Introduction of T levels', 2019.

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Reasons for recommending academic or vocational routes into engineering

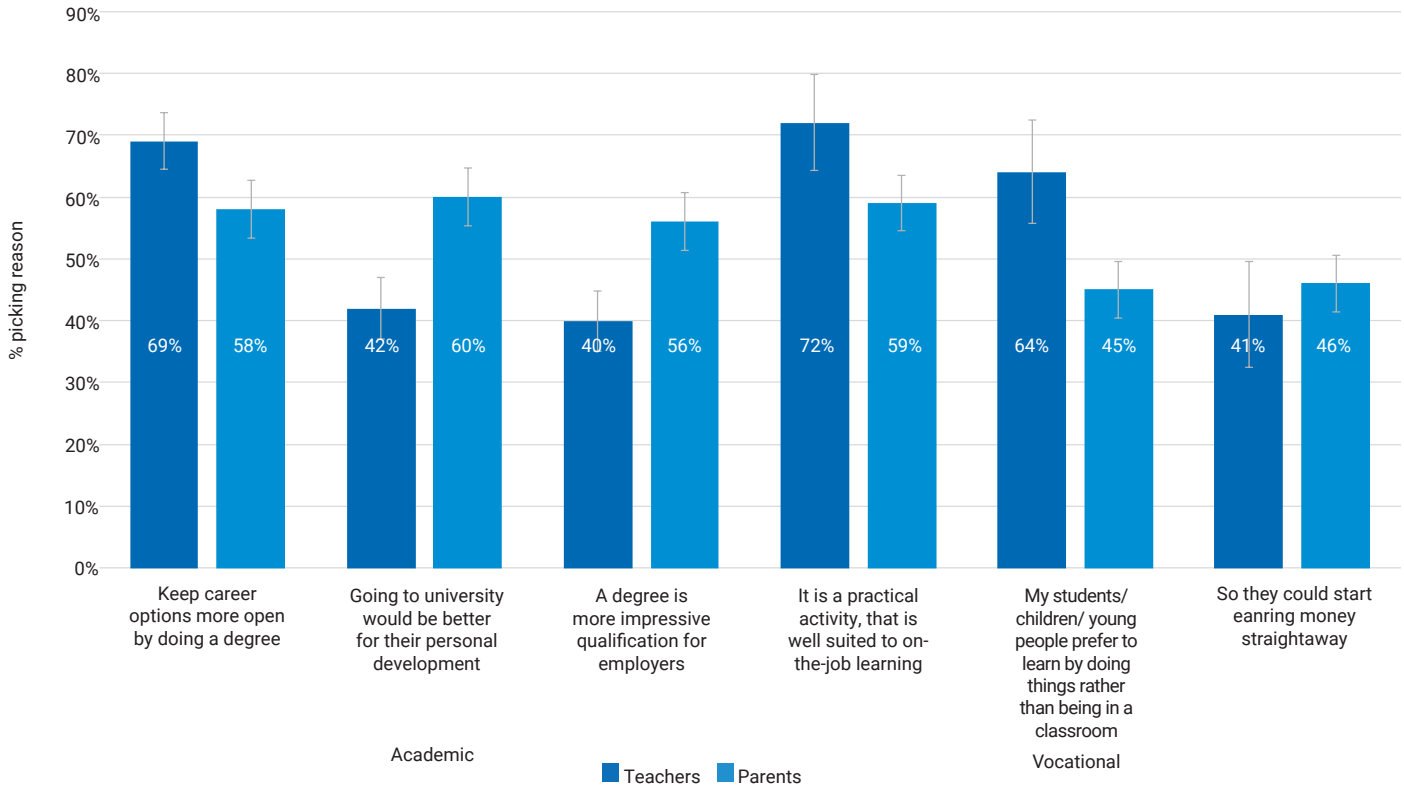
Though it may be understandable that teachers are more familiar with academic routes into engineering and therefore more likely to recommend this over a vocational one, it is perhaps less expected that a higher proportion of parents would recommend a vocational route over an academic route.[19]

In order to understand what reasons might underpin teachers' and parents' preferred or recommended pathway into engineering, both groups were asked to indicate from a given list why that was the case, with the option to tick all that applied.

Of those who would recommend an academic route into engineering, STEM secondary school teachers were more likely than parents to do so as they felt students would be keeping their career options more by doing a degree. In contrast, parents were more likely than teachers to think that university would be better for their child's personal development and that a degree is a more impressive qualification for employers.

For both teachers and parents who would recommend a vocational route over an academic one, the most common reason for doing so was the view that engineering is a practical activity that is well suited to on the job learning. This suggests the key draw for vocational routes is its hands-on nature and direct link to employment – and careers activities geared toward promoting such routes would benefit from emphasising these characteristics.

Figure 29 Reasons given by STEM secondary school teachers and parents in 2019 for recommending either an academic or vocational route into engineering – UK



Source – EngineeringUK Engineering Brand Monitor 2019

Q – 'Why would you recommend a vocational / academic route into engineering?'. Base – academic: all those who would recommend an academic route. Vocational: all those who would recommend a vocational route. Options – Academic: keep career options more open by doing a degree, might need a degree to get promoted / progress, going to university would be better for personal development, a degree is a more impressive qualification for employers, it is a specialist activity that needs degree-level learning, because you need a degree to get a job in engineering, a vocational qualification or apprenticeship is not prestigious. Vocational: It is a practical activity that is well suited to on-the job learning, so they could start earning money straight away, my children/young children prefer to learn by doing things rather than being in a classroom, they would be more likely to get a job, so they can avoid high student fees/debt, my students/ children have never considered going to university, I am not sure my students / children would get into university.

[19] Please note that 97% of the teachers within the EBM sample taught at secondary schools (as opposed to other institutions such as further education colleges), which may have biased the results towards academic learning.

Annex

Summary of benchmark indicator results

Figure 31 (overleaf) shows the overall scores for the key benchmark indicators for the different cohorts within the Engineering Brand Monitor. Where there are no percentages in the table, this indicates that the cohort displayed were not asked the relevant question.

Respondent profile

This section provides basic descriptive statistics on the composition of the sample, including by age, gender and ethnicity for each of the survey groups.

Please note that, with the exception of the educators table, the percentages displayed will not match the percentages that can be calculated from the raw frequencies. This is because the percentages are the target percentages used in the weighting calculations, derived from Office for National Statistics population estimates. More information on the weighting methodology follows below.

Weighting

For the 2019 EBM, Office for National Statistics (ONS) data[20] was used to obtain population estimates, broken down by region, local authority, age and gender. For the student datasets, the weighting was calculated based on region, age and gender, whereas for the public, the weighting included all of the prior characteristics, as well as social grade.

The weighting is calculated as follows:

1. From the national population data, we work out what proportion of the population falls into each subgroup for a characteristic – this is the profile we are aiming for when weighting is applied.
2. We calculate *counts* for the unweighted data based on the different characteristics. As an illustrative example, the ONS data states that for students aged 7 to 11, those based in Wales comprise of 4.55% of the total population. Within the survey population, we are therefore aiming for 4.55% of respondents in this age category to be Welsh, which equates to 602 x 4.55% = 27.28 individuals.
3. The figures are fed into a bespoke computer software, and a weighting technique called Random Iterative Method (RIM) weighting[21] is applied. The software uses the RIM weighting function to calculate the appropriate weights for each record so the target profile will be achieved when weighting is applied – this technique is used when multiple characteristics (i.e. region, gender, …) in a dataset need adjusting at the same time.

KS2 Students (7 to 11 year olds)

Figure 30 provides information about the 7 to 11 year old sample by gender and ethnicity. The 'total in sample' is the total number of respondents in the sample, whereas the proportions given are those obtained after adjusting for the national proportions.

Figure 30 Sample proportions and frequencies for 7 to 11 year olds in the 2019 EBM

Students aged 7 to 11	Frequency (Unweighted)	Proportion (Weighted)
Total in sample	602	
By gender		
Male	308	51%
Female	294	49%
By ethnicity		
Asian or Asian British	59	9%
Black or Black British	38	6%
Mixed	45	7%
White	438	75%
Other ethnic groups	8	1%
Don't know	2	0%
Prefer not to say	12	2%

[20] ONS, 'Mid-year population estimates, 2017', June 2018
[21] RIM weighting is a commonly used technique for attaining a representative sample within market research panels. For a more detailed discussion of the technique along with strengths and weaknesses, see, for example, this discussion from 'Research and Marketing Strategies results' - https://rmsresults.com/2014/06/24/what-is-rim-weighting/

Figure 31 Overview of benchmark indicators in the EBM for young people, teachers and the public in 2019 - UK

		Base	Knowledge of engineering	Perceptions of engineering	Desirability of engineering	Consideration of a career in engineering	Knowledge of next steps to become an engineer
Students age 7-11	Overall	(602)		50%	59%		
	Male	(308)		59%	70%		
	Female	(294)		41%	49%		
Students age 11-14	Overall	(719)	24%	51%	39%	55%	36%
	Male	(372)	29%	62%	48%	68%	43%
	Female	(347)	18%	38%	29%	40%	28%
Students age 14-16	Overall	(460)	25%	47%	43%	50%	39%
	Male	(236)	31%	56%	51%	64%	46%
	Female	(224)	20%	38%	34%	36%	32%
Students age 16-19	Overall	(735)	24%	51%	42%	45%	36%
	Male	(373)	31%	59%	49%	55%	39%
	Female	(362)	16%	42%	34%	33%	33%
Overall Public	Overall	(1,810)	24%	67%	68%	30%	48%
	Male	(803)	36%	71%	71%	41%	55%
	Female	(1,007)	13%	63%	65%	20%	43%
Parents	Overall	(1,202)	27%	69%	68%	35%	48%
	Male	(586)	41%	75%	71%	45%	55%
	Female	(616)	14%	64%	65%	25%	43%
Non-Parents	Overall	(607)	17%	63%	67%	21%	
	Male	(296)	25%	64%	70%	32%	
	Female	(311)	10%	63%	64%	10%	
Teachers	Overall	(1,023)	30%	90%	80%		54%
	Male	(462)	38%	93%	82%		56%
	Female	(561)	23%	87%	77%		52%

Source – EngineeringUK Engineering Brand Monitor 2019

Question list

1. Knowledge of engineering: 'How much do you know about what people working in engineering do?' Proportions presented represent the proportions reporting '4 – know quite a lot' or '5 – know a lot' on a 5-point Likert scale, with 1 representing 'know almost nothing' and 5 representing 'know a lot'.
2. Perceptions of engineering: 'How positive or negative is your view on engineering?' Proportions presented represent the proportion of respondents that answered '4 – Quite positive' or '5 – Very positive' on a 5-point Likert scale, with 1 representing 'very negative' and 5 representing 'very positive'.
3. Desirability of engineering: Students aged 7 to 11: 'How much would you like to be an engineer when you are older?' Percentages presented represent the proportion of respondents that answered '3 – a little' or '4 – very much' on a 4-point Likert scale, with 1 representing 'not at all' and 4 representing 'very much'. Students aged 11 to 19: 'How desirable do you believe a career in engineering to be?' Proportions presented represent the proportions reporting '4 – quite desirable' or '5 – very desirable' on a 5-point Likert scale, with 1 representing 'not at all desirable' and 5 representing 'very desirable'. Teachers/parents/public: 'How desirable do you believe a career in engineering to be for your students/children/young people?' Proportions presented represent the proportion of respondents that answered '4 – quite desirable' or '5 – very desirable' on a 5-point Likert scale, with 1 representing 'not at all desirable' and 5 representing 'very desirable'.
4. Consideration of a career in engineering: Students aged 11 to 19: 'Do you think you would ever consider a career in engineering?' Proportions presented represent the proportions reporting 'yes', with the options being 'yes' or 'no'. Public: 'Have you ever considered a career in engineering?' Proportions presented represent the proportions reporting 'yes', with the options being 'yes' or 'no'.
5. Knowledge of next steps to become an engineer: Students aged 11 to 19: 'How much do you agree or disagree with the following statement: I know what to do next to become an engineer?' Proportions presented represent the proportions reporting '4 – agree a little' or '5 – agree a lot' on a 5-point Likert scale Teachers/parents/public: 'How much do you agree or disagree with the following statement: 'My students/children/young people know what to do next in order to become an engineer'?' Proportions presented represent those that answered '4 – agree a little' or '5 – agree a lot' on a 5-point Likert scale, with 1 representing 'Disagree a lot' and 5 representing 'Agree a lot'.

KS3 Students (11 to 19 Year olds)

Figure 32 breaks down the 11 to 19 year old sample by age, gender and ethnicity. As above, the total frequency figure is the number of respondents in the sample, whereas the proportions are the weighted proportions. The proportions are aligned to the proportions of the overall population of 11 to 19 year olds in the UK.

Figure 32 Sample proportions and frequencies for 11 to 19 year olds in the 2019 EBM

Students aged 11 to 19	Frequency (Unweighted)	Proportion (Weighted)
Total in sample	1,912	
By gender		
Male	981	51%
Female	931	49%
By age		
11-14	704	38%
14-16	606	24%
16-19	602	38%
By ethnicity		
Asian or Asian British	201	10%
Black or Black British	106	5%
Mixed	129	6%
White	1,400	75%
Other ethnic groups	32	2%
Don't know	8	0%
Prefer not to say	36	2%

Educators – STEM secondary school teachers

As detailed in the methodology section, the data for teachers was not weighted. For this reason, the proportions shown are the same as the proportions of teachers found in the sample, unlike the weighted proportions displayed for the other survey strands.

Figure 33 Sample proportions and frequencies for educators in the 2019 EBM

Educators	Frequency (Unweighted)	Proportion (Unweighted)
Total in sample	1,023	
By gender		
Male	462	45%
Female	561	55%
By age		
20-34	224	22%
35-44	318	31%
45-54	332	32%
55+	149	15%
By ethnicity		
Asian or Asian British	59	6%
Black or Black British	23	2%
Mixed	18	2%
White	883	86%
Other ethnic groups	9	1%
Prefer not to say	31	3%

Public – Overall

In this section we will show weighted percentages and frequencies for the overall public, including both parents and non-parents. The data has been weighted as described in the methodology section and does not include separate weights for parents and non-parents.

Figure 34 Sample proportions and frequencies for the general public in the 2019 EBM

Public (Overall)	Frequency (Unweighted)	Proportion (Weighted)
Total in sample	1810	
By gender		
Male	803	49%
Female	1,007	51%
By age		
20-24	63	8%
25-34	317	18%
35-44	607	17%
45-54	493	18%
55-64	243	15%
65+	87	24%
By ethnicity		
Asian or Asian British	79	5%
Black or Black British	31	2%
Mixed	38	2%
White	1615	87%
Other ethnic groups	22	1%
Don't know	5	0%
Prefer not to say	20	1%
By whether have children		
Parents	1203	66%
Non-Parents	607	34%

Public - Parents

This section displays frequencies and weighted proportions for parents in the EBM. Parents are classified as such if they have children between the ages of 7 and 19, and are a subset of the overall public, found in the table above. Within the parent sample, those aged 65 and over are likely to be overrepresented due to using the age profile of the national population, rather than just parents. Because over 65 year olds make up 24% of the national population, this is the 'target' population for parents, which is highly unlikely to be the actual proportion of parents aged over 65. The data has been used in this way as it was not possible to obtain detailed information on ages of parents in the UK.

Figure 35 Sample proportions and frequencies for parents in the 2019 EBM

Public (Parents)	Frequency (Unweighted)	Proportions (Weighted)
Total in sample	1,203	
By gender		
Male	586	49%
Female	617	51%
By age		
20-24	13	8%
25-34	204	18%
35-44	512	17%
45-54	366	18%
55-64	97	15%
65+	11	24%
By ethnicity		
Asian or Asian British	58	7%
Black or Black British	20	3%
Mixed	29	3%
White	1,067	86%
Other ethnic groups	15	2%
Don't know	1	0%
Prefer not to say	13	1%

Previous years – KS2 students

Because we have included time series data within the body of the main report, it is useful to observe the frequencies of respondents included in the previous years data. Figure 36 below displays the number of surveys taken for 7 to 11 year olds – the numbers in 2015 were far lower than following years.

Previous years – KS3 students

Similar to the number of respondents in the 7 to 11 category, the figures here (Figure 37) show the number of questionnaires completed for 11 to 19 year old students between 2015 and 2019. The large confidence intervals displayed throughout the report for sample proportions in 2015 reflect the lower sample sizes achieved during this year.

Figure 36 Sample proportions and frequencies for KS2 students in the EBM over time

Students aged 7 to 11	Frequency (Unweighted)				Proportion (Weighted)			
Year	2015	2016	2017	2019	2015	2016	2017	2019
Total in sample	400	615	613	602				
Male	194	314	314	308	49%	51%	51%	51%
Female	206	301	299	294	51%	49%	49%	49%

Figure 37 Sample proportions and frequencies for KS3,4,5 students in the EBM over time

Students aged 11 to 19	Frequency (Unweighted)				Proportion (Weighted)			
Year	2015	2016	2017	2019	2015	2016	2017	2019
Total in sample	728	1,942	1,947	1,912				
11-14	408	719	715	704	56%	35%	36%	38%
14-16	200	602	618	606	28%	25%	25%	24%
16-19	120	621	614	602	17%	39%	39%	38%
Male	386	985	998	981	54%	51%	51%	51%
Female	334	957	949	931	46%	49%	49%	49%

STEM careers activities

Students aged 11 to 19 were asked the question 'have you taken part in a STEM careers activity in the past 12 months, and given the options of 'no', or 'yes', with a list of prompts. A small proportion of students had attended more than one activity.

The full list of options is displayed below, along with the proportion of 11 to 19 year olds that had attended each activity in the past 12 months.

Figure 36 Attendance of STEM careers activities in the past 12 months among 11 to 19 year olds in 2019 – UK

STEM careers activity	Proportion of students that had attended
Big Bang UK Fair	7%
Big Bang Near Me	9%
Tomorrow's Engineers	5%
Year of Engineering	4%
Visit from industry	1%
Careers day/fair/event	*%
STEM related fair/festival	1%
Work experience	*%
Visit to industry	1%
Higher education hosted/ produced activity	1%
Museum hosted activity/ activity centre	1%
STEM activity	2%
Space camp/centre	*%
Science club/competition	*%
Maths challenge	*%
Maths fair/event	*%
Engineering club/competition	1%
Other	1%

Source – EngineeringUK Engineering Brand Monitor 2019

Q – 'Have you taken part in a STEM careers activity in the past 12 months?' Percentages presented represent the proportion selecting each activity from a list of possible activities.

Where the percentage is represented with an asterisk, the percentage of students selecting the option rounded to 0%.

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.

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.

Driven by data

We base everything we do on evidence and we share our analysis and insight widely. Our flagship publication Engineering UK: The State of Engineering, published for the 20th time in 2018, is 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. Its findings are used widely by the media, policy makers and employers alike. The Engineering Brand Monitor establishes the national benchmark for public perceptions of engineers 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.


EngineeringUK