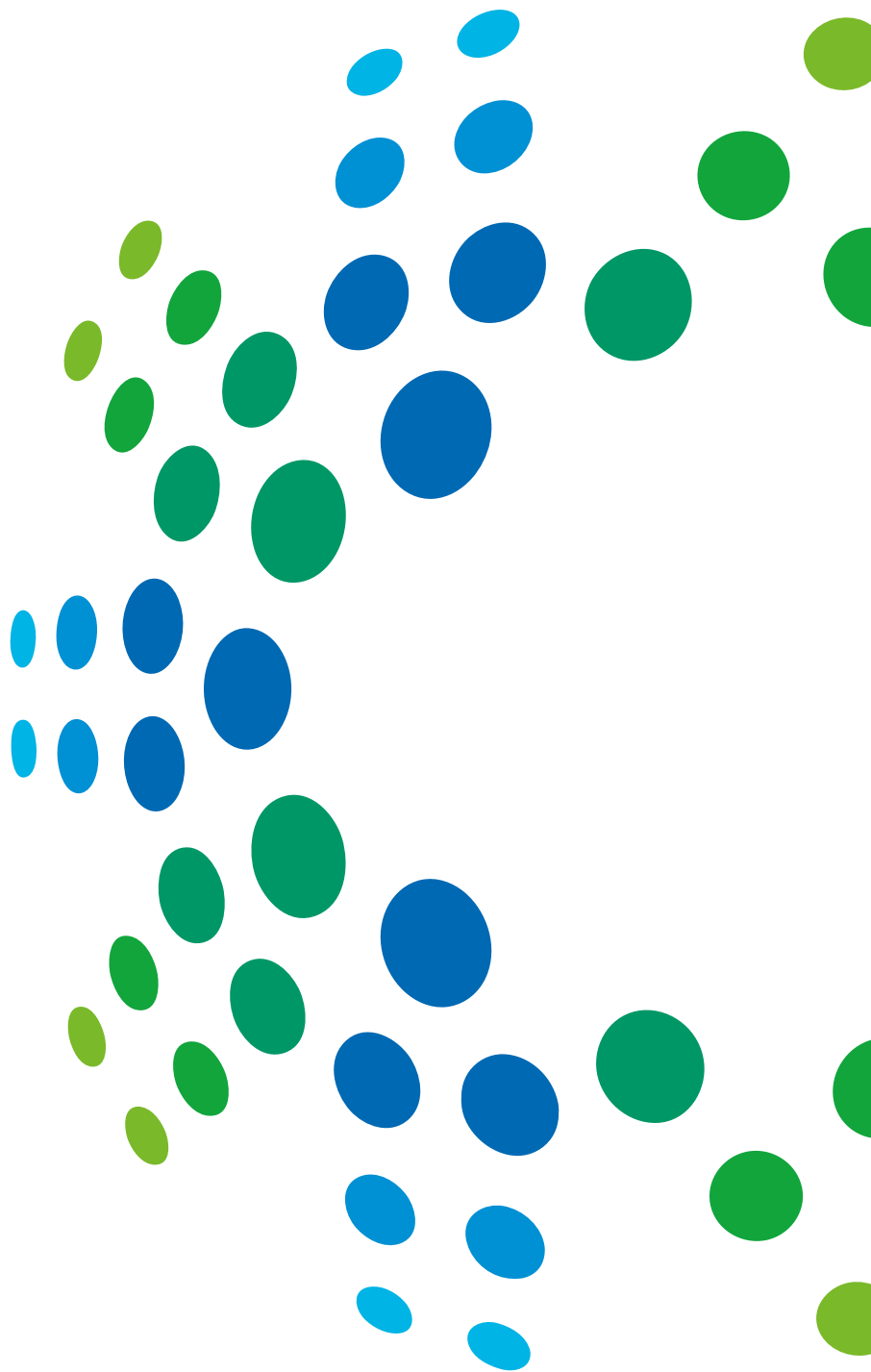


EngineeringUK

Engineering Brand Monitor

STEM secondary school teachers



Engineering Brand Monitor - STEM secondary school teachers

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Foreword

Teachers can be hugely influential in the lives of their students, not only in helping them to succeed academically but also in exposing them to ideas they might not otherwise encounter and encouraging and guiding them to a bright future. We know from our research with young people that teachers are often their go-to source for advice on education and career choices – and that such advice has only grown more important with the disruptions and uncertainties brought on by the Covid-19 pandemic.

It is in this context that we publish our first-ever Engineering Brand Monitor report focused specifically on STEM secondary school teachers. It examines their knowledge and understanding of engineering and the extent to which they feel able and are motivated to provide related careers guidance and activities to their students. The UK has an ongoing shortage of engineers, and this is only likely to become more acute as the government invests in infrastructure, innovation and to achieve net zero. It is therefore essential to understand how we can better support teachers to ensure all young people, whatever their background, are encouraged to consider a future in STEM and engineering.

Promisingly, we found that teachers are, in general, a well-informed and motivated group of key influencers. Of the more than 500 STEM secondary teachers responding to our survey across the UK, over 4 in 5 felt that they understand what engineers can do in their jobs and know what qualifications young people would need to become an engineer. The majority of teachers surveyed also saw careers information, advice and guidance (IAG) as a key part of their role.

That said, it is clear that while there is often a will to deliver STEM and engineering careers provision to students, it can be a struggle to find a way, particularly in schools that are already experiencing challenges. Around half of the teachers who responded to our survey were not actively embedding careers information into their STEM lessons, signposting students to their careers advisors, or engaging with the school's careers leader themselves. Just 15% had organised a careers event with STEM employers in the 2020/21 academic year – and engagement was markedly lower among teachers teaching in schools with higher-than-average numbers of students eligible for free school meals.

These findings must, of course, be read in the context of the Covid-19 pandemic – and we hope that some of the challenges we have identified reflect what was an undoubtedly a tumultuous and anomalous year. However, we know many of the barriers teachers reported in providing careers provision are longstanding and, given the additional pressures schools now face to 'catch students up', are likely to be exacerbated if no concerted action is taken to address them. Our research underlines the urgency to increase funding for STEM engagement activities. Also apparent is the need to support teachers in making sense of the careers outreach activities and resources available to them and their students. We are playing our own part in this, through Neon, a digital platform we launched in 2020 at neonfutures.org.uk, to help teachers identify engineering enrichment activities and careers resources. We also support funders and providers of engineering outreach to make sure these activities are as impactful as possible through our work on The Tomorrow's Engineers

Code, a commitment co-created by and for the engineering community to raise the quality, inclusivity and reach of activities designed to inspire young people.

With such a fast-evolving profession as engineering and the variety of routes to becoming an engineer, it is also critical that we help teachers keep their knowledge current. Although teachers generally expressed confidence in their knowledge of engineering, it was evident that some held outdated perceptions of the profession. Some also held academic routes into engineering in higher esteem than vocational pathways, a preference that could potentially constrain the opportunities their students are encouraged to consider. With the introduction of T Levels and renewed investment in apprenticeships, we need to ensure teachers are fully informed of the nature and breadth of engineering careers and educational pathways into them – and that they are supported to pass on this knowledge to their students.

In the wake of the pandemic, this government is rightly seeking to ‘build back better’ – but ambitions to ‘level up’ the country, make the UK a science superpower, and achieve net zero by 2050 will only be realised if we actively inspire today’s young people to become tomorrow’s engineers. We work with deeply passionate STEM teachers who want to guide students’ educational and career choices, but now more than ever they need support to do so. We need intensified efforts to support teachers to better understand engineering careers and to promote a more accurate picture of the profession to their students, further training for teachers to ensure their knowledge remains current, additional funding for secondary schools to

run STEM activities, dedicated STEM leaders within careers hubs, and to embed engineering careers provision into the curriculum.

We hope that the insights from this report drive government, industry and all supporters of engineering into action to better support schools and teachers to deliver quality STEM careers provision and to inspire employers to engage with STEM outreach – and in doing so, to ultimately grow the talented and diverse engineering workforce essential to our future.

Dr Hilary Leever
**Chief Executive
EngineeringUK**



Executive Summary

EngineeringUK has run the Engineering Brand Monitor (EBM) survey annually since 2010, asking young people aged 7 to 19, parents and STEM secondary school teachers about their perceptions, understanding, and knowledge of STEM and engineering. Using the capability, opportunity and motivation - behaviour (COM-B) model¹ as a framework, this report focuses on the responses we received from teachers, exploring aspects such as their roles and responsibilities and whether they feel able and have the knowledge to support their students. We examine whether teachers have the knowledge to support their students into engineering, whether they feel able (that is, they have the opportunities) to provide that support, and indeed, whether they are motivated to do so. We hope to shed light on how teachers as key influencers can be better supported and, in turn, support young people from all backgrounds to have the capability, opportunity and motivation to pursue an engineering career.

STEM secondary school teachers were invited to participate in the survey between 16 March and 23 April 2021. We received a total of 528 completed surveys.

Capability

Teachers, as key educators and one of the major influencers of young people, need to have the knowledge, confidence and experience to provide quality STEM education to their students and give them a good understanding of engineering careers and how to get into them.

Encouragingly, we found that **knowledge of engineering and confidence in giving careers advice was generally high** among the teachers surveyed. For example:

- 81% agreed or strongly agreed that they know about the different types of things that engineers can do in their jobs
- 84% agreed that they knew what qualifications students would need to become an engineer
- More than half associated engineering with good opportunities (75%) and as a well-paid (66%), respected (62%), varied (61%), rewarding (60%) and exciting (51%) profession
- 72% agreed or strongly agreed that they were confident in giving careers advice related to engineering

However, some teachers surveyed knew more about the different types of things engineers can do than others, and this appeared linked to both personal characteristics and the schools in which they teach.

- 86% of male teachers agreed that they know about the different types of things that engineers can do in their jobs compared with 77% of female teachers
- 83% of white teachers agreed compared with 72% of those from minority ethnic groups
- 90% of teachers in schools with low levels of young people eligible for free school meals (FSM) compared with 73% of those teaching in schools with high FSM

It was also clear **work is needed to improve teachers' perceptions of engineering** as a career choice, with just under a third (31%) viewing it as a secure profession and 28% seeing engineering roles as complicated or difficult.

Opportunity

Of course, it is not enough that teachers feel knowledgeable about engineering and confident in giving related careers advice to their students. They must be able to apply this. In other words, teachers must have, and utilise, the opportunity to help their students make

¹ As part of the EngineeringUK Impact framework for engineering outreach (see Tomorrow's Engineers website) the COM-B model explores the need for young people to have the capability, opportunity and motivation in order to change their behaviours. Further details on the framework can be found in the introduction of this report.

sense of their own possible educational and career opportunities.

In order to understand the extent to which teachers have the opportunity to give their students STEM careers experiences and knowledge, we asked teachers questions about whether they feel able to link STEM careers information with their curriculum, organise STEM outreach activities for their students and share information, advice, and guidance (IAG) about the variety of engineering careers and educational pathways into engineering with them. We also asked when they might recommend a vocational route into engineering over an academic one and vice versa.

Encouragingly, **the majority of teachers surveyed said that their school supports students to develop the skills they would need to pursue engineering if they wanted to**, saw careers IAG as a key part of their role, and felt they had the opportunity within the curriculum to link information about careers into their lessons.

- Around three quarters of teachers (73%) agreed that their school supports students to develop the skills they would need to pursue engineering if they wanted to
- 85% of teachers agreed that it was part of their role to help students understand what STEM careers they could pursue and just 6% agreed that careers outreach was not relevant for them and their students
- 59% of teachers agreed that they do have the opportunity within the curriculum to link information about careers into their lessons, with 17% disagreeing and the remainder neither agreeing nor disagreeing

While many teachers are aware of their role in communicating careers IAG and have the opportunity to link this into their lessons, they are less likely to know the appropriate tools, resources, and activities to do so.

- Just 29% agreed or strongly agreed they know what engineering careers outreach was available to them and their students and 43% disagreed or strongly disagreed
- Only 1 in 5 teachers surveyed had organised a careers event with employers and just 15% with STEM employers in 2021. It is recognised external factors such as the Covid-19 pandemic were likely to have impacted these figures

In addition, our findings suggest **there is some work to be done to improve the careers information and advice teachers are providing** – in particular, working to establish a parity in the esteem in which they hold vocational and academic routes into engineering.

- Only 6% of teachers surveyed recommend students take an academic route into engineering over a vocational one because they felt that a degree was necessary
- More than a quarter nevertheless felt that a degree is a more impressive qualification to potential employers than a vocational one

Motivation

It is important that teachers are motivated to provide high quality STEM education that fosters hard and soft skills, and to encourage their students to explore engineering as an inclusive and desirable career. We asked teachers about their experiences of STEM activities within their school to explore ways in which young people are exposed to – and consequently potentially motivated to explore further – the practical applications of STEM in the real world.

Our findings indicate that **a large proportion of teachers are not currently embedding careers information into their STEM lessons** or able to carry out STEM activities on a regular basis.

- Around half of teachers actively embed careers information into their STEM lessons, signpost students to the school's own careers

advisors for STEM careers information and themselves engage with their school's careers leader. This also indicates that around half of teachers are not doing this

- When asked how frequently STEM activities were run at their schools, 37% of teachers said they did so at least once a week
- There were significant differences between schools, with proportions of teachers carrying out STEM activities at least once a week ranging from 29% of teachers in schools with high rates of free school meals (FSM) to 49% of those in schools with low rates

Limitations in carrying out STEM activities have been attributed to difficulties in funding within the school environment.

- Overall, 48% of teachers agreed that a lack of funding had negatively affected their ability to run STEM activities within their school
- There are significant differences by level of FSM eligibility within schools, as you might expect. However, perhaps unexpectedly, the highest agreement that funding is an issue comes from schools with medium levels of FSM eligibility

Teachers need more support to motivate and enable them to improve the STEM experience for students in school. Some of the most popular responses for options that would enable them to bring STEM subjects to life in schools were:

- externally run STEM engagement events to help support the school curriculum (69% agreed)
- additional support and/or funding (66% agreed)
- more training for teachers (62% agreed)
- more externally run competitions and/or challenges such as EngineeringUK's Big Bang Competition (55% agreed)

Covid-19

We understand that the last year has been difficult in schools due to the Covid-19 pandemic and the various restriction measures in place, such as lockdowns, year-group bubbles and self-isolation. We asked STEM secondary schools about the factors that negatively affect their ability to run STEM activities either virtually or in school:

- 68% of teachers agreed that a lack of teacher time and Covid-19 restrictions have negatively impacted their ability to run activities
- 53% agreed that they had been negatively affected by additional pressures during the pandemic
- 19% reported that a lack of knowledge and 18% a lack of appropriate space and equipment was negatively affecting them

Diversity and inclusion

Engineering employers need a diverse workforce including more women, people with disabilities or people from socially disadvantaged or ethnic minority backgrounds to bring a range of perspectives as well as the sheer numbers to meet our future engineering needs. With teachers having a major influence over their students, teachers' opinions on who will make up the future engineering workforce and perceived barriers to joining it can affect how they advise and influence their students.

It was clear from our results that the majority of teachers understood the underrepresentation of women and people from some minority ethnic groups or socially disadvantaged backgrounds in engineering to be the result of societal barriers as opposed to natural differences.

- More than half of teachers surveyed (55%) agreed that women face more obstacles that make it harder for them to get into engineering

than men, with just 10% of teachers agreeing that there are natural differences between men and women that make men better suited to a career in engineering

- Similarly, only 4% of teachers agreed that people from some minority ethnic backgrounds are less suited to a career in engineering, with 44% agreeing that more barriers are faced by people from some minority ethnic backgrounds in joining the engineering workforce compared to those from white backgrounds
- Teachers also showed awareness of the barriers faced by people from socially disadvantaged backgrounds, with 70% agreeing that they face more barriers in joining the engineering workforce, and just 5% agreeing that they were less suited to the profession

Recommendations

Throughout this report, the analyses aim to explore areas for improvement within the STEM education system, and recommendations for the engineering sector and policymakers.

Our findings confirm insights from previous research undertaken by EngineeringUK and partners, particularly around the issue of funding for careers provision and the need for ongoing and better training and support for teachers. It is for this reason that the recommendations in this report largely build on recommendations made in the recent EngineeringUK report on careers provision.²

Targeted communications for teachers

The engineering community, together with engineering employers, should intensify its efforts to support teachers to better understand the vast variety of roles and routes into engineering careers and to promote a more accurate picture of the profession to their students.

The focus should be on promoting engineering roles as secure, varied, and relevant to areas considered important to young people (for example, environmental sustainability), and supporting teachers to provide this to their students alongside practical knowledge on the various routes into engineering careers. By improving awareness amongst teachers through providing better tools and resources, increasing their knowledge and confidence, and guiding their ability to advise on engineering careers, more young people may be motivated to explore engineering as a future career choice. Further thought should be given to the role of platforms such as Neon to support this activity.

Further teacher training

Teacher training and continuous professional development should include information and training on STEM careers, including careers in modern engineering.

62% of teachers agreed that teachers need more training to bring STEM to life in the classroom. High proportions of teachers agreed that engineering was a well-paid profession (66%) with good opportunities (75%). However, there is more work to be done to change the image of engineering as a career. Just under a third (31%) viewed it as a secure profession and 28% viewed engineering roles as complicated or difficult, which may affect the advice they give to their students.

Dedicated STEM leaders within careers hubs

We recommend that there is a dedicated STEM leader/co-ordinator within each careers hub.³

Given that Covid-19 has not only made the school environment more difficult but also caused more uncertainty for young people

² EngineeringUK. 'Our careers, our future', 2020

³ Careers hubs are groups of 20 to 40 secondary schools and colleges within a specific Local Enterprise Partnership (LEP) area. They work together to deliver the Gatsby benchmarks. Careers hubs have access to some funding, including bursaries for schools and colleges to train careers leaders and a central hub fund equivalent to £1,000 per education provider. They also each have a hub lead to help co-ordinate activities.

regarding career prospects, teachers (and schools more generally) need further support and a way to link in with STEM careers activities in their area. As we emerge from lockdown restrictions and moving forward, a dedicated STEM leader in each careers hub would play a pivotal role in facilitating this.

Embedding careers provision into the STEM curriculum

We ask that the government embeds careers into the subject content of the STEM curriculum and highlights the diverse range of roles and people in science and engineering, ensuring that all young people get access to careers provision.

Strengthening the link between the curriculum and the application of careers provision is important for teachers to raise their awareness of the appropriate tools, resources, and activities to link careers into their lessons, with many indicating that they want to but need further support to do so effectively. By integrating engineering into a broader, interwoven curriculum, including skills such as applying theory and problem-solving within the wider world, young people can gain an understanding of how people work together, the ability to think creatively and have a design mindset to conceptualise a problem and develop solutions. These are all essential if we are to cultivate the skills necessary for engineering.

Additional funding

We ask that the government provides additional funding in the region of £40 million annually to support careers activities in schools. At least £10 million of this should be spent on schools with medium to high levels of students eligible for free school meals.

Our survey found that some teachers' limitations on carrying out STEM activities were

attributed to difficulties in funding, with 48% of teachers agreeing that a lack of funding had negatively affected their ability to run STEM activities within their school. As might be expected, there were significant differences by level of free school meal (FSM) eligibility within schools. Surprisingly, however, it was teachers from schools with medium levels of students eligible for FSM – not those with the highest – who were most likely to agree funding was an issue.

Teachers need more support to enable them to improve the STEM experience for students in school. 66% of teachers agreed that additional support and/or funding would enable them to bring STEM subjects to life in schools.

Promoting engineering as an inclusive career

The wider STEM community and those engaging with young people in careers advice must work to instil confidence in all young people that they have the capability to become an engineer, with particular focus on girls, students from minority ethnic groups, those with disabilities and those from socioeconomically disadvantaged backgrounds, promoting the engineering workforce as an inclusive and diverse environment.

Teachers' perceptions of the workforce, including barriers they perceive are faced by women, people from minority ethnic groups, those with disabilities and those from socioeconomically disadvantaged backgrounds, may affect the way in which they provide careers advice and to whom. It is therefore important that engineering is viewed as a career path open to all, allowing teachers and students to be open to exploring further.

1. Introduction

Since 2010, EngineeringUK has run an annual survey known as the Engineering Brand Monitor (EBM), exploring perceptions, understanding, and knowledge of STEM and engineering amongst young people aged 7 to 19 years, parents, and STEM secondary school teachers. This report focusses on the results obtained from STEM secondary school teachers in 2021, with a separate report available exploring the views of parents and young people in greater detail.

There are frequently reported issues with recruiting and retaining science, technology, engineering and mathematics (STEM) teachers and government targets for training science teachers have not been met in successive years.⁴ Despite many targeted interventions to address this issue, the undersupply of STEM specialist teachers continues and many STEM teachers are not specialists in the subjects they teach.

As discussed in detail in our 'Educational pathways into engineering'⁵ report, there are multiple and complex factors that enable or limit the pathways for young people into STEM, including, for example, limited knowledge or perceptions of engineering, subject choices and academic attainment, science capital and key influencers (such as parents and teachers). These factors broadly relate to young people's own **capabilities**, the **opportunities** they have access to and knowledge of, as well as their individual **motivations**, and key influencers such as teachers have a vital role in facilitating this (the 'COM-B' model). But teachers also need to have their own capabilities – skills and knowledge – to provide high-quality STEM

education and accurate careers advice, the opportunities within their schools to deliver careers advice as well as STEM teaching, and to be motivated to do so. Our research, starting from the questions asked in the survey and continuing through the analysis we carried out, is guided by this concept.

1.1 The COM-B model

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

The factors affecting decision-making can be organised into the COM-B model, a framework for understanding the processes that shape individuals' behaviour.⁶ According to the COM-B framework, **behaviour** is a function of an individual's:

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

⁴ Gatsby Foundation. 'Key indicators in STEM education', 2020

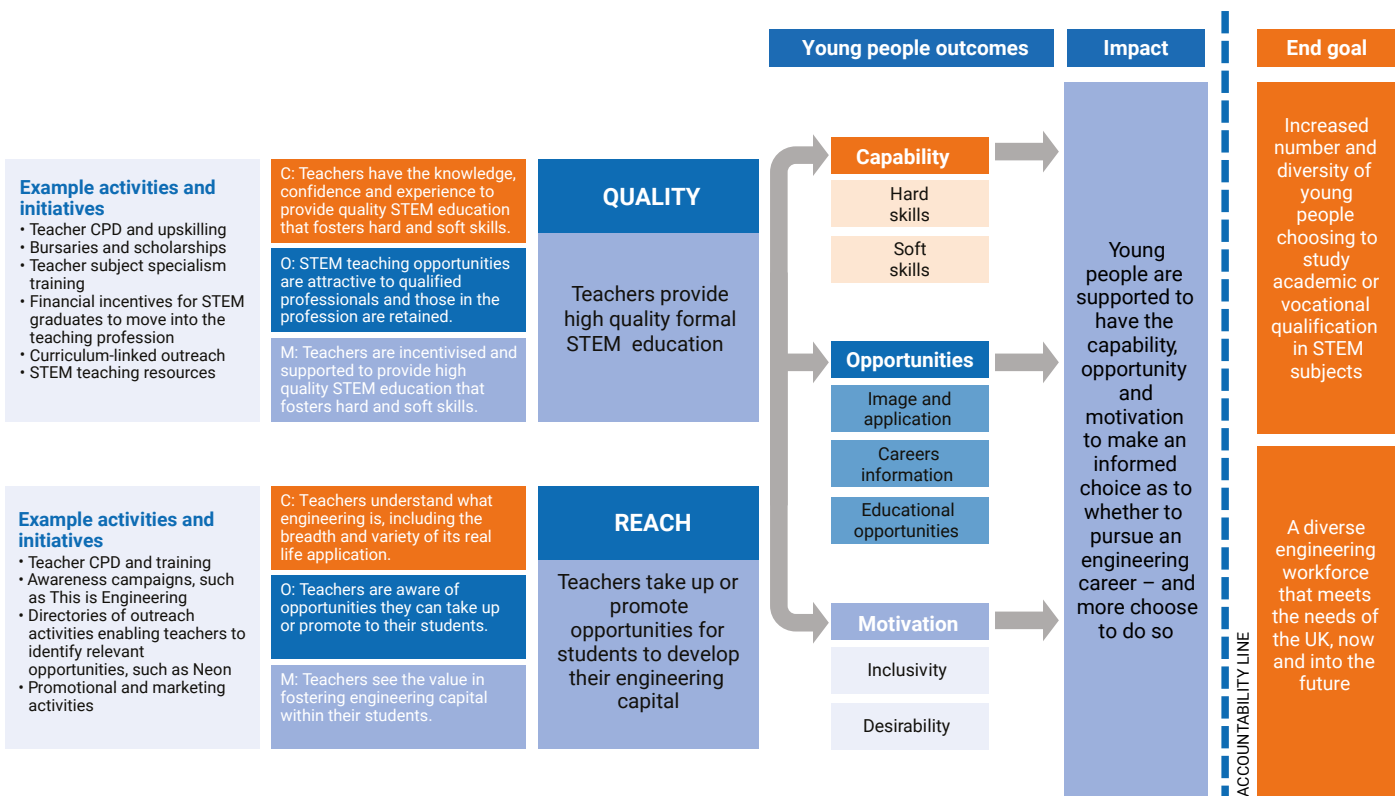
⁵ EngineeringUK. 'Educational pathways into engineering', 2020

⁶ Michie, S and others. 'The behaviour change wheel: A new method for characterising and designing behaviour change interventions'. Implementation Science, 2011

EngineeringUK, working with partners, has developed an impact framework⁷ for engineering outreach, drawing from the COM-B model. This framework enables the sector to map activities and organisations against specific outcomes and stages within young people’s journeys and better assess the purpose of these activities/organisations and how they work together. It provides a theoretical foundation to examine the collective and long-term impact of STEM outreach and a basis to develop appropriate measures. The framework identifies the main actors, including teachers, that can influence young people’s capabilities, opportunities, and motivations in the formal and informal learning settings.

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

Figure 1.1 COM-B model of pursuit of engineering as a career



⁷ EngineeringUK. 'Impact framework for engineering outreach' Tomorrow's Engineers website [online], (accessed on 26 August 2021)

1.2 Methodology

Ahead of carrying out the EBM survey in 2021, EngineeringUK commissioned AdvanceHE⁸ to review the existing EBM questionnaires, create new questions and undertake cognitive testing of the new research instruments. The questionnaire review was conducted in collaboration with EngineeringUK and intended to ensure the questions were fit for purpose, given EngineeringUK's mission and commitment to growing a more diverse engineering workforce.

Consequently, there have been some changes to the wording of the questions and results presented in this report may not be comparable to previous years.

EngineeringUK also commissioned Everfi UK⁹ to manage the fieldwork element of the research – both for teachers, and young people and parents. Everfi UK sub-contracted Kantar Public to manage the young people and parent fieldwork, and Omnisys to deliver the teacher fieldwork.

STEM secondary school teachers were invited to participate in the survey between 16 March and 23 April 2021. Those teaching STEM subjects in a secondary school were sent details of the survey via a Sprint mailing list (totalling around 21,000 teachers). We also published communications via EngineeringUK social channels, and Everfi undertook an outbound calling campaign to boost response rates. We received a total of 528 completed surveys.

For the purposes of analysis, survey responses were weighted to account for differences between the sample and the known characteristics of the population of STEM secondary school teachers obtained from teacher workforce statistics. For teachers based in England, responses were weighted by gender and subject taught. For those based in

Scotland, Wales or Northern Ireland, responses were weighted by gender only due to small numbers in the sample.

Weighted percentages are displayed throughout the report with breakdowns for various teacher characteristics, with responses generally grouped into binary categories due to small numbers and for ease of analysis and interpretation (for example, men vs women for gender, white vs minority ethnic groups for ethnicity, 10 years or fewer vs 11 years or more for number of years taught).

As a measure of socioeconomic status within a school, the report includes levels of eligibility for FSM (high, medium, or low FSM) which were calculated using the percentage of students eligible for FSM within the school of each responding teacher. For Scotland, Wales and Northern Ireland, the high/medium/low categories were derived by ranking the schools by percentage of students eligible and placing a third of schools into each category. For England, thresholds derived by the Department for Education were used,¹⁰ which are set using quartiles and differ depending upon whether the secondary school has a sixth form attached. For secondary schools with a sixth form, the boundaries are set as low FSM for schools with 0% to 6% of students eligible for FSM, medium FSM for schools with 6% to 16.5% of students eligible and high FSM for schools with more than 16.5% of students eligible. For schools with no sixth form the boundaries are 0% to 8%, 8% to 21.5% and above 21.5% respectively. This approach was used for England because it is an established approach and used in funding calculations, whereas equivalent data and methodology was not available for devolved nations.

Confidence intervals displayed throughout the report are 95% confidence intervals calculated using the normal approximation.

⁸ AdvanceHE is a member-led, sector-owned higher education charity, that is an expert at undertaking equality, diversity and inclusion (EDI) analysis of the higher education sector. The research team has extensive experience analysing STEM experiences of young people.

⁹ Everfi UK is a technology company committed to driving social impact through education. Everfi UK is the current name of the organisation previously known as EdComs, who have over 35 years' experience working in the classroom and the community.

¹⁰ Department for Education. 'Dashboard guidance 2019-20', gov.uk [online] (accessed on 26 August 2021)

2. Capability

Young people need to have, and to be confident that they have, the psychological capability to consider engineering as a career option for themselves. This includes both hard skills, such as competency in STEM subjects, and soft skills, such as their enjoyment of STEM subjects, teamwork and leadership skills.

Just as young people need the capability, opportunity and motivation to act in a certain way, so do their key influencers. Previous iterations of the Engineering Brand Monitor survey have shown that teachers are the third most common group that young people would consider going to for careers advice, after their parents and careers advisors. From this, it's clear that teachers can influence the decisions made by young people on their career pathway and it is therefore imperative that they have the capability to do so. In this section we will explore whether STEM secondary school teachers have the knowledge, confidence and experience to provide quality STEM education and advice to their students.

2.1 Knowledge

It is important for teachers to understand what engineering is, including the breadth and variety of routes into engineering so that they can advise and support young people in their education and career path from an early stage. 96% of the teachers surveyed said that they would suggest to their students that they consider a career in engineering and overall, STEM secondary school teachers had good knowledge of what people working in engineering do. Around 4 out of 5 (81%) agreed or strongly agreed that they know about

the different types of things that engineers can do in their jobs. This compares to 83% for scientists and 72% for technology. Male teachers were more likely to agree they know what engineers do than female teachers (86% vs 77%) as were white teachers as compared with those from minority ethnic groups (83% vs 72%) (**Figure 2.1**).

There was higher agreement among STEM secondary school teachers on their knowledge of qualifications, with 84% of teachers overall agreeing that they knew which qualifications students would need to become an engineer and higher proportions of teachers in all groups agreeing with this question compared to knowledge of what engineers do. This indicates that teachers may understand the routes into engineering roles more than they understand the roles themselves and points to an area that could be developed in helping to reach more students.

Teachers in schools with high levels of students eligible for free school meals (FSM) were significantly less likely to have good knowledge of engineering than those in schools with low FSM.

Figure 2.1 Knowledge of engineering amongst STEM secondary school teachers, by gender, ethnicity and number of years teaching, 2021, UK

Characteristics of teacher		Base	Knowledge of what people working in engineering do	Knowledge of qualifications needed to be an engineer
	All	(528)	81%	84%
Gender	Men	(249)	86%	86%
	Women	(268)	77%	83%
Ethnicity	White	(445)	83%	86%
	Minority ethnic groups	(70)	72%	78%
Number of years teaching	10 or fewer	(122)	79%	82%
	11 or more	(360)	82%	87%

Source – Engineering Brand Monitor 2021

Q - Knowledge of engineering: 'How much do you know about what people working in the following areas do? Engineering.' 1-Strongly disagree/ 2-Disagree/ 3-Neither agree nor disagree/ 4-Agree/ 5-Strongly agree

Q - Knowledge of qualifications needed to be an engineer: 'How much do you agree or disagree with the following statements: I know what subjects or qualifications my students would need to take next to become an engineer.' 1-Strongly disagree/ 2-Disagree/ 3-Neither agree nor disagree/ 4-Agree/ 5-Strongly agree

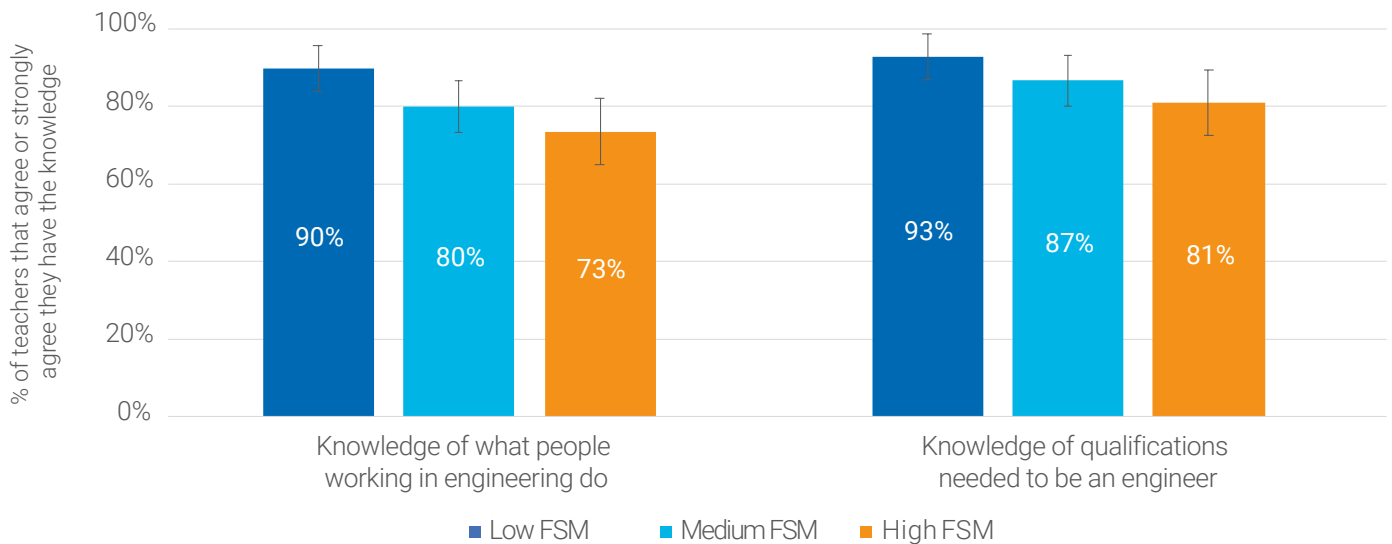
For the engineering workforce to diversify, it is important that young people from all backgrounds, including those who may be socially disadvantaged, have the same opportunities and receive the same advice regarding future career paths. The number of young people eligible for free school meals (FSM) can be an indication of socioeconomic status.

Figure 2.2 shows the proportions of teachers in schools with high, medium and low levels of FSM eligibility who agreed or strongly agreed that they have knowledge about engineering professions and the qualifications needed to be an engineer. The error bars displayed represent the 95% confidence intervals, meaning that

with 95% certainty we can say the true value in the overall population lies within the range displayed and there are significant differences between groups demonstrated where the error bars do not overlap. In **Figure 2.2**, we can see that there were no significant differences in the proportions of teachers reporting they know about which qualifications are needed to become an engineer by school FSM level as the error bars are overlapping. However, teachers in schools with high levels of students eligible for free school meals were significantly¹¹ less likely to have good knowledge of engineering as a profession, with 73% agreeing that they know what engineers do compared with 90% of teachers in low FSM schools.

¹¹ 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.

Figure 2.2 Knowledge of engineering amongst STEM secondary school teachers, by level of eligibility for free school meals within the school in which they teach, 2021, UK



Source – Engineering Brand Monitor 2021

Q - Knowledge of engineering: 'How much do you know about what people working in the following areas do? Engineering.' 1-Strongly disagree/ 2-Disagree/ 3-Neither agree nor disagree/ 4-Agree/ 5-Strongly agree

Q - Knowledge of qualifications needed to be an engineer: 'How much do you agree or disagree with the following statements: I know what subjects or qualifications my students would need to take next to become an engineer.' 1-Strongly disagree/ 2-Disagree/ 3-Neither agree nor disagree/ 4-Agree/ 5-Strongly agree

2.2 Associations with engineering and engineers

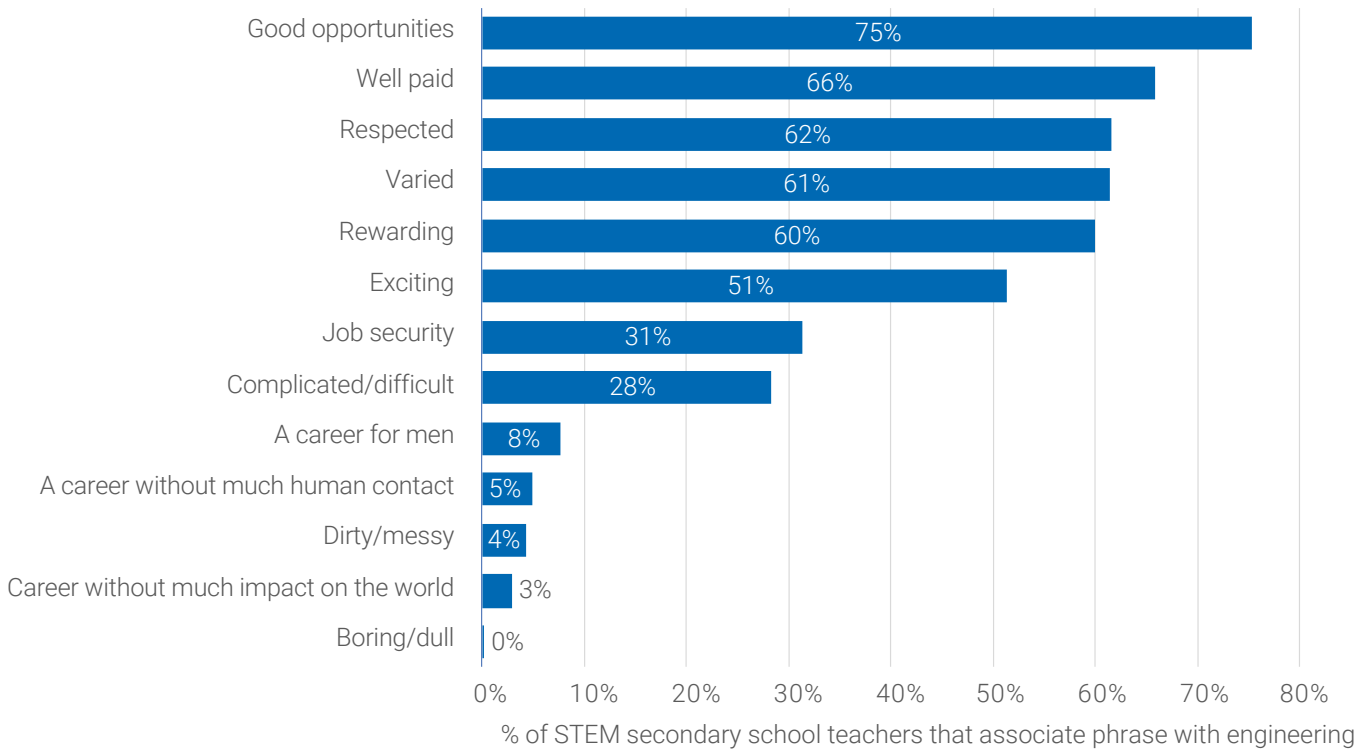
For teachers to encourage students into engineering professions, it is important that they have a positive opinion of engineers and positive associations with engineering. Encouragingly, an overwhelming majority of teachers agreed or strongly agreed with the following 4 statements:

- Engineering is a well-respected profession (96% agreed)
- On balance, engineers have a positive impact on society (95% agreed)
- Engineers are important for improving environmental sustainability (95% agreed)

- Engineering is applicable across a wide range of industries (92% agreed)

Furthermore, more than half of STEM secondary school teachers associated engineering with good opportunities (75%), and as a well-paid (66%), respected (62%), varied (61%), rewarding (60%) and exciting (51%) profession. However, only around a third (31%) viewed it as a secure profession and 28% viewed engineering roles as complicated or difficult. These more negative perceptions could have an adverse impact on the advice they provide and which students they may suggest a career in engineering to ([Figure 2.3](#)).

Figure 2.3 Phrases associated with engineering amongst STEM secondary school teachers, 2021, UK



Source – Engineering Brand Monitor 2021

Q - Which of these words or phrases would you associate with a career in engineering? Please select all that apply.

2.3 Confidence in giving advice

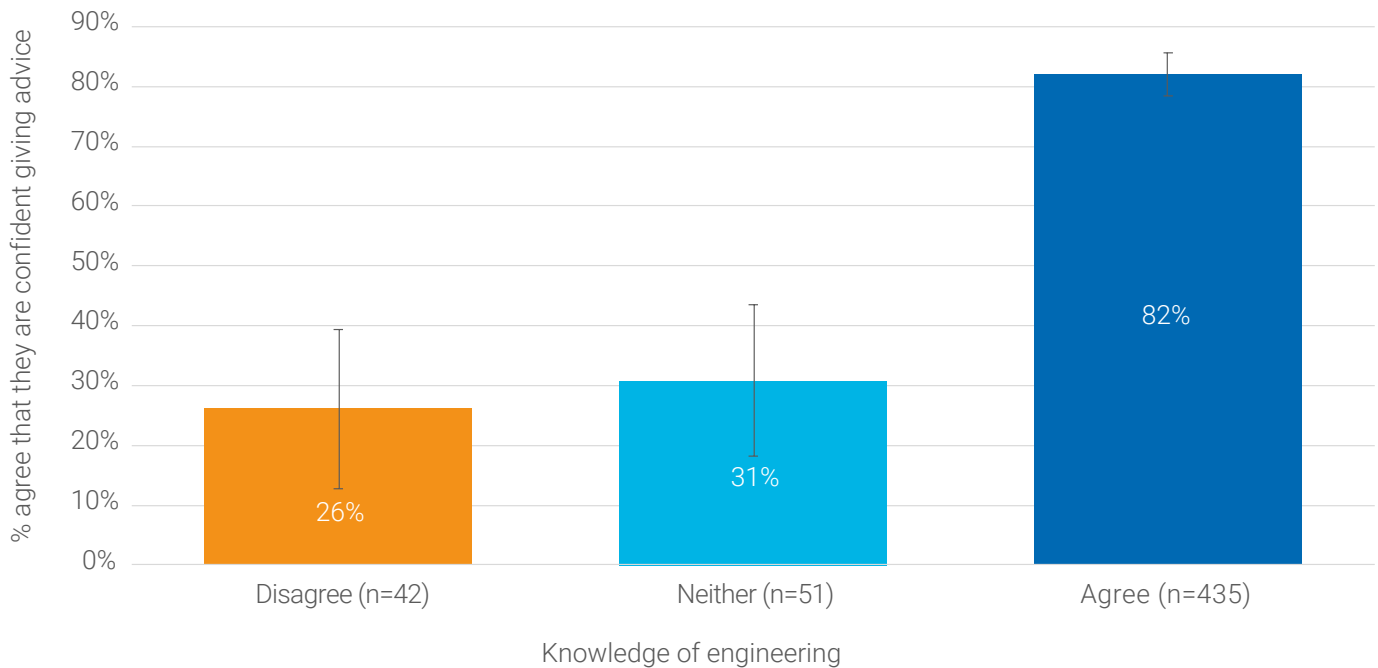
Teachers need to feel confident in giving advice on careers so that they can inspire young people to follow that advice and continue their education or other pathway to an engineering career.

We asked about how confident they felt giving advice on STEM careers, specifically related to science, technology, and engineering. 72% of teachers agreed or strongly agreed that they were confident in giving careers advice related to engineering. This compares to 73% being confident giving advice on careers in science and 62% on careers in technology. Except for

technology, where male teachers were more confident in giving careers advice than their female counterparts, there were no significant differences by gender.

We would expect that the more knowledge teachers have about engineering, the more confident they feel about giving advice and the survey responses certainly seem to substantiate this. Overall, 82% of those who agreed that they know what engineers do also agreed that they are confident in giving advice on engineering careers, compared to less than a third of teachers who did not agree (**Figure 2.4**).

Figure 2.4 Knowledge of engineering and confidence in providing engineering careers advice amongst STEM secondary school teachers, 2021, UK



Source – Engineering Brand Monitor 2021

- Q - Knowledge of engineering: 'How much do you know about what people working in the following areas do? Engineering.' 1-Strongly disagree/ 2-Disagree/ 3-Neither agree nor disagree/ 4-Agree/ 5-Strongly agree
- Q - 'Generally, how confident do you feel in giving your students advice about careers in the following areas? Science; Technology; Engineering' Chart displays percentage of all respondents selecting 4 and 5 from the following options 1- Not at all confident/ 2- Not very confident/ 3- Neither confident nor unconfident/ 4- Fairly confident/ 5- Very confident

We also explored where teachers get their information on engineering careers from. Around half of teachers surveyed reported they had heard about engineering careers through university websites (58%), careers leaders/ advisors/co-ordinators/administrators (54%), other teachers/colleagues (51%) or someone who works as an engineer (48%).

It was clear that the source of information influenced teachers' reported knowledge of – and confidence in providing advice on – engineering careers. Overall, the highest level of agreement that they know what engineers do came from the teachers who reported they had heard about engineering careers from

local employers, with 92% of these teachers agreeing that they know what engineers do and 85% feeling confident in giving careers advice. Similarly high levels of knowledge and confidence came from those who had heard from someone who works as an engineer, with 87% of those agreeing they know what engineers do and 85% agreeing that they are confident in advising on engineering careers (**Figure 2.5**). This suggests that engineers themselves could have an important role to play in educating teachers about engineering careers that could then empower teachers to provide advice to their students.

Figure 2.5 Sources of information on engineering careers and association with knowledge of engineering and confidence in providing engineering careers advice amongst STEM secondary school teachers, 2021, UK

Where do you get information about engineering careers from, if at all?	Agree this is a source of information (%)	Agree that they know what engineers do (%)	Agree that they are confident advising on engineering careers (%)
University websites	58%	83%	76%
Careers leaders/ advisors/co-ordinators/ administrators	54%	84%	71%
Other teachers/colleagues	51%	81%	71%
Someone who works as an engineer	48%	87%	85%
Careers fairs	46%	79%	76%
Employer or recruitment websites	41%	88%	81%
Science associations or societies	38%	89%	85%
Former students	33%	83%	86%
A local employer	27%	92%	85%
TV (for example science documentaries)	23%	89%	86%
Social media	22%	76%	74%
Friends	20%	86%	85%
Newspapers/magazines	15%	92%	83%
Family	15%	87%	89%
Parents/carers	7%	91%	87%
Radio	6%	89%	74%

Source – Engineering Brand Monitor 2021

Q - Some teachers may search for information to help them advise their students on possible careers. Where do you get information about engineering careers from, if at all? Please select all that apply.

Q - Knowledge of engineering: 'How much do you know about what people working in the following areas do? Engineering.' 1-Strongly disagree/ 2-Disagree/ 3-Neither agree nor disagree/ 4-Agree/ 5-Strongly agree

Q - 'Generally, how confident do you feel in giving your students advice about careers in the following areas? Science; Technology; Engineering. Chart displays percentage of all respondents selecting 4 and 5 from the following options 1- Not at all confident/ 2- Not very confident/ 3- Neither confident nor unconfident/ 4- Fairly confident/ 5- Very confident

3. Opportunity

As well as having the capability to become an engineer, young people need to have, be aware of and be able to access adequate educational opportunities to enable them to pursue routes into engineering. This includes having an accurate picture of what engineering is and understanding the variety of careers in – and pathways into – the profession.

There are 2 aspects to consider in terms of opportunity for teachers – STEM teaching opportunities and opportunities to reach and inspire young people. Teaching opportunities need to be attractive to qualified professionals and continue to be appealing to ensure that those in the profession are retained. Teachers also need to be aware of the influence they can have on the capability, opportunity and motivation of their students and the opportunities they can take up to promote STEM careers to them. In this section of the report, we explore the opportunities that teachers can provide to their students regarding careers advice, STEM activities and the barriers that teachers believe are in place that may stop their students following a pathway into engineering.

Teachers often held academic routes in higher esteem than vocational routes.

3.1 Advice on routes into engineering

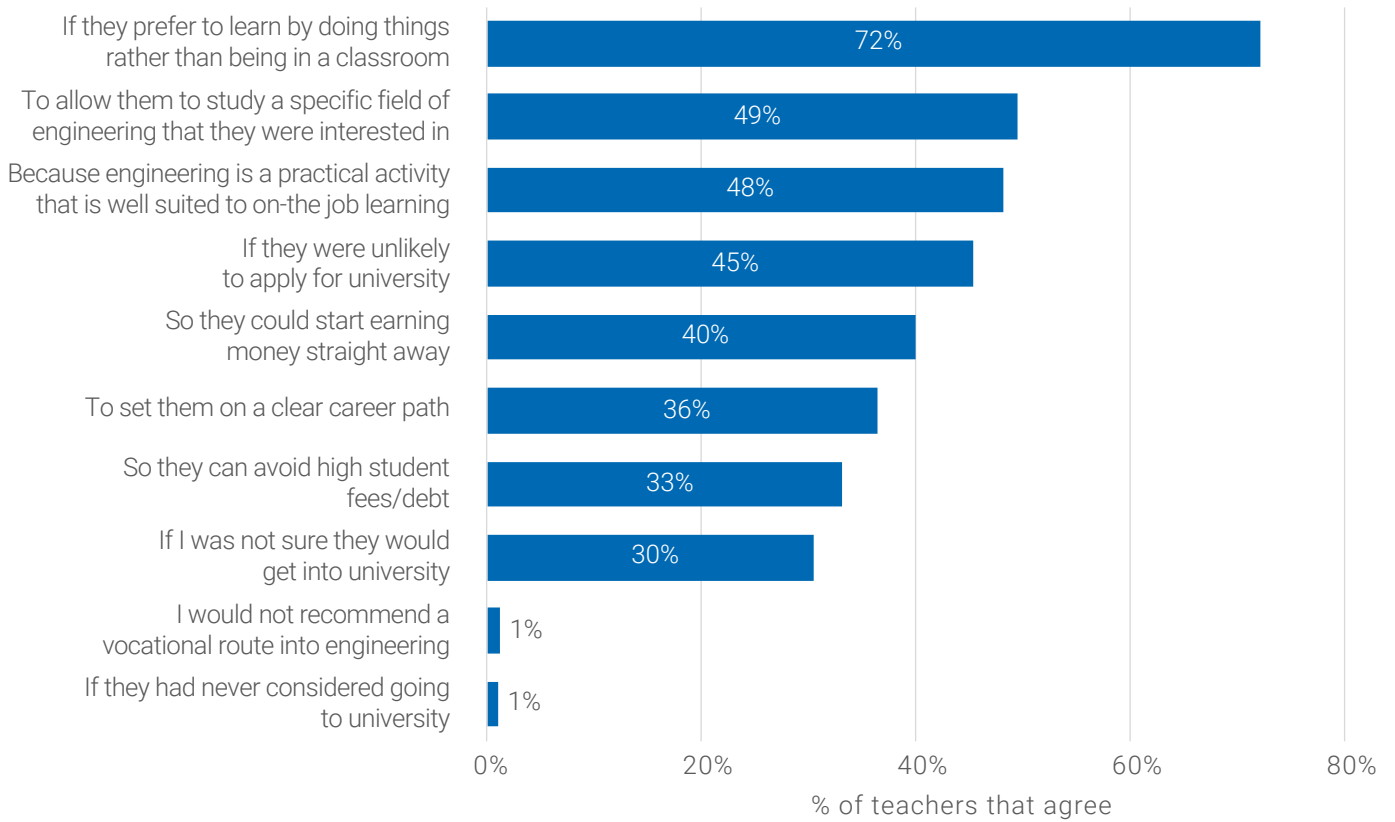
It is important for teachers to understand and be able to communicate to their students that there are several routes into engineering careers, and that not all young people necessarily need to follow the same route to reach the same outcome. Recent government initiatives¹² have highlighted the importance of there being a variety of pathways into the workplace by putting apprenticeships and T Levels centre stage in their new skills strategy. With this in mind, we asked STEM secondary school teachers about advice they might give to students on vocational and educational routes into engineering, and when they may advise on each option.

The most common cited reason a teacher might recommend a vocational route into engineering over an academic one was where the student preferred to learn by doing things rather than being in a classroom (72%) (**Figure 3.1**). Around half of teachers surveyed would also advise on a vocational route over an academic one if a student wanted to study a specific aspect of engineering that they were interested in (49%) or because they thought engineering was suited to on-the-job learning (48%).

It was also clear that teachers were mindful there may be challenges related to the university pathway into engineering when advising their students. For example, 45% agreed they would advise on a vocational route if their student was unlikely to apply for university, 30% if they were not sure they would get into university, and a third so that the student in question could avoid high student fees or debt.

¹² Department for Education. Skills for Jobs: Lifelong Learning for Opportunity and Growth, [online] (accessed on 26 August 2021)

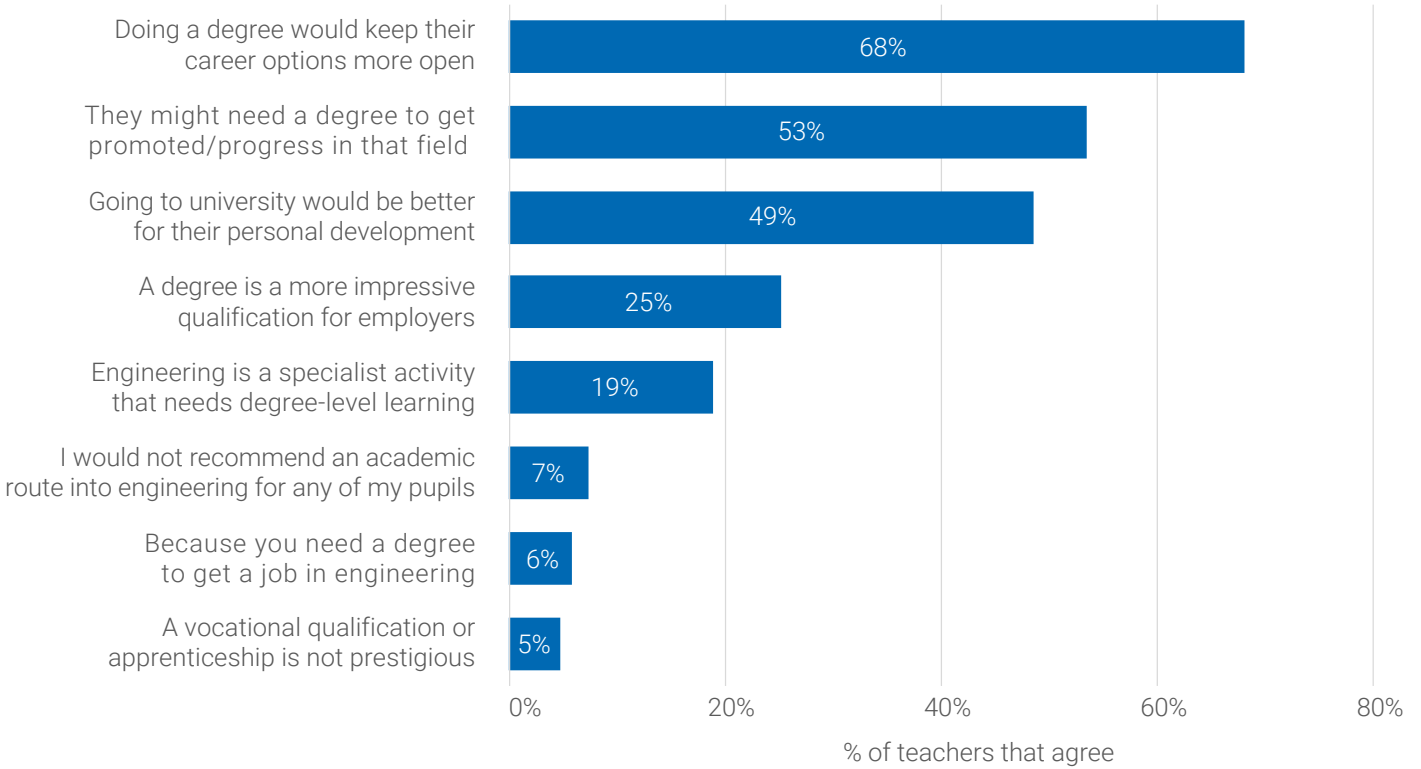
Figure 3.1 Reasons for STEM secondary school teachers advising students to take a vocational route into engineering over an academic route, 2021, UK



Source – Engineering Brand Monitor 2021

Q – Suppose a pupil was interested in becoming an engineer. For what reason(s) might you recommend they pursue a vocational route into engineering over an academic one? Please select all that apply. Percentages shown are for those who selected the option.

Figure 3.2 Reasons for STEM secondary school teachers advising students to take an academic route into engineering, 2021, UK



Source – Engineering Brand Monitor 2021

Q – Suppose a pupil was interested in becoming an engineer. For what reason(s) might you recommend they pursue an academic route into engineering over a vocational one? Please select all that apply. Percentages shown are for those who selected the option.

Conversely, we also asked teachers why they might recommend students pursue an academic route into engineering over a vocational one. Reassuringly, very small proportions of teachers surveyed cited a degree as a necessity to get a job in engineering (6%) or the lack of prestige associated with a vocational qualification or apprenticeship (5%) as reasons to recommend students take an academic route into engineering over a vocational one. That said, it was evident

teachers often held academic routes in higher esteem than vocational routes.

The most cited reason for recommending an academic route over a vocational one was that degrees kept career options more open (68% agreement) (Figure 3.2). Around half of teachers believed that students might need a degree to progress through their career (53%), and that going to university is better for their personal development (49%). A quarter

of teachers also responded that a degree is a more impressive qualification to potential employers. Together this suggests that there is a long way to go if a parity of esteem between vocational and academic routes into engineering among teachers – and by extension, their students – is to be established.

3.2 STEM careers engagement activities

Improving knowledge of engineering through STEM careers activities can be a first step in engaging and inspiring young people and helping them develop the skills needed to broaden the range of careers they are able to consider in the future. Therefore, it is important that young people are given the opportunity at school to engage with STEM and be inspired to follow a career in engineering through organised activities. A recent report by EngineeringUK found that, even after controlling for gender and enjoyment of STEM subjects, young people aged 11 to 19 who attended a STEM careers activity in the past 12 months were 3.5 times more likely to know ‘quite a lot’ or ‘a lot’ about what engineers do and 3.4 times more likely to consider a career in engineering (compared to those who had not attended a STEM career activity).¹³ Furthermore, the same report showed that young people felt that greater employer engagement such as work experience, job fairs, site visits, advice from those in the profession and internships could help them better understand what careers they are interested in pursuing. This highlights the impact such activities can have on decisions young people make about their future careers.

Understandably, it has been a challenge in schools in the past 12 months to organise these events and activities due to absences from school, government lockdowns, virtual lessons, self-isolation and social distancing measures being enforced related

to the Covid-19 pandemic. We asked STEM secondary school teachers if they had arranged careers activities in their school, and then if these activities were related to careers in STEM. Overall, 28% of the teachers surveyed had organised a careers advice session with someone in their school either online or in person, and 1 in 5 (20%) said that this was related to STEM careers. Similarly, 23% had organised a careers advice session with someone outside of their school, either online or in person, with 20% having organised this related to STEM careers. These findings are in line with EngineeringUK’s June 2021 report on the impact of Covid-19¹⁴, which found 76% of young people (aged 11 to 19 years) had not taken part in any formal careers activity, such as a careers guidance session or an online work experience since March 2020.

Teachers reported relatively low employer careers provision in the last 12 months, with only 20% of teachers stating they had organised a careers event with employers, 15% with STEM employers, and even lower proportions organising work experience for their students¹⁵. This contrasts with a report by the CEC¹⁶ before the pandemic in 2019, which found that 52% of schools had facilitated encounters with employers. This is something that needs to be monitored to ensure that activities increase as restrictions are eased, and that schools are supported to engage with employers and organise activities for their students.

Young people are much more likely to know what engineers do and to consider a career in the profession if they have taken part in STEM careers activities.

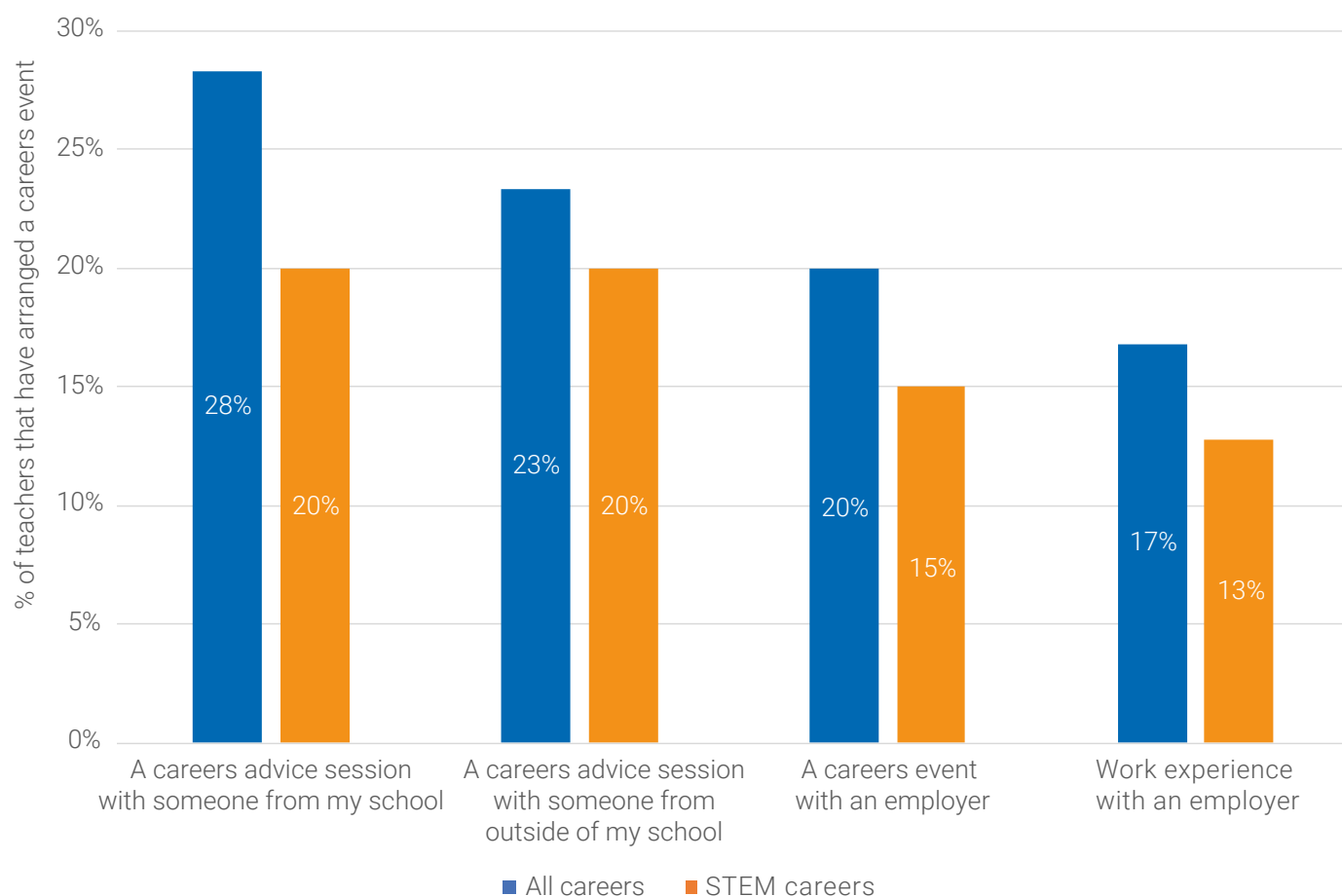
¹³ EngineeringUK. ‘Engineering Brand Monitor’, 2019

¹⁴ EngineeringUK. ‘Our careers, our future’, 2020

¹⁵ EngineeringUK. ‘Securing the future’, 2021

¹⁶ The Careers & Enterprise Company (CEC). ‘Closing the Gap’, 2019

Figure 3.3 Activities arranged by secondary STEM teachers in the past 12 months related to all careers and STEM careers, 2021, UK



Source – Engineering Brand Monitor 2021

Q – Which, if any, of the activities that you arranged for your pupil were related to careers in STEM? Please select all that apply. Percentages shown are for those who selected the option.

3.3 The curriculum

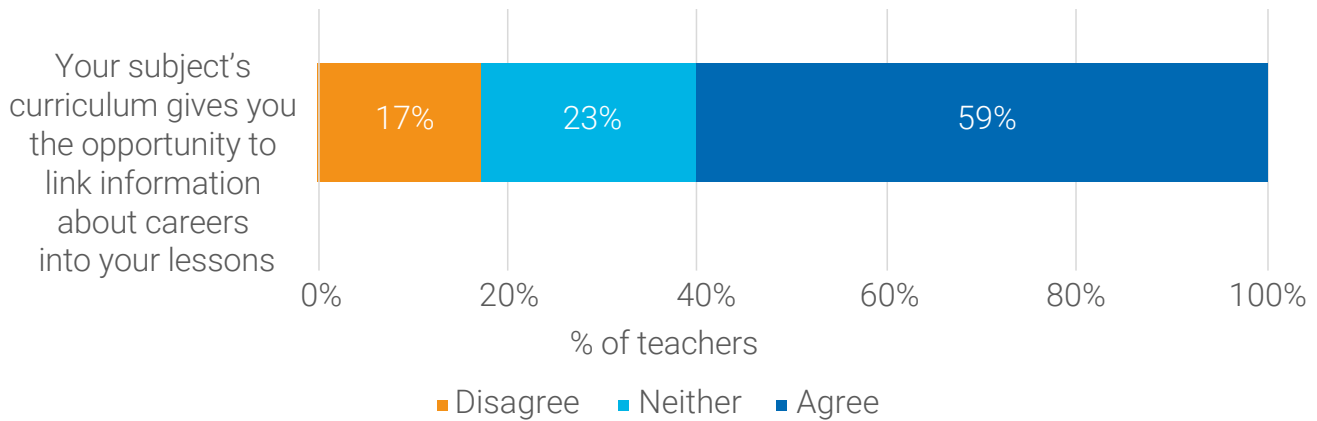
STEM secondary school teachers have a limited time within the curriculum to embed STEM, and particularly engineering, careers provision into their lessons. The Royal Academy of Engineering reported that there is currently “not enough practical evidence to provide teachers with insight into how to embed engineering activities and lessons within the curriculum” and that there are many barriers to carrying out engineering activities

in school, such as time within the lesson and space in the classrooms.¹⁷ We understand that teachers are often constrained for time and face mounting workloads and pressures – and that as a result, they may not have the time they’d like to discuss future careers with their students.¹⁸ For this reason, we call for careers provision to be more clearly embedded in the STEM curriculum to ensure all young people have access.

¹⁷ Royal Academy of Engineering. ‘Progressing to be an engineer’

¹⁸ EngineeringUK. ‘Educational pathways into engineering’, 2020

Figure 3.4 Response of STEM secondary school teachers on the curriculum and the opportunity to link to information about careers, 2021, UK



Source – Engineering Brand Monitor 2021

Q – How much do you agree or disagree that your subject’s curriculum gives you the opportunity to link information about careers into your lessons? 1-Strongly disagree/ 2-Disagree/ 3-Neither agree nor disagree/ 4-Agree/ 5-Strongly agree

Encouragingly 85% of teachers agreed that it was part of their role to help students understand what STEM careers they could pursue, with just 6% indicating that careers outreach was not relevant for them and their students. We also asked teachers their opinions on the opportunities they have within the curriculum to link information about careers into their lessons and 59% agreed that they do have the opportunity to do so. Around three quarters of teachers (73%) agreed that their school supports students to develop the skills they would need to pursue engineering if they wanted to.

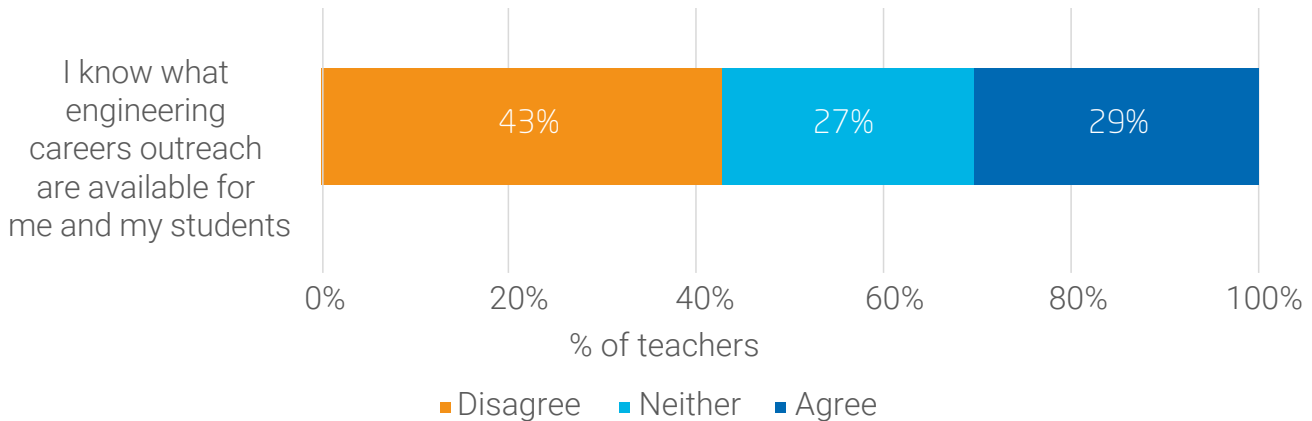
However, more needs to be done to make STEM secondary school teachers aware of how to use the opportunities to embed careers provision into their lessons. When asked to what extent they agreed they know what engineering careers outreach was available to them and their students, just 29% agreed or strongly agreed and 43% disagreed or strongly disagreed.

In other words, teachers believe they have the opportunity to link information about careers into their lessons and support students to develop the skills to pursue an engineering career but are less aware of the appropriate tools, resources, and activities to enable them to do so. A recent publication by the Royal Academy of Engineering¹⁹ reported that greater depth of understanding about how engineers think and work (for example, taking a more agile approach to teaching in contrast with the more frequently found objective- or outcome-led approaches that are currently emphasised in UK schools) better equipped teachers to design opportunities to integrate skills into the curriculum.

STEM secondary school teachers have limited time within the curriculum to embed STEM, and particularly engineering, careers provision into their lessons.

¹⁹ Royal Academy of Engineering. 'Tinkering for learning', 2018

Figure 3.5 Response of STEM secondary school teachers on knowledge of engineering careers outreach, 2021, UK



Source – Engineering Brand Monitor 2021

Q – How much do you agree or disagree with the following statements: I know what engineering careers outreach are available for me and my students.? 1-Strongly disagree/ 2-Disagree/ 3-Neither agree nor disagree/ 4-Agree/ 5-Strongly agree

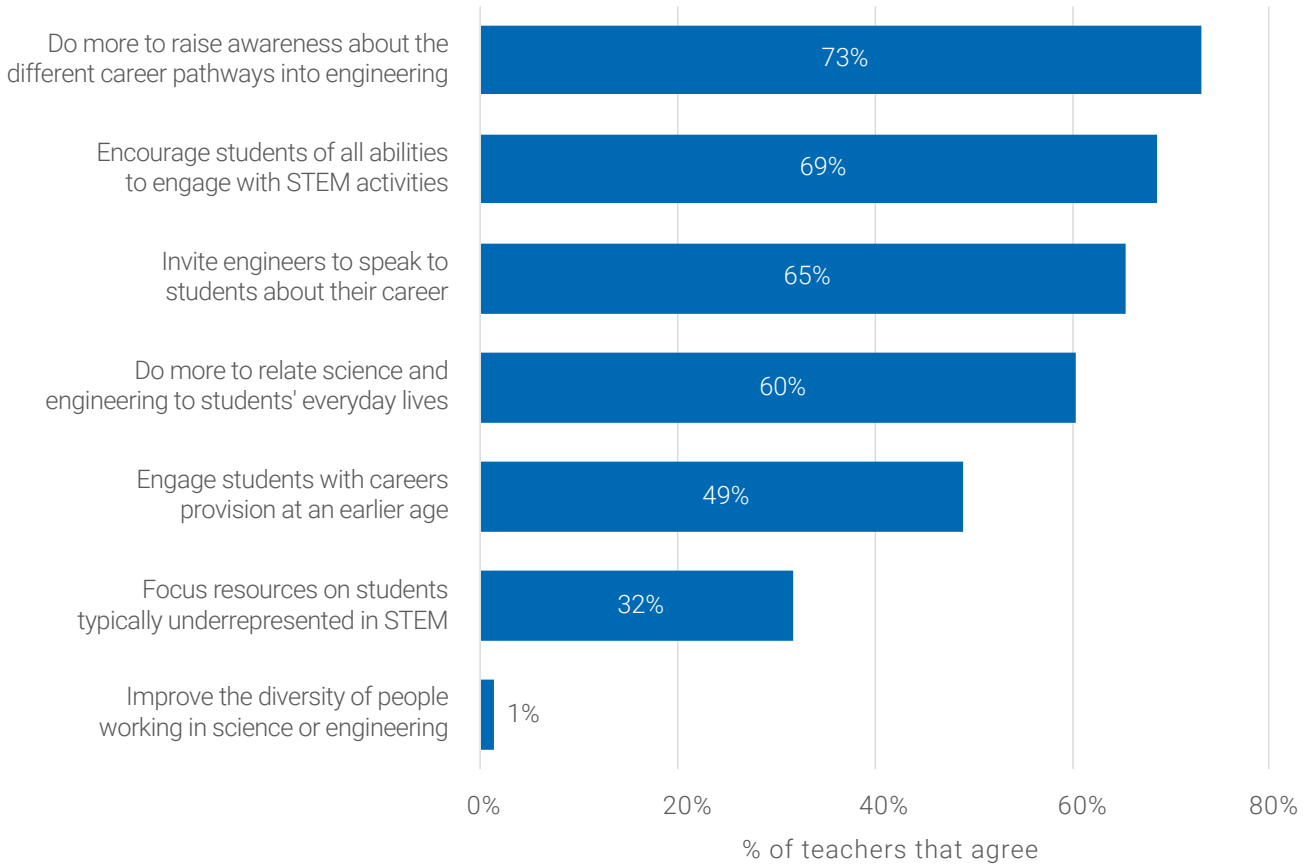
3.4 Diversity and inclusion

Engineering employers need a diverse workforce to bring a range of perspectives as well as the numbers required to meet the needs of all engineering roles in the future. With teachers having a major influence over their students, their opinions on who will make up the future engineering workforce and perceptions of the barriers faced can affect how they advise and influence their students.

When teachers were asked what they think they need to do to increase the diversity of young people interested in engineering, the most popular response option was to raise more awareness of the different career pathways into engineering (73% of teachers in agreement), followed closely by encouraging students of all abilities to engage with STEM activities (69%). There is a key role therefore for teachers in addressing both these issues.

More than half of teachers surveyed agreed that women face more obstacles that make it harder for them to get into engineering than men.

Figure 3.6 STEM secondary school teachers' opinions on what they need to do to increase the diversity of young people interested in engineering, 2021, UK



Source – Engineering Brand Monitor 2021

Q – What do you think teachers need to do to increase the diversity of young people interested in engineering?
Please select all that apply.

3.6 Gender

Latest figures from the Labour Force Survey show that 14.5% of the engineering workforce in 2020 (Q3) were women. To assess the extent to which teachers felt the disparity is the result of natural differences versus societal barriers, we asked teachers how much they agreed or disagreed with following 2 statements:

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

It was clear from our results that the majority of teachers understood the underrepresentation of women in engineering to be the result of societal barriers as opposed to natural differences between men and women. More than half of teachers surveyed (55%) agreed that women face more obstacles that make it harder for them to get into engineering than men, with just a quarter (25%) disagreeing that this was the case. In contrast, just 10% of teachers agreed that there are natural differences between men and women that make men better suited to a career in engineering, with 80% disagreeing with the statement.

Figure 3.7 STEM secondary school teachers' opinions on gender and engineering, 2021, UK

	Disagree	Neither	Agree	Don't know
Women face more barriers	25%	18%	55%	2%
There are natural differences	80%	13%	10%	0%

Source – Engineering Brand Monitor 2021

Q - Currently, only 14.5% of people working in engineering in the UK are women. We are interested in your thoughts on why this may be. How much do you agree or disagree with the following statement? 1-Strongly disagree/ 2-Disagree/ 3-Neither agree nor disagree/ 4-Agree/ 5-Strongly agree

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

For the purposes of this analysis 'strongly agree' and 'agree' were combined for the 'agree' category and 'strongly disagree' and 'disagree' were combined for the 'disagree' category.

3.7 Ethnicity

Despite those from ethnic minority backgrounds being overrepresented within engineering at higher education level, there are disproportionately fewer people from some ethnic minority backgrounds than white backgrounds currently in the engineering workforce compared to the general population.²⁰ Research shows that Black engineering graduates are less likely to progress into a career in engineering and those who do have a more difficult experience in the workplace and find that assumptions are made about them based on their ethnicity or nationality.²¹

To examine why teachers thought why this is the case, we asked how much they agreed with the following 2 statements:

- People from some minority ethnic backgrounds face more barriers getting into engineering than people from white backgrounds
- People from some minority ethnic backgrounds are less suited to a career in engineering than people from white backgrounds

Just 4% of teachers agreed that people from minority ethnic backgrounds are less suited to a career in engineering, with 44% agreeing that more barriers are faced by people from some minority ethnic backgrounds in joining the engineering workforce compared to those from white backgrounds.

Figure 3.8 STEM secondary school teachers' opinions on ethnicity and engineering, 2021, UK

People from some minority ethnic backgrounds	Disagree	Neither	Agree	Don't know
Face more barriers	24%	27%	44%	5%
Are less suited	87%	8%	4%	1%

Source – Engineering Brand Monitor 2021

Q - There are fewer people from some ethnic and social groups working in engineering than in other careers. We are interested in your thoughts on why this may be. How much do you agree or disagree with the following statements? 1-Strongly disagree/ 2-Disagree/ 3-Neither agree nor disagree/ 4-Agree/ 5-Strongly agree

- People from some minority ethnic backgrounds face more barriers getting into engineering than people from white backgrounds
 - People from some minority ethnic backgrounds are less suited to a career in engineering than people
- For the purposes of this analysis 'strongly agree' and 'agree' were combined for the 'agree' category and 'strongly disagree' and 'disagree' were combined for the 'disagree' category.

²⁰ EngineeringUK. 'Engineering UK: The state of engineering', 2018

²¹ Royal Academy of Engineering. 'Black History Month 2020' [online] (accessed on 26 August 2021)

3.8 Socially disadvantaged groups

Another group typically underrepresented in the engineering workforce are those considered to be socially disadvantaged. These are people from lower socioeconomic groups, with low household income, where students may be eligible for free school meals and parents have lower levels of qualifications. The Perkins' review of engineering skills²² report has identified the need for people from more socially disadvantaged backgrounds to join the workforce in order to reduce the skills gap in engineering.

We asked teachers how much they agreed with the following 2 statements related to people from socially disadvantaged backgrounds and engineering roles:

- People from socially disadvantaged backgrounds face more barriers getting into engineering than people from advantaged backgrounds
- People from socially disadvantaged backgrounds are less suited to a career in engineering than people from advantaged backgrounds

Teachers showed awareness of the barriers faced by people from socially disadvantaged backgrounds, with 70% agreeing that they face more barriers in joining the engineering workforce. Encouragingly, 87% disagreed that they were less suited to the profession which implies they should not be deterred from encouraging students from all socioeconomic backgrounds from pursuing engineering pathways.

Figure 3.9 STEM secondary school teachers' opinions on socially disadvantaged backgrounds and engineering, 2021, UK

People from socially disadvantaged backgrounds	Disagree	Neither	Agree	Don't know
Face more barriers	11%	16%	70%	3%
Are less suited	87%	8%	5%	0%

Source – Engineering Brand Monitor 2021

Q - There are fewer people from some ethnic and social groups working in engineering than in other careers. We are interested in your thoughts on why this may be. How much do you agree or disagree with the following statements? 1-Strongly disagree/ 2-Disagree/ 3-Neither agree nor disagree/ 4-Agree/ 5-Strongly agree

- People from socially disadvantaged backgrounds face more barriers getting into engineering than people from advantaged backgrounds
- People from socially disadvantaged backgrounds are less suited to a career in engineering than people from advantaged backgrounds

For the purposes of this analysis 'strongly agree' and 'agree' were combined for the 'agree' category and 'strongly disagree' and 'disagree' were combined for the 'disagree' category.

²² Department for Business, Innovation & Skills, 'Engineering skills: Perkins review', GOV.UK [online] (accessed 26 August 2021)

4. Motivation

We have already explored the various aspects of a teacher's capability and opportunity in advising their students on STEM careers and embedding learning into their lessons - the 'C' and 'O' of the COM-B model. The final aspect to explore is the motivation element of the theory – the 'M' – as all 3 are needed to make the required impact and in turn motivate young people to find out more about their future potential in STEM careers. In the EBM for young people, we explored motivation by looking to measure the extent to which young people see engineering as suitable for themselves (inclusivity) and the extent to which they want to pursue engineering (desirability). For teachers, it is important that they are motivated and supported to provide high quality STEM education that fosters both hard and soft skills and that they communicate engineering as an inclusive and desirable career to their students.

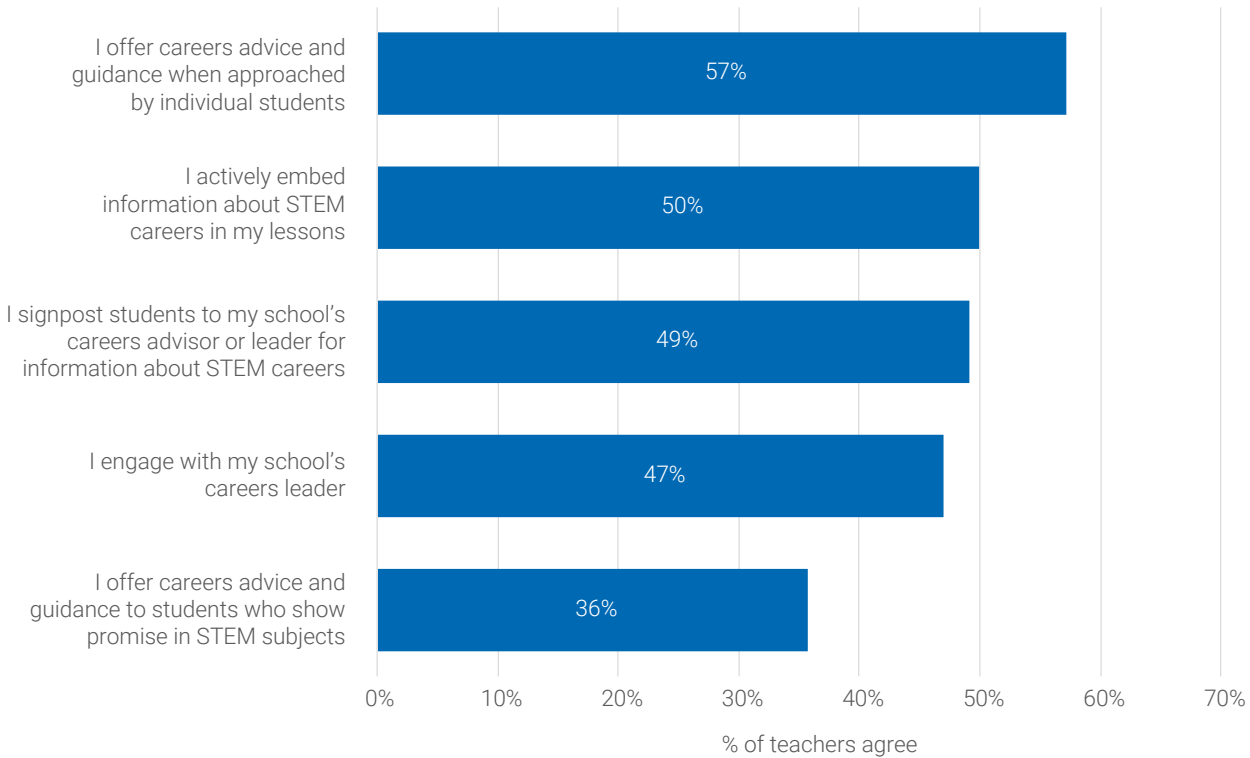
In this section we explore different approaches that teachers may have to careers guidance, along with how frequently teachers are able to use STEM activities to motivate and enthuse young people to learn more about STEM subjects and occupations and whether additional support is needed for teachers to embed this further.

4.1 Approach to careers advice and guidance

Teachers are often approached to give STEM careers advice to their students and we asked teachers about how they deal with this. We found that around half of teachers actively embed information into their STEM lessons, signpost students to the school's own careers advisors and engage with their school's careers leader themselves (**Figure 4.1**). 57% also agreed that they gave careers advice and guidance when approached by individual students. However, more surprisingly, just 36% offered careers advice to students showing promise in STEM subjects, who may be those most interested in pursuing a career in engineering. This shows that there is still much improvement to be made in these areas.

Half of teachers actively embed information into their STEM lessons.

Figure 4.1 STEM secondary school teachers' approach to careers advice, 2021, UK



Source – Engineering Brand Monitor 2021

Q - Thinking about your approach to careers advice and guidance across the year, which of the following applies to you? Please select all that apply.

4.2 Running activities

In addition to careers advice, it is important for teachers to increase young people's interest in STEM activities by being able to run activities both inside and outside of the school that are engaging for young people. In fact, EngineeringUK's report on STEM careers provision and young people²³ found that students who attended 2 or more activities were 8 times more likely than those not attending any activities to know 'quite a lot' or 'a lot' about engineering, highlighting the importance of regular access to STEM for engaging students.

When asked how frequently STEM activities were run at their schools, 37% said this

happened at least once a week, 22% a few times a term and 38% occasionally (less than a few times a month), with 3% reporting that they never run STEM activities within their school. Overall, this is, on the face of it, encouraging. However, as we investigated further we found that there were significant differences between schools, dependent upon the number of students eligible for free school meals within the school (**Figure 4.2**).

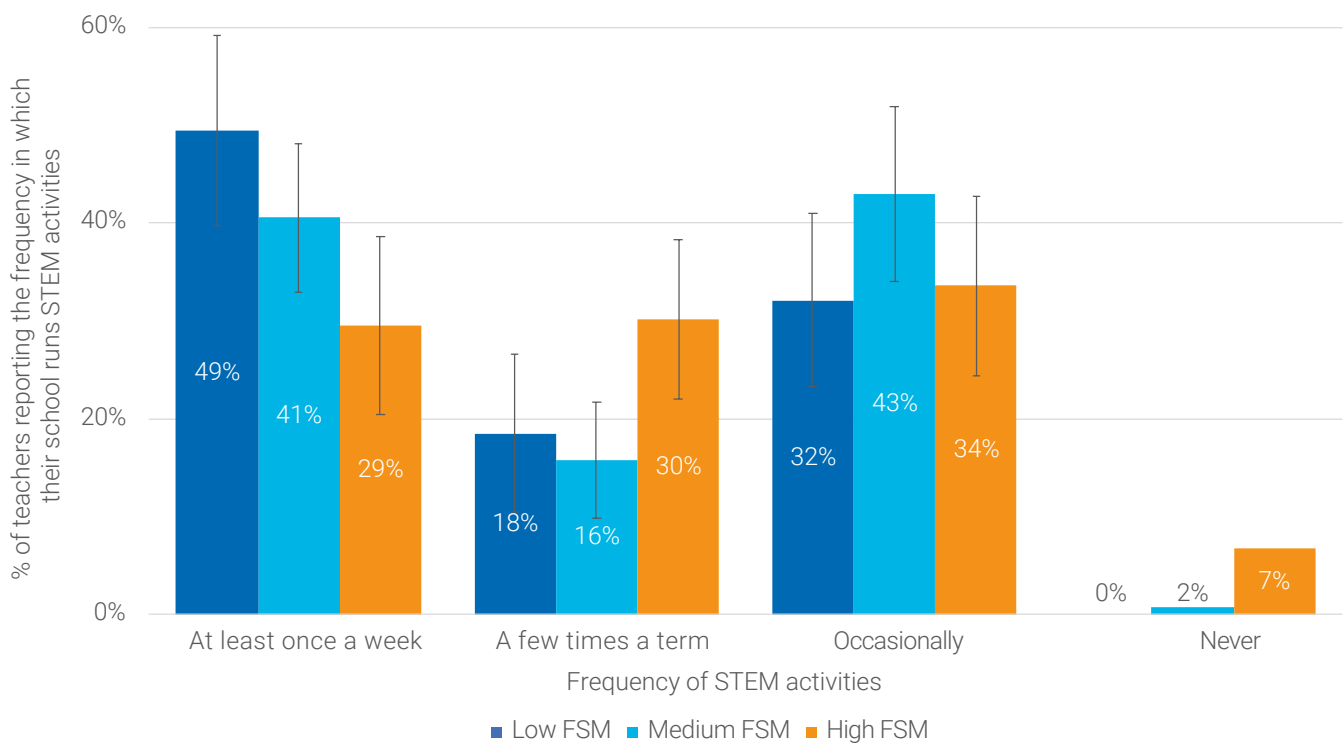
Around half of teachers in schools with low levels of free school meal eligibility reported carrying out STEM activities on a weekly basis, which is significantly higher than the 29% of schools with high levels of students eligible for free school meals. Many teachers at all

levels reported that they occasionally carried out STEM activities, with this meaning specific events within the school for example an off-curriculum day where STEM activities are the focus.

highlighting the need for dedicated resource for this kind of activity to introduce and interest the most socially disadvantaged young people.

Of most concern is the 7% of teachers in schools with high levels of FSM eligibility who never run STEM activities within their school,

Figure 4.2 Frequency of STEM activities in secondary schools by level of free school meal eligibility, UK, 2021



Source – Engineering Brand Monitor 2021

Q - Both inside and outside of the school environment, there are activities related to science, technology, engineering or mathematics (STEM) that your students may take part in. These STEM activities may include (but are not limited to) STEM clubs, STEM careers programmes run by external organisations (for example, Robotics Challenge) or STEM ambassador programmes.

How often does your school run STEM activities (virtually or in school)? For the purpose of this analysis, the options 'every day', 'a few times a week', and 'once a week' were combined to create the 'at least once a week' category and 'a few times a month' and 'a few times a week' were combined to create the 'a few times a term' category.

²³EngineeringUK. 'Our careers, our future', 2020

4.3 Issues and further support needed

Teachers were asked to take part in the 2021 EBM during a time of unprecedented flux as schools sought to balance every aspect of their students' education, with ongoing lockdown and school closures due to Covid-19 providing little time for careers activities. It is important to acknowledge this and the difficulties that have been faced in order to improve as restrictions begin to ease.

To better understand how the pandemic may have affected provision of careers information, advice and guidance, we asked teachers about their recent experiences and how they had been affected by the Covid-19 pandemic. Around half (49%) of teachers reported that their ability to provide students with advice and guidance about careers had become more difficult and an additional 10% that it had become much more difficult. There were no significant differences between teachers according to their own characteristics or level of FSM eligibility in their school, suggesting every school has faced difficulties throughout the pandemic and needs support to recover and provide students with what they need to understand and access a career in engineering.

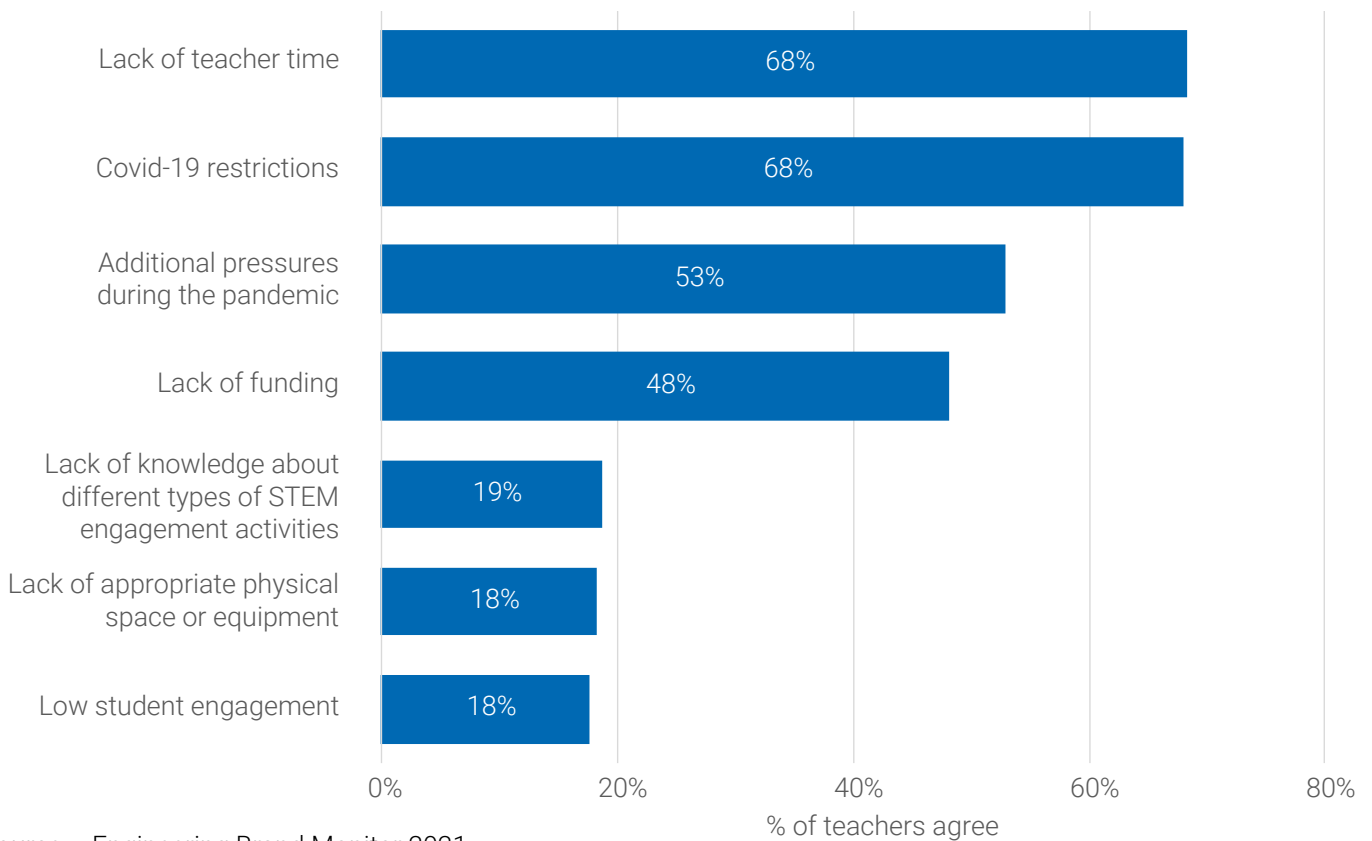
With that in mind, now more than ever, teachers need support in finding, designing and/or running STEM activities with their students.

To understand more, we asked STEM secondary schools about the factors that negatively affect their ability to run STEM activities either virtually or in school (**Figure 4.3**).

Around two thirds (68%) of teachers agreed that a **lack of teacher time and Covid-19 restrictions have negatively impacted their ability to run activities**, and around half (53%) agreed that they had been negatively affected by additional pressures during the pandemic. Around 1 in 5 teachers reported that a lack of knowledge (19%) or a lack of appropriate space and equipment (18%) was negatively affecting them, a notable proportion and something that could be improved with teacher training and more funding. Importantly we also saw that fewer than 1 in 5 teachers reported a lack of student engagement inhibited them, which shows that young people have retained interest in STEM activities, and this can be capitalised on to lead them into STEM careers.

7% of teachers in schools with high levels of FSM eligibility never run STEM activities within their school.

Figure 4.3 Factors that negatively affect a school’s ability to run STEM activities, UK, 2021



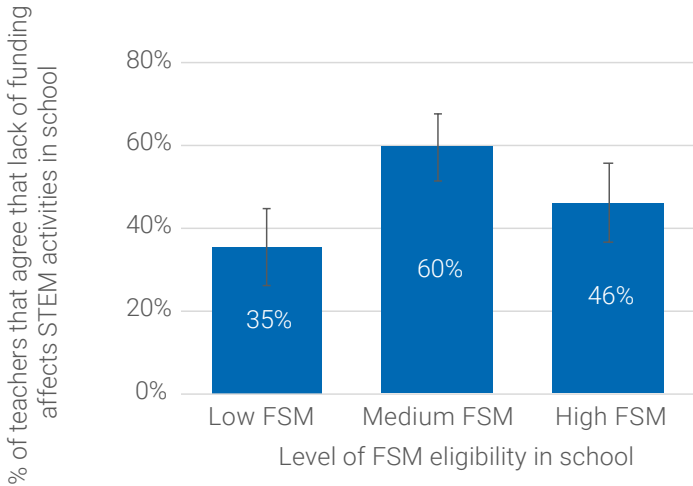
Source – Engineering Brand Monitor 2021

Q - Do any of the following negatively affect your school’s ability to run STEM activities virtually or in-school?
Please select all that apply.

Overall, 48% of teachers agreed that a lack of funding had negatively affected their ability to run STEM activities within their school. If we look at this by the proportion of children eligible for free school meals within the school (**Figure 4.4**), there are significant differences, as you might expect. However, perhaps unexpectedly, the highest agreement that funding is an issue comes from schools with medium levels of FSM.

48% of teachers agreed that a lack of funding had negatively affected their ability to run STEM activities within their school.

Figure 4.4 Percentage of STEM secondary school teachers that agree that lack of funding affects STEM activities in school, by levels of eligibility for free school meals, UK, 2021

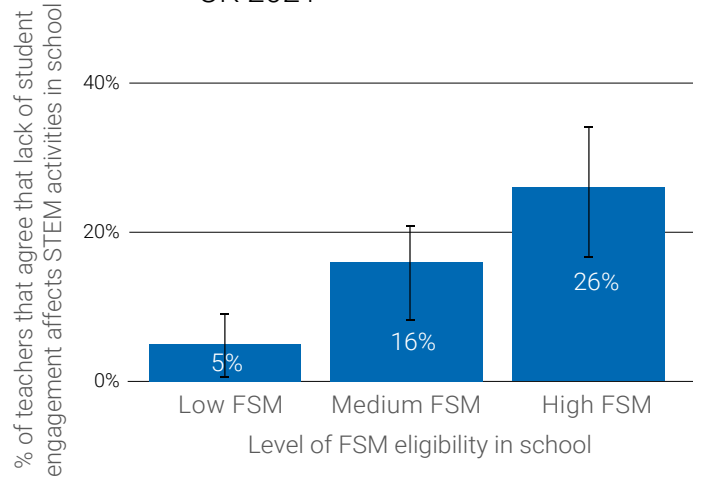


Source – Engineering Brand Monitor 2021

Q - Do any of the following negatively affect your school's ability to run STEM activities virtually or in-school? A lack of funding

Low levels of student engagement were also a factor that negatively affects schools differently dependent upon eligibility for free school meals (**Figure 4.5**), with a quarter of teachers in schools with high FSM reporting low student engagement compared with just 5% in those with low FSM. This may perhaps be linked to funding and resources, with around a half of teachers overall who reported low student engagement, also reporting that lack of funding had a negative effect on their ability to run STEM activities.

Figure 4.5 Percentage of STEM secondary school teachers that agree that lack of student engagement affects STEM activities in school, by levels of eligibility for free school meals, UK 2021

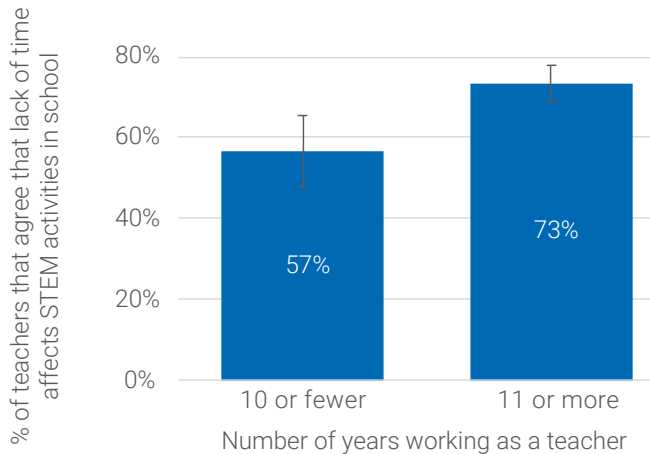


Source – Engineering Brand Monitor 2021

Q - Do any of the following negatively affect your school's ability to run STEM activities virtually or in-school? A lack of student engagement

There were few other differences seen between responses related to factors that have a negative effect on teachers' ability to run activities. However, one notable difference was that more experienced teachers (those who had been working as a teacher for more than 10 years) were more likely to report that a lack of time was an issue than those who had been teaching for 10 years or less. In fact, three quarters of teachers with 11 or more years' experience reported that lack of time was an issue, compared with 57% of newer teachers.

Figure 4.6 Percentage of STEM secondary school teachers that agree that lack of time affects STEM activities in school, by number of years teaching, UK, 2021



Source – Engineering Brand Monitor 2021

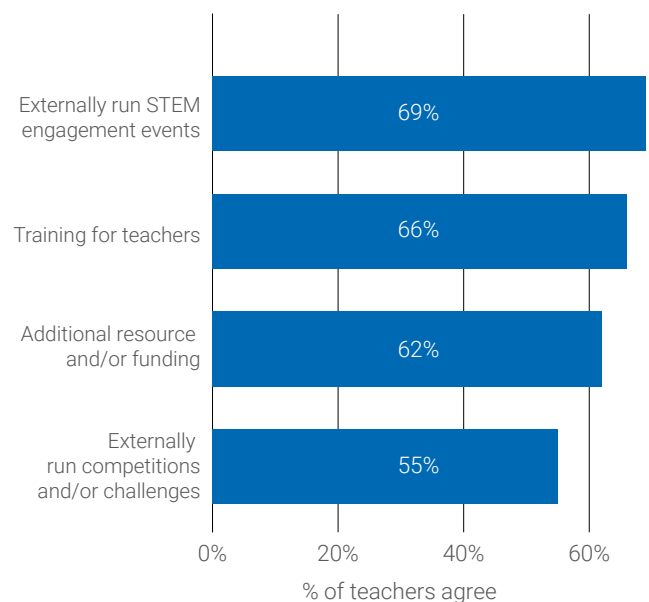
Q - Do any of the following negatively affect your school's ability to run STEM activities virtually or in-school? A lack of time

To improve the STEM experience for students in school, it is important that we listen to teachers and understand where they need additional support to bring subjects to life in the classroom, getting more students engaged for the future. Two thirds of teachers reported that additional support and/or funding would be needed to make this happen, and 62% reported that teachers need more training. There were also high levels of agreement that external involvement would be helpful support, with 69% agreeing that externally run STEM engagement events help to support the school curriculum and 55% wanting more externally run competitions and/or challenges such as EngineeringUK's Big Bang Competition. This suggests that schools are open to more

involvement from STEM employers and that more could be done to help support schools from external bodies.

There were no significant differences seen between responses based on the characteristics of the teachers, which shows that teachers from all backgrounds feel there is a need for further support to improve the STEM experience and engagement among students in general, which would ultimately lead to more interest and engagement with engineering pathways.

Figure 4.7 Further support needed by STEM secondary school teachers, UK, 2021



Source – Engineering Brand Monitor 2021

Q - STEM subjects have many real-world applications, and some teachers may wish to bring STEM subjects to life, by promoting a positive, compelling and authentic view of STEM, and showcasing the breadth of opportunities available. What further support do you need to bring STEM subjects to life for your students? Please select all that apply.

Who we are

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

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

Driven by data

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

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

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

The Engineering Brand Monitor, which establishes the national benchmark for public perceptions of engineers and engineering, is an annual survey of young people, STEM secondary school teachers and parents on their knowledge, perceptions and understanding of STEM and engineering.

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

