

Energy Quest: Programme Evaluation Year 3

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Executive Summary

Energy Quest (EQ) is a curriculum-linked programme for schools developed by EngineeringUK (EUK). It is designed to help students to learn about the role of sustainable energy and renewable technologies in engineering, and to encourage them to consider engineering careers as an option. EQ is delivered via two-hour workshops to Key Stage 3 students (11–14-year-olds), with a particular focus on groups underrepresented in the engineering profession.

Funded by Shell, EQ has been running for nine years and has so far reached 213,484 students in 1,350 schools across Great Britain. Over the past three academic years (2020/21–2022/23), EUK has worked with partners to develop, test and evaluate new content and delivery methods to maximise the impact of EQ on young people. During this period, three iterations of EQ have been delivered by external providers to 42,006 students in Years 7–9 in 450 schools across Scotland, Wales, and all regions of England.

This independent report by CFE Research presents the findings from the final year of a three-year process and impact evaluation of EQ. It draws on the findings from a large-scale survey and four case studies to consider the effectiveness of the revised Content 3, following changes made in autumn 2022 and rolled out to schools from January 2023, in addition to students' perceptions of the impact of taking part in the workshop.

Evaluation aims and objectives

The evaluation of EQ consists of two parts. The *process* evaluation assesses different approaches to the delivery, content and structure of the workshop to identify the most effective elements as well as areas for further improvement. The *impact* evaluation measures four primary outcomes:

1. Young people have accurate and positive perceptions of engineering and engineers.
2. Participants are encouraged to see a career in engineering as desirable.
3. Participants' understanding of sustainable energy sources and the role that engineers play in developing and implementing green technologies is improved.
4. Participants' knowledge of which educational choices facilitate a career in teaching or science, technology, engineering and mathematics (STEM) is improved.

Content 3 reach

The latest iteration of EQ, Content 3, has been successfully delivered to 11,060¹ students in Years 7–9, with 129 schools across Great Britain receiving at least one workshop. Over three quarters (76%) of schools that took part in a workshop were

¹ Of the 11,060 students who participated in EQ, 10,205 (92%) had demographic data.

classified as ‘priority schools’²; this is the highest proportion of schools meeting this criterion in the last three years. Of the schools that received a workshop, 20 percent took part in the evaluation. This resulted in 1,267³ responses to the post-workshop student survey, representing a 7% response rate. This lower response rate in Year 9 may be due to the limited amount of time teachers, delivery partners and EngineeringUK had to ensure the evaluation was included, as schools are busy, particularly post-pandemic. Content 3 also involved practical activities designed to be delivered concurrently by facilitators, who instead often opted to deliver these sequentially. In these cases, less time was available during the workshop for students to take part in the evaluation. On a positive note, there was a much higher completion rate for the post-workshop survey for Content 3.

Of those students who responded, 87% completed all of the survey questions and nearly four fifths of schools that took part in the survey were considered to be priority schools. Over half (52%) of students were in Year 7, and there was a relatively even split of males (43%) and females (51%). Content 3 survey respondents were more ethnically diverse than those of Content 1 and 2 — 27% were Asian, 10% Black, and 7% mixed.

Key findings

Delivery of EQ

- Communication between delivery partners and schools is generally effective and most teachers are prepared for the workshop.

Overall, the level of enjoyment among students is slightly higher for Content 3 than for previous versions of the workshop.

The practical activities are perceived to be the most interesting and most engaging element. Students welcome the opportunity to choose their practical activities.

7/10	6/10	7/10
Average level of interest in fruit battery experiment	Average level of interest in shelter task	Average level of interest in clean water task

Consistent with previous workshop versions, the storyline is perceived to be the least interesting part of the session. Students in Year 7 find the storyline more convincing and believable than older students.

² EngineeringUK defines as priority schools those that meet the organisation’s equality, diversity and inclusion (EDI) criteria based on a student population with higher numbers of groups typically underrepresented in engineering (e.g. girls, students eligible for Free School Meals, from a UK minority ethnic background or with special educational needs or disabilities). For more details see EngineeringUK EDI criteria (tomorrowsengineers.org.uk).

³ The survey data was quality assured ahead of the data analysis for the report, including a review of the ‘incomplete’ survey responses. A threshold for inclusion in the final dataset was derived and this resulted in a slightly reduced sample size (36 fewer cases) than the figure provided in the Year 3 KPI report.

Both students and teachers are positive about the introduction of the competitive element of the workshop in Content 3, saying that it helps to maintain engagement.

- Teachers recognise the content's links to the national curriculum as well as its role in highlighting the diversity of careers in engineering.
- Only some case study teachers have engaged with Neon⁴ following the workshop, which suggests that EUK should continue to proactively promote STEM enrichment resources to enhance sustained engagement.
- Nearly two thirds of teachers who responded to the EUK teacher survey would consider running the EQ workshop themselves, without an external facilitator, if they were provided with guidance and online resources. However, teachers and facilitators suggest that not all activities would continue, and that the facilitator role cannot easily be replicated by school staff. Expanding the number and diversity of organisations that can provide volunteer engineers to support school staff to delivery the workshop could enhance the content and provide an element of novelty for students.

Impact of EQ

Students report being more knowledgeable about engineering because of the EQ workshop:

<i>How much has your knowledge changed because of taking part in the Energy Quest workshop about:</i>	A bit more/a lot more knowledge		
	Content 3	Content 2	Content 1
The different types of things that engineers can do in their jobs	87%	87%	89%
The role that engineers play in developing technologies for renewable energy sources	81%	80%	82%
The range of careers that engineering can offer	NA ⁵	86%	88%

EQ is perceived to have a more limited impact on students' interest in STEM-related careers, the desirability of STEM careers, their confidence in becoming an engineer, and the likelihood of wanting to pursue an STEM-related career; this is nonetheless in line with expectations of a single-intervention workshop. After the workshop, however, students' reported interest increased the most for engineering in comparison to other STEM-related careers. Additionally, the proportion of students who are more interested in engineering careers because of taking part in EQ is higher for Content 3 than for previous versions of the workshop:

⁴ Neon brings together the UK's best engineering experiences and inspiring career resources to help teachers to bring STEM to life with real-world examples of engineering.

⁵ NA refers to questions that were removed from the Content 3 survey to reduce the survey length or that were not included in previous versions of the survey.

<i>How much has your interest in a future career that involves any of the following changed because of taking part in the Energy Quest workshop?</i>	More interested		
	Content 3	Content 2	Content 1
Engineering	45%	40%	41%
Technology	36%	30%	41%
Science	28%	24%	30%

Content 3 has a positive impact on some students' perceptions of the desirability of engineering careers. The proportion who regard engineering careers as more desirable as a result of EQ is higher for Content 3 than for Content 2:

<i>Has the extent to which you view a career in engineering as desirable changed because of taking part in Energy Quest?</i>	More desirable		
	Content 3	Content 2	Content 1
Students view an engineering career as more desirable because of the EQ workshop	43%	32%	38%

The Content 3 cohort report being more confident that they could become an engineer after taking part in the workshop than those who took part in Content 1 or 2:

<i>Has taking part in Energy Quest changed how confident you are about whether you could become an engineer if you wanted to?</i>	More confident		
	Content 3	Content 2	Content 1
Student confidence to become an engineer because of the EQ workshop	43%	37%	38%

The EQ workshop has some impact on the likelihood of students pursuing STEM careers. However, the workshop is most likely to change students' intentions towards careers in engineering:

<i>How much has the likelihood of you choosing a career in each of the following areas changed because of taking part in the Energy Quest workshop?</i>	More likely		
	Content 3	Content 2	Content 1
To choose a career in engineering	41%	35%	38%
To choose a career in technology	36%	30%	39%
To choose a career in science	32%	25%	29%

Following the workshop, students tend to have positive perceptions of engineering careers:

<i>How much do you agree or disagree with the following statements?</i>	Agree/strongly agree		
	Content 3	Content 2	Content 1

Engineering careers are open to people of all backgrounds	81%	75%	71%
There are opportunities to be creative in engineering careers	85%	NA	NA

Nearly two thirds (65%) of students agree that the workshop is enjoyable. Enjoyment along with participation in STEM activities outside of school and studying three or more STEM subjects are consistently associated with positive perceptions of EQ. In contrast, student demographics are not consistently associated with perceptions of EQ, implying that the workshop may be effectively engaging students of all backgrounds.

Recommendations

Energy Quest appears to have a positive impact on young people. The funding provided by Shell for mainstream EQ delivery ceased at the end of the 2022/23 academic year. This evaluation explored teachers' views about a teacher-led delivery model and the overall recommendation is that this model should go ahead via a soft launch with some adaptations to ensure the feasibility of such a model. The following recommendations are made in the context of both an external provider- and teacher-led delivery model. EUK should consider:

- Reducing the amount of material that school staff are required to review ahead of the workshop and providing a checklist of requirements to support teachers with their pre-workshop preparation.
- Providing school staff with a point of contact for queries prior to the workshop.
- Highlighting to teachers the aims of Energy Quest in order to help them question their unconscious bias about who engineers are and can be so that students from minority ethnic backgrounds and those who identify as female are as engaged in the workshop as white students who identify as male.
- Ensuring that sufficient equipment and resources are provided to schools well in advance of the session to enable any required modifications to be made (or amending the kit required to minimise the difficulty in obtaining it) and being clear about the kit requirements and who is expected to provide what.
- Encouraging the provision of support to facilitators during the workshop so that an element of student choice for the practical activities can be maintained.
- Devising an alternative storyline for Year 9 students to improve workshop engagement or considering only targeting Year 7 and 8 students.
- Re-emphasising the role of engineers in the energy sector in the workshop content.
- Increasing the interactivity of the non-practical activities and reducing the amount of time that facilitators spend on talking to students.

- Building on the competitive element of the workshop for both the practical and the non-practical activities.
- Enhancing opportunities for engineering volunteers to engage with students through face-to-face sessions or live remote video link formats.
- Expanding the number and diversity of organisations that provide volunteer engineers and ensuring that they place a greater focus on the role of engineers in the energy sector, the potential salaries that engineers can earn, the non-academic routes into engineering, and the scale of demand for engineers.
- Simplifying and condensing the workshop content for use as an 'off the peg' resource that can be effectively delivered by teaching and support staff in the context of a single or double period.
- Integrating the EQ workshop as part of the new Climate Schools and Big Bang Schools Programmes to ensure that students can engage in sustained STEM enrichment activity.

To understand how schools engage with new activity and a teacher-led model if it is implemented, as well as perceptions of the impact, robust monitoring and evaluation processes will be essential. Therefore, it is advisable that EUK consider:

- Developing a standardised data collection process that schools can easily follow when reporting on their participation to EUK programme teams. This will be especially important because previously it was the responsibility of delivery partners to complete a pro forma capturing monitoring data on the reach of EQ.
- Conducting school visits to observe the facilitation of school-led workshops.
- Evaluating the impact of school-led delivery on students' interest in STEM and career aspirations and collecting teacher and student feedback on their experiences and views of the workshop.

Introduction

This report by independent evaluators, CFE Research, presents the findings from the final year of a three-year process and impact evaluation of Energy Quest (EQ). It provides insight into teachers' and students' perceptions of the revised workshop (Content 3) and the emerging impacts of EQ on students' knowledge of engineering and associated careers. These insights are designed to inform any future development and delivery of EQ.

Background and context

EQ is a curriculum-linked programme for schools designed to help students to learn about the role of sustainable energy and renewable technologies in engineering, and to encourage them to learn about associated engineering careers. A core element of EngineeringUK's (EUK) strategy is to increase the number and diversity of young people who understand the range of career opportunities in engineering and who consider engineering to be a career option. The programme contributes to EUK's strategy by challenging perceptions of engineering and equipping young people with knowledge of the pathways into engineering to inform their decision making.

Funded by Shell, EQ has been running for the last nine years and has so far reached 213,484 students in 1,350 schools across Great Britain. EQ is targeted at young people at Key Stage 3 (11–14-year-olds) and designed to be engaging for girls and other groups that are underrepresented in engineering professions. Over the past three years (2020/21–2022/23), EUK has been working with partners to develop, test and evaluate new content and delivery methods to maximise the impact of EQ on young people. During this period, three iterations of EQ have been delivered by external providers to 42,006 students in Years 7–9 in 450 schools across Scotland, Wales, and all regions of England. Funding from Shell for mainstream EQ delivery ceased at the end of the 2022/23 academic year, which means that the future content and delivery model for EQ may change.

EUK commissioned CFE Research in October 2020 to undertake an independent evaluation of EQ to explore the effectiveness of different approaches to delivery as well as the impact of participation. The workshop content has been revised annually, informed by the evaluation findings.

Content design

EQ Content 1 ran from May to December 2021⁶. The session began with a video of a young person called 'Carlotta' who became lost in a forest and had a low phone battery as well as a friend (Ruby) who had been injured. The purpose of the video was to challenge students to think of ways in which to help Carlotta. After this introduction, participants engaged in a variety of activities, including a group-based practical activity and an energy quiz; moreover, they had the opportunity to hear from

⁶ Programme delivery was due to begin in January 2021 and run until July 2021. However, the COVID-19 pandemic resulted in a much smaller delivery window (May–July 2021).

an engineer. Due to COVID-19 restrictions imposed in 2021, Content 1 workshops were primarily delivered remotely, with only two workshops having a volunteer attend (both were remote attendees).

Content 2 was rolled out to schools from January 2022 until January 2023. In contrast to Content 1, almost all schools (94%) received Content 2 face-to-face, with workshops delivered in person by external facilitators. There was a target to ensure the presence of an engineering volunteer at half of the sessions; however, this target was not met. According to available monitoring data, 85 workshops (24%) were attended by a volunteer.

For Content 2, the workshop was restructured to ensure a clearer central narrative with Carlotta and the other workshop components. The energy quiz was removed in response to feedback that it was less effective than other activities. Two activities replaced the energy quiz:

1. 'Act like an engineer part 2' was modified to include a opportunity for students either to design a way for Carlotta to keep Ruby warm or to filter the water to clean Ruby's wound.
2. The 'What problems energy engineers try to solve' video was presented by an engineer who outlined how they used the engineering design process (EDP) to solve problems.

Content 3 ran from February to July 2023. The changes included reducing the delivery time from two to 1.5 hours and redeveloping the 'Act like an engineer' section of the workshop to provide two practical activities and one design activity that could be carried out concurrently. This was designed to give students more choice regarding the activities in which they could participate. A new activity called 'Which engineers can help?' was also introduced. This required students to choose from a selection of energy engineers who they would parachute in to help and to provide a justification for their choice. This activity was introduced to ensure that green skills were effectively integrated into the workshop. Like Content 2, Content 3 was primarily delivered in person by external facilitators. A small proportion of workshops had the participation of a volunteer (n= 66, 18%), underscoring the ongoing difficulty in involving volunteer employers in face-to-face activities.

Evaluation aims and objectives

The aims of the independent process and impact evaluation are to understand:

the effectiveness and perceived impact of different modes of delivery, structure and content and their applicability to the wider work of EUK,

any differences in perceived impact from the presence of an employer volunteer⁷ and the characteristics of the facilitator, and

⁷ There was a target to ensure a volunteer presence at 50% of the sessions.

changes in the motivations and behaviours of students as well as differences in the perceived impact of the programme by demographic subgroups with reference to EUK's impact framework.

The perceived impact of participating in EQ is measured against four primary outcomes:

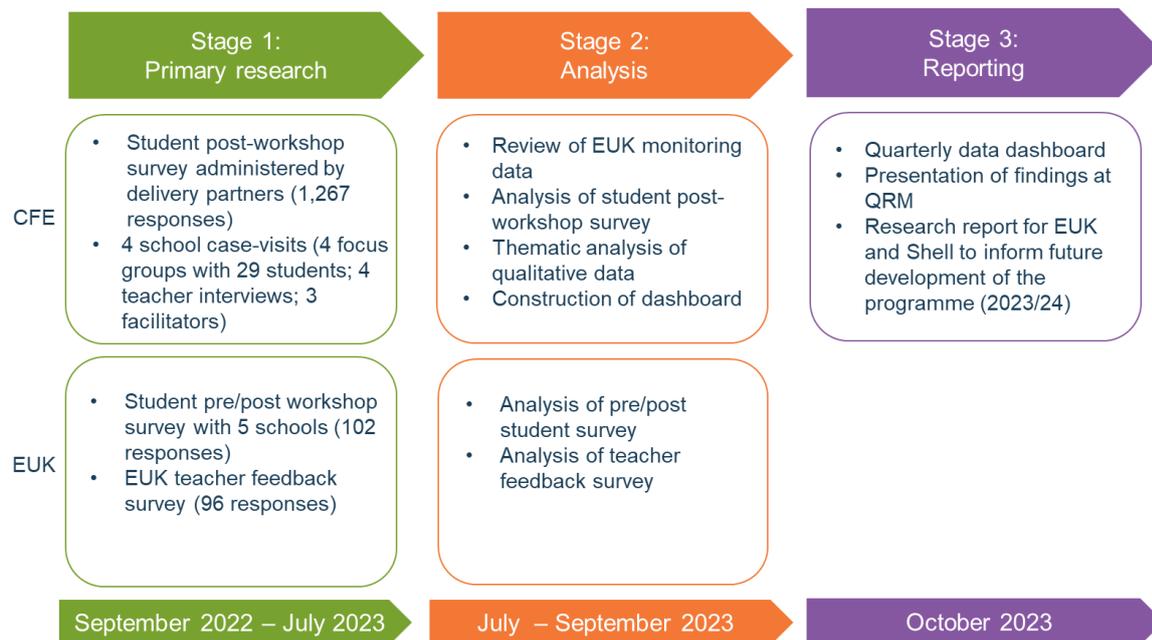
1. Young people have accurate and positive perceptions of engineering and engineers.
2. Participants are encouraged to see a career in engineering as desirable.
3. Improvement in participants' understanding of sustainable energy sources and the role that engineers play in developing and implementing green technologies.
4. Improvement in participants' knowledge of which educational choices facilitate a career in teaching or STEM.

The study design focuses on students' perceptions of change in these outcomes following the workshop, as the core evaluation only captures data following an EQ session. As in the second year of programme delivery, EUK conducted a pre–post design with a smaller number of students to capture change on key outcome measures. The findings of the pre–post evaluation are considered alongside the findings from the Content 3 post-workshop survey, where relevant, throughout the report. The full report is provided in [Appendix 3](#). Appendix 3Appendix 3Appendix 3Appendix 3Appendix 3Appendix 3

Approach

CFE implemented a mixed-methods approach for the evaluation, underpinned by a framework (see [Appendix 1](#)) that maps the research objectives to the immediate and longer-term outcomes and impacts of the programme. The approach, summarised in [Figure 1](#), combines analysis of EUK monitoring data (outlined below) with an online post-workshop survey for students as well as qualitative information derived from interviews and focus groups with teachers and students. Data from a teacher feedback survey and the pre–post student survey designed and administered by EUK are also integrated into the report findings.

Figure 1: Overview of the evaluation approach



Monitoring data

Delivery partners are required to complete a pro forma that captures monitoring data to assess the reach of EQ as well as progress against key performance indicators (KPI): gender of participants (target: 60% female students), ethnicity of students (top 25% ethnic minority students), characteristics of schools engaged (target: 50% of schools meeting EngineeringUK's EDI criteria and presence of an employer volunteer (target: 50%)⁸. Furthermore, the pro forma collects details on the school location, whether it is a priority school (yes/no), the characteristics of the workshop facilitator (gender, ethnicity, age), and a fidelity score based on facilitator reports of the extent to which key messages are delivered, ranging from 0 (not at all) to 10 (completely). During 2022-23, the EngineeringUK's operations team made efforts to brief delivery partners that they should communicate to teachers that the workshops were open to everyone, rather than targeting students with an existing interest in STEM. EngineeringUK's demographic survey, completed by teachers for Year 3, shows that 57% of teachers reported that all students from a class or a year group participated in EQ and approximately 20% reported that participated students were taking, or high achievers in STEM subjects.

CFE uses the monitoring data to assess whether the sample achieved through the student survey is broadly representative of the wider population of EQ participants and to explore the difference in the perceived impacts associated with programme characteristics (e.g. presence of a volunteer, proportion of students eligible for FSMs within the school). However, it is important to note that gaps in the monitoring data continue to limit the analysis that is possible in some instances.

⁸ KPIs were relaxed for delivery in 2020/21 due to the impact of COVID-19 on delivery.

Consultation with students

CFE modified the post-workshop survey (see [Appendix 2](#)Appendix 3Appendix 3Appendix 3Appendix 3) to reflect the content change in the workshop and reduce the overall length. The survey explores students' knowledge of and interest in engineering as well as the desirability of STEM-related subjects and careers. The extent to which any change in students' knowledge and attitudes is perceived to be attributable to the workshop is also captured in the survey. A question on the role of engineers in developing technologies for renewable energy sources is also included.

The survey is distributed by delivery partners to *all* schools that participate in a workshop. Teachers are asked to disseminate the survey to their students at the end of the workshop, in a later class session or as a science-based homework task. The total number of survey responses for Content 3 is 1,267, representing a response rate of 7%. This compares with 1,193 survey responses for Content 2 and 2,322 responses for Content 1.

Table 1 and Table 2 summarise the characteristics of the participating schools and students (based on the monitoring data provided by EUK) and the characteristics of those who responded to the survey.

Table 1: Programme reach and survey response rate

	Programme reach			Survey respondents		
	C3	C2	C1	C3	C2	C1
Total no. of schools receiving at least one workshop	210	112	120	43	39 ⁹	827 ¹⁰
Proportion of schools that are priority schools	76%	63%	31%	78%	54%	39%
Total no. of students taking part or responding to the survey ¹¹	19,484	11,861	9,584	1,267	1,193	2,322
Proportion of responding students who completed all survey questions	NA	NA	NA	87%	78%	81%

⁹ In four schools, only one survey response was received.

¹⁰ In 10 schools, only one survey response was received.

¹¹ Number of participating students and year group are based on data obtained from the monitoring information.

Table 2: Characteristics of participating students and survey respondents

Programme reach ¹²				Student survey respondents			
Year group	C3	C2	C1	Year group	C3	C2	C1
Year 7/S1	43%	25%	32%	Year 7/S1	52%	18%	53%
Year 8/S2	33%	38%	42%	Year 8/S2	25%	47%	30%
Year 9/S3	23%	29%	27%	Year 9/S3	23%	35%	17%
FSM eligibility	C3	C2	C1	FSM eligibility	C3	C2	C1
Receives FSM ¹³	NA	NA	NA	Receives FSM	13%	16%	17%
Ethnicity				Ethnicity	C3	C2	C1
Information not collected in monitoring data				Asian	27%	9%	13%
				Black	10%	5%	7%
				Mixed	7%	3%	5%
				White	45%	76%	65%
				Other	5%	1%	4%
				Prefer not to say	6%	6%	7%
Gender	C3	C2	C1	Gender	C3	C2	C1
Male	47%	54%	51%	Male	43%	49%	46%
Female	53%	46%	49%	Female	51%	40%	44%
Other/prefer not to say	1%	0.1%	0.05%	Other/prefer not to say	6%	11%	11%
Prior experience of STEM				Prior experience of STEM ¹⁴	C3	C2	C1 ¹⁵
Information not collected in monitoring data				Participation in STEM activities outside of school	63%	74%	37%
				No participation in STEM activities outside of school	37%	26%	36%
Knows somebody working in STEM				Knows somebody working in STEM ¹⁶	C3	C2	C1
Information not collected in monitoring data				Doesn't know anyone working in STEM	42%	50%	46%
				Yes, family member	26%	20%	22%

¹² There were uncertainties in the monitoring data relating to mixed year delivery and information about the year group was missing for some workshops, hence the final split does not add up to 100%.

¹³ FSM eligibility was not collected in the EUK monitoring data.

¹⁴ A total of 1,119 students responded to this question in the C3 survey.

¹⁵ Twenty-seven per cent of C1 respondents stated 'don't know'. This was not an option in the C2 survey, so the proportions are not comparable.

¹⁶ A total of 1,090 students responded to this question in the survey.

	Yes, parent or guardian	23%	17%	17%
	Yes, family friend	14%	14%	13%
	Yes, someone else	14%	13%	13%

CFE conducted field visits at four schools between March and June 2023, supplemented by telephone interviews. Participating schools were based in Wales, the East Midlands, the South West, and the Yorkshire and Humber regions. Schools varied in size from just under 800 to approximately 1,100 students. All participating schools were EUK priority schools. For three out of four of the schools, it was their first face-to-face EQ session. CFE facilitated an in-person focus group at each school with students who had participated in the workshop. A total of 29 young people in Years 7–9 were consulted about their experiences of EQ as well as their views on the impact of the workshop on their knowledge of and interest in engineering.

Student pre- and post-workshop survey

The Content 1 student survey contained several questions that were also included in the Engineering Brand Monitor (EBM)¹⁷. The aim was to compare the self-reported outcomes of EQ participants with the outcomes reported by EBM respondents who shared similar characteristics in order to understand the impact of the programme. Although this analysis provided some additional context and insights for the report, it was not possible to attribute any differences in the outcomes achieved to EQ¹⁸. As a result, the decision was made to discontinue this analysis.

Instead, for Content 2, EUK introduced a pre–post methodology designed to measure actual change in participants’ knowledge of and attitudes towards engineering to better understand the impact of the programme. EUK continued this approach for Content 3. Students were invited to complete a survey prior to taking part in EQ to measure their existing knowledge of and attitudes towards engineering. They were then asked to complete a second survey at the end of the session that was designed to capture any change. EUK achieved 102 matched student responses from five schools. EUK analysed the data, and a summary of findings is included in this report (see [Appendix 3](#)).

Consultation with teachers and facilitators

CFE interviewed a staff member from each of the four case visit schools who was involved in the setup and/or facilitation of the session as well as the external facilitator. The interviews explored teachers’ and facilitators’ views on the content and structure of the workshop.

Information from the student focus groups and the teacher and facilitator interviews was coded and analysed thematically. The qualitative research with teachers was

¹⁷ The EBM was an annual survey run by EUK since 2010 asking young people aged 7–19, parents, and STEM secondary school teachers about their perceptions, understanding and knowledge of STEM and engineering. <https://www.engineeringuk.com/research/engineering-brand-monitor/>.

¹⁸ There were unobservable differences between the two groups of respondents that could not be controlled for in the analysis, including participation in EQ among EBM respondents.

supplemented by data from a teacher survey that was designed by EUK to explore teachers' experiences of EQ (see [Appendix 4](#)). The survey generated 96 responses, with three out of five teachers (60%) indicating that they taught two or more STEM-related subjects. Four out of five teachers (79%) were from priority schools (i.e. that met EUK's EDI criteria).

Analysis framework

Although this report focuses on the results of the evaluation of Content 3, where possible, student perceptions are compared with the perceptions of students who received previous iterations of EQ to provide some additional context for the results. It is important to note that different student cohorts received the different versions of the workshop. This means that the findings are not directly comparable and it is not possible to attribute differences in student perceptions of Content 1, 2 and 3 to the workshop and conclude whether one version is more effective than the others.

We adopted an iterative approach for exploring student perceptions of Content 3 based on their responses to the post-workshop survey. This involved top-line analysis of each of the outcomes of interest, followed by logistic and linear regression analysis to understand the range of student and workshop characteristics associated with the different programme outcomes. A series of binary outcome and predictor variables were constructed for the logistic and linear regression models (Table 3). Two of the predictor variables included in the regression models can be viewed as outcomes in the post-workshop student survey (enjoyment of the workshop and choosing to study an STEM subject). These two variables are included as predictors in the models because they are precursors to the short-term outcomes that the workshop is designed to achieve. Regression findings are only reported if they are significant at the $p < .05$ level as a minimum, and are presented in order from the most to the least significant throughout the report.

Table 3: Summary of the predictor and outcome variables included in the regression models

Outcome measured ¹⁹	Coding
Perceptions of EQ workshop delivery (wanting to find out more about engineering as a career and wanting to do more science- or engineering-related activity in the future)	Agree versus disagree/neutral
Knowledge of engineering	Agree versus disagree/neutral
Knowledge change of engineering	Bit more/lot more knowledge versus no change
Interest in engineering career	Agree versus disagree/neutral
Interest change in engineering career	More interest versus less/no change

¹⁹ Two survey items were removed from the C3 survey about students' perceptions of the suitability of engineering careers and the change in perceptions of the suitability of engineering careers.

Perceptions of engineers and engineering	Agree versus disagree/neutral
Desirability of engineering career	Agree versus disagree/neutral
Change in desirability of an engineering career	More desirable versus less desirable/no change
Confidence that could become an engineer	Yes versus no
Change in confidence that could become an engineer	More confident versus less/no change
Likelihood to pursue engineering career	Likely versus unlikely/neutral
Change in likelihood of pursuing an engineering career	More likely versus less likely/no change
Perceptions of interest about workshop elements	Full scale used (0 = very boring to 10 = very interesting)

Model predictors ^{20,21}	Coding
Choosing to study an STEM subject (biology, chemistry, physics, maths, computing/computer science, design and technology)	Chose 0–2 STEM subjects versus 3–6 STEM subjects ²²
Enjoyment of the Energy Quest workshop	Agree versus disagree/neutral
Participation in STEM activity outside of school	Yes versus no
Knowing someone in an STEM-related career	Yes versus no
Year group	Year 7, Year 8, Year 9
Gender	Male, female, other (non-binary, questioning, prefer to self-describe)
Ethnicity	White versus minority ethnic groups
Free School Meal status (FSM)	Yes versus no
School meets EUK's equality, diversity and inclusion criteria	Yes versus no

²⁰ Please note that, due to missing data, variables to indicate the session fidelity score, the presence of a volunteer, and characteristics of the session deliverer could not be included in the regression models. Additionally, there was an insufficient sample to include the school location (urban vs. rural) as a predictor in the regression models.

²¹ The survey item on students' 'knowledge of subjects needed to become an engineer in the future' was removed in the C3 survey.

²² The C2 analysis was based on whether students would choose to study any STEM subjects versus none of these subjects. The distribution of responses to the C3 survey indicated that very few students would not choose an STEM subject. Therefore, a more informative threshold for the C3 analysis was 0–2 versus three or more subjects.

Delivery of Energy Quest

In this chapter we explore the effectiveness of the delivery of Content 3 and how this compares to that of previous versions. The findings are informed by the post-workshop student survey and qualitative research with students and teachers. The primary data are supplemented by data from EUK's teacher feedback survey.

Key findings

Pre-workshop engagement

- Pre-workshop engagement between schools and delivery partners is largely effective. However, simplifying and consolidating the information on practical activities would enable school staff to better understand the workshop requirements and would help them with their upfront preparation.

Workshop content and delivery

- Teachers recognise the content's links to the national curriculum as well as its role in highlighting the variety of careers in engineering. This could be important in securing buy-in to extracurricular programmes such as EQ.
- Teachers appreciate the flexible session length introduced for Content 3. Shorter sessions can be better integrated into the school timetable and are a good fit for younger and/or lower-ability students.
- Consistent with previous workshop versions, the storyline is perceived to be the least interesting part of the session. Students in Year 7 find the storyline to be more convincing and more believable than do older students.
- Students and teachers welcome the opportunity to choose which practical activities they undertake. According to some facilitators, however, this makes the sessions more complicated to run.
- The addition of the competitive element to Content 3 helps to maintain student engagement and encourages students to immerse themselves in the activities.
- Overall, a higher proportion of students report that they enjoyed Content 3 in comparison with previous versions of the workshop. Students in Year 7 enjoy the workshop more than do students in Years 8 and 9.

Post-workshop engagement

- Some teachers engage with Neon following the EQ workshop, but there is scope for EUK to proactively promote STEM enrichment resources to enhance sustained engagement.
- Teachers perceive that the workshop has increased the profile of STEM within their schools and stimulated greater interest in STEM careers and related activities among students.
- Nearly two thirds of teachers who responded to EUK's teacher survey would consider running the workshop themselves, without an external facilitator, if they were provided with guidance and online resources. However, not all activities would continue if this model were implemented and there is a view that the facilitator role cannot easily be replicated by school staff.

Pre-workshop engagement

The school case visits provide insights into their experiences of preparing for the workshops. All of the four schools that took part in a case visit reported that liaising with delivery partners was straightforward and that workshop dates and times were efficiently arranged. Pre-session communication regarding the content, resources and facilitators was also generally felt to be helpful.

I saw the resources very helpful, very informative. We use it to put all our kit together, tell them what we're going to do, and, again, it provides a clear idea of what we were up against during the day in the sense of what the facilitators are doing, when we need to get a kit out, that kind of thing. It's good.

Case visit teacher

Individual facilitators had little contact with schools before their EQ sessions, which limited the amount of tailored support that they could offer to schools in advance of their workshop. One teacher suggested that providing more information to students on the facilitator's background ahead of the workshop could help to generate more student interest and engagement. Another teacher also suggested that having this information in advance would help them to introduce and complete the inner engineer quiz before the workshop (as recommended by EUK).

Two out of the four schools conveyed that they were given too much advance information on the Content 3 workshops, which resulted in them being 'confused' and 'overwhelmed'. These staff members would have preferred to receive only one briefing document or a simplified list of requirements. Another teacher described finding the information on sourcing equipment to be confusing until they received a resource pack to support the workshop. This was a view reflected by two of the facilitators interviewed who felt that there was a need to streamline the information provided on Content 3. Because of the amount of information supplied, case visit teachers did not always have time to fully review the EQ materials prior to the workshops. School staff had limited time to prepare for the workshops and could not always provide staff cover for the sessions. Information sent to schools should be as succinct as possible because of the time pressures that school staff face.

I think the original bulk of the information was probably a bit too much.

Case visit teacher

We did struggle a little bit with the equipment because that's a new practical for us, so there was a little bit of confusion about where the equipment was to be sourced prior to the activity taking place.

Case visit teacher

I think this version of Energy Quest asks a lot of the schools and it's more likely for things to get missed or confuse them.

Case visit facilitator

Overall, these findings reflect staff perceptions of previous versions of EQ that the pre-workshop engagement is generally effective. However, some aspects of Content 3 may be more complex for teachers to grasp than in previous years²³ because of the new practical activities. If the same practical activities are offered in future iterations, EUK should consider simplifying and condensing the pre-workshop materials to help school staff to understand the workshop requirements.

Workshop content and delivery

The main changes for Content 3 were designed to address concerns surrounding the session length, make the content more accessible for younger age groups of all abilities, increase enjoyment of the non-practical aspects of the workshops, and add more choice for students. As such, Content 3 was designed to:

- Reduce the content of core activities to enable the workshop to be delivered in 1.5 hours, with extension content available depending on the circumstances (taking the workshop to a two-hour experience if required).
- Ensure that the content can be adapted in order to suit individual school timetables, with a set of optional activities ('Discover your inner engineer' quiz, 'This is engineering' film, and follow-up activities which can be utilised as extensions for older groups).
- Redevelop the 'Act like an engineer' activity, creating two practical activities (fruit battery and water filtration) and a design activity (design a shelter) that can be delivered concurrently, and provide delivery partners with the necessary kit to run the practical sessions.
- Give students the opportunity to choose their preferred practical activities from the three available.
- Introduce a new, fun activity which connects the practical experiments to engineers working in green energy ('Parachute an engineer').

Teachers recognise the links between EQ and the national curriculum, which is important in fostering school engagement with extracurricular programmes such as EQ. Positively, findings from the EQ teacher survey show that 97% of teachers agreed (30%) or strongly agreed (66%) that the workshop has clear links to the curriculum. This mirrors the findings from the Content 2 survey.

Session length

In case visit schools, facilitators had generally run the session over two hours, although they reported that they could, and had, varied this according to school needs. In one school, for example, the workshop was run before and after the lunch break, and in another school the session was completed in 50 minutes. Where the

²³ Only one of the four case visit schools had participated previously, so teachers in these schools were unable to comment directly on this.

content was tailored in order to fit in with the school timetable — a revised feature for Content 3 — this was appreciated by the school and generally worked well.

Some facilitators experienced student engagement issues when the session was two hours long, which made it more challenging to manage later workshop activities. For example, some students found it challenging to concentrate when volunteers were introduced towards the end of longer workshops. Longer sessions were felt to be particularly challenging for Year 7 students, as they are normally only asked to sit for around one hour in a typical class.

The engineer nearly always comes at the end of the session, so then right at the end of the session you're like, 'Here's someone on Teams to talk to you who never normally speaks to people your age and is going to talk to you about their profession for 10 minutes'.

Case visit facilitator

Students' views on the length of the session varied. Whilst some felt that the content could have been covered more quickly or that there needed to be more content to fill the time, others enjoyed having extra time to explore the topics and complete the practical activities.

I think it could have been done in a shorter amount of time, but it's better that it was done in the time that it was done in.

Case visit student

Teachers generally agreed that the facilitators took too long to introduce topics. This resulted in some younger and/or lower-ability students finding it difficult to concentrate for the entire workshop. Generally, school staff fed back that the sessions would benefit from being more interactive, with less talking by the facilitator as well as more practical content.

From a teacher's point of view, it probably would be better to try and lessen the theory a little bit and introduce the practical bit a bit earlier on [...] chop it up a little bit because you had a whole lesson of theory and then you had a lesson of practical, where some of the kids struggle to sit and listen for 50 minutes and retain what they're doing.

Case visit teacher

Storyline

Consistent with perceptions of Content 1 and 2, students regarded the storyline as the least interesting aspect of EQ (mean interest = 5.8 on a scale of 0–10) ([Figure 2](#)), although Year 7 students (mean = 6.2) find the storyline to be more interesting than do older students in Years 8 (mean = 5.7) and 9 (mean = 5.2). Case visit students had mixed views on the storyline. One group of students did not find the story to be convincing or believable, describing it as 'daft', and could not see how anyone could get themselves into that situation. However, another Year 7 student group reported

that they related well to the characters and situation, enjoying the cliffhanger in the video. One facilitator felt that it was necessary to add some storytelling to the video to really engage students.

I'm like, 'It's gone bad to worse for Ruby — this has happened, the wind', and try and do a bit of storytelling and they're like, 'What? It's gotten even worse?' And I'm like, 'Yes, it's got worse', and it's tongue in cheek, but they enjoy that sort of urgency around it.

Case visit facilitator

Another facilitator reflected on their experience of working with different age groups. They described that pupils from Years 7 and 8 tend to get the most out of the sessions and immerse themselves in the storyline because they are keen to be involved and answer questions.

Year 9s are the most difficult. They are a “negative sweet spot” — they're not quite in Year 10 when they're having to seriously think about what they want to do and they feel a bit too old, you know. They're at the age where they don't want to put their head above the parapet in any way for fear of embarrassing themselves or anything like that. So you're much more likely in Year 9 to have a group that, you know, doesn't respond at all.

Case visit facilitator

Further findings from the regression analysis show that the following characteristics are associated with greater interest in the storyline:

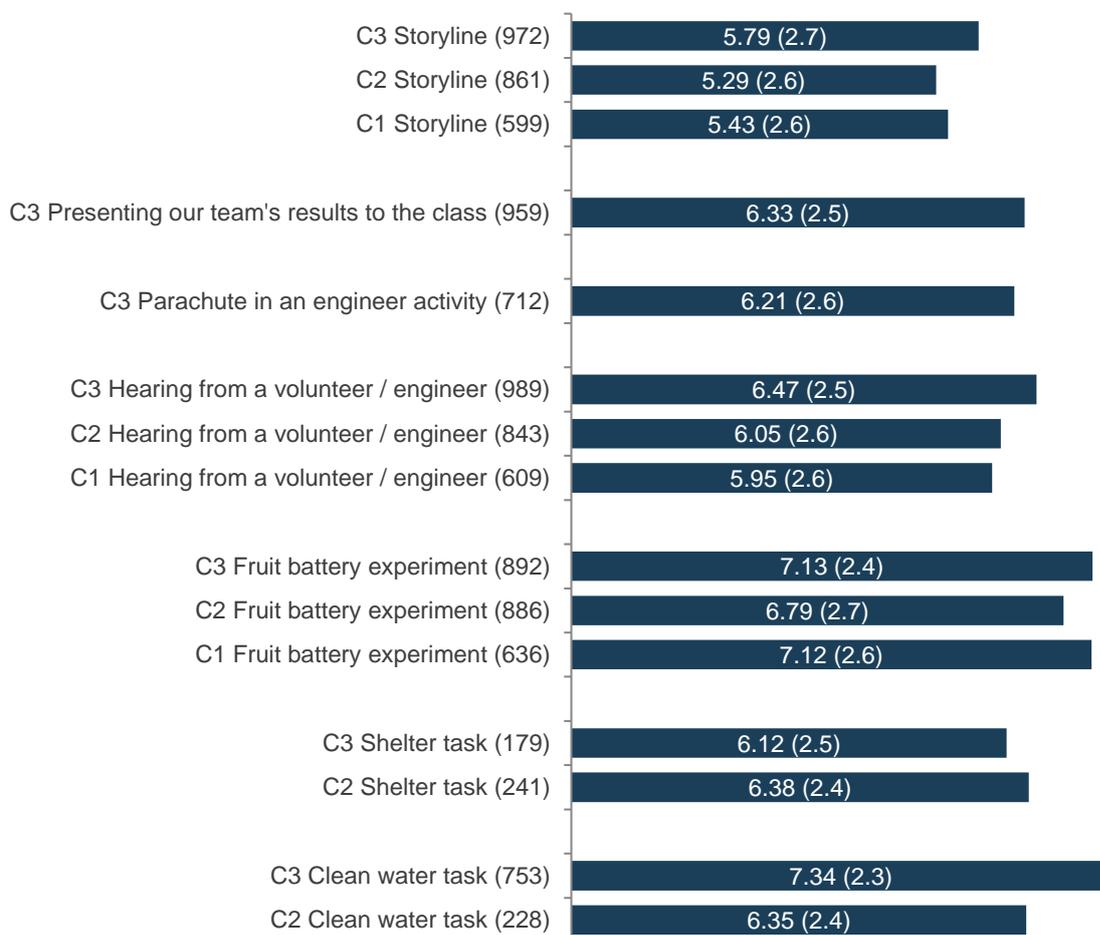
Students in Year 7

Students who would choose to study three or more STEM subjects

Students who report that they enjoyed the workshop

Few student characteristics are associated with perceptions of the storyline, which suggests that it equivalently impacts underrepresented groups in STEM. The overall evidence suggests that the storyline can work well, at least for some students, and for younger age groups in particular. This element of the workshop may therefore be something which students simply find to be intrinsically less engaging than the practical aspects of the session ([Figure 2](#)).

Figure 2: Average level of student interest in aspects of EQ (mean rating and standard deviation in brackets, 11-point scale, where 0 is 'very boring' and 10 is 'very interesting')



Presenting our team's results

Content 3 was modified in order to introduce an element of competition, and students were tasked with evaluating which team they thought to be the best at 'thinking like an engineer'. Each group shared the results of their practical activity with the whole class, and students were asked to discuss and rate, using assessment criteria, which groups' solution would work the best.

Students perceived this activity to be quite interesting (mean interest = 6.3) and the regression analysis shows that several characteristics are associated with higher interest levels:

Enjoyment of the workshop

Students who participate in STEM activities outside of school

Students in Year 7

White students

Several case visit students shared positive views on the competitive element included in the workshop. Some students would have liked even more competitive

elements, with suggestions of a practical such as ‘see who can achieve the highest voltage’, as well as creating a league table of the success of different materials in the battery task. Another group of students suggested giving people the opportunity to work on their own following group tasks to see if they could further improve group results.

It was like people thought they’d get a sense of accomplishment and it would cheer them up a bit. So they wanted to do it and try and make it as clear as possible.

Case visit student

Case visit teachers also observed their pupils responding well to the competitive elements of the workshop. They felt that students gained a sense of achievement and enjoyed the challenge.

They were pleased within their own little groups and then they began to compare their group with their friend’s group next to them or on the other side of the room. And there was starting to be a bit of a competitive spirit between the students and the groups in the room, so, most definitely, they felt a sense of achievement.

Case visit teacher

‘Parachute in an engineer’ activity

Another new aspect of Content 3 is the ‘Parachute in an engineer’ activity. This activity follows the team presentations and requires students to choose from a selection of energy engineer profile cards and which person they would parachute in to help in different engineering scenarios. Students are asked to discuss and justify why they think that their selection will be the best. For example, they are asked to discuss what skills different engineers will bring and how they will be useful.

Overall, students perceive this activity to be relatively interesting (mean interest = 6.2), but it is rated as less interesting than the practical activities and the other non-practical activities. Results of the regression analysis show that the following characteristics are related to higher interest levels:

Enjoyment of the workshop

Students who participate in STEM activities outside of school

Students identifying as male

Knowing someone who works in an STEM-related career

All of the case visit schools participated in this activity, and school staff felt that this element worked particularly well for younger students to stimulate their thinking regarding engineering careers. Some focus group students enjoyed this activity because they thought that it was the most different in comparison with their standard science lessons (whereas they were more familiar with some of the practical elements of the workshop). One suggestion from students was to schedule this activity between the practical elements to give the workshop a better balance.

I think that choosing the engineer to parachute in was better because most of the other stuff I'd either done at Scouts or in primary school. So it was something different.

Case visit student

Facilitators' views on this activity varied — whilst one facilitator said that this was an element that they would drop if time was short, another commented that they always undertake this activity because the students 'love it'.

Practical activities

The Content 3 practical activities comprised the 'fruit battery experiment' on how to charge a phone, a 'water filtration design' activity on how to clean Ruby's wound, and the 'shelter activity' on using properties of materials to keep warm.

Students rated the group-based practical tasks as the most interesting part of EQ, with students who took part in Content 3 rating the practicals as slightly more interesting than those who participated in Content 1 or 2 ([Figure 2](#), above). This could indicate that the changes made to the content and format of the Content 3 practicals have improved the workshop by more effectively engaging students.

Students rate the 'clean water task' (mean = 7.3) and the 'fruit battery experiment' (mean = 7.1) as the most interesting practical activities and most engaging activities overall. Students find the 'shelter task' to be slightly less interesting (mean = 6.1). Case visit students also tended to prefer the clean water and fruit battery activities. One group of students felt that the shelter task could be enhanced if they then proceeded to build a model of the shelter that they had designed.

I liked the fruit battery because I think it's a good life lesson as well, because if you were ever stranded by yourself, you'd know how to make a battery.

Case visit student

At one school, the facilitator dropped the shelter task because their experience in other schools was that few students chose this activity when offered the choice of all three. Another facilitator reflected that students tend to choose activities that look the most hands-on, even amongst the practical options.

The filtration exercise can involve even the most challenging of students. Once they're getting to grips with it, once they're getting the water poured through, it's a real visual impact of whether they've done a good job or not. They get really into it and they can all have a go because really it's just arranging stones, sand, cotton wool, how you think it might work, and giving it a go.

Case visit facilitator

The practical activities appeal more to younger students. Those in Year 7 perceive the 'clean water task' (Y7 mean = 7.7) and the 'fruit battery experiment' (Y7 mean = 7.5) to be more interesting than do older students in Years 8 (clean water task mean

= 7.2; fruit battery experiment mean = 6.8) and 9 (clean water task mean = 6.8; fruit battery experiment mean = 6.6).

Insights from the school case visits suggest that older students could complete the practical with less instruction, having conducted a similar experiment in the past. One facilitator reported finding it more challenging to work with younger students because they had less experience of running practicals and using the equipment. The novelty of practical work for younger students, however, may help to explain their higher ratings.

The regression analysis confirms that age is significantly associated with interest in the practical activities, with older students (Year 9) less likely than younger students (Year 7) to find the practical activities to be interesting.

Further findings from the regression analysis show that the following characteristics are also associated with higher levels of interest in the practical activities:

Enjoyment of the workshop

Students who would choose to study three or more STEM subjects

Students who identify as male (fruit battery experiment only)

Not knowing someone in STEM (shelter task only)

Priority (EDI) schools (clean water task only)

Interviews with facilitators and students highlight some of the reasons as to why the more practical elements are preferred. One group of students described how they enjoyed being able to repeat the exercise, test new approaches, and undergo the process of trial and error to obtain the best results. Another group described how they enjoyed working in smaller groups as part of a team, which enabled them to use their initiative and develop their own ideas. Other students described how they enjoyed using the materials from the backpack in interesting ways:

I think when you're with a team, you really put your mind to it — to, like, not show off in a way, but get your idea out there.

Case visit student

I think it's better to do some hands-on stuff because it's, like, more experience and you're most likely to remember it.

Case visit student

Teachers also felt that the practicals worked well and engaged students effectively:

The practical tasks were pitched perfectly. The kids really enjoyed them. They were explained really well. The kids engaged with them really well and understood what they were doing and they were challenged as well, which I really liked.

Case visit teacher

Facilitators conveyed that the Content 3 practicals have been more challenging to set up and run than previous versions, particularly the water filtration task. Facilitators sometimes found that they were not offered an appropriate space in schools to run the sessions (e.g. being asked to run the practicals in gyms). If schools have not read nor understood the information provided in advance by the delivery partners, this can affect how well the activities run:

Since they changed the content, a water filtration exercise has been added, which requires quite a lot of materials. That's really widened the margin for error of what we get when we come into schools.

Case visit facilitator

The water filtration exercise can also be quite messy and is most effective when carried out in a laboratory setting. In previous workshop versions, where schools were tight on space, facilitators could use any available room. Facilitators could work in non-laboratory settings if schools could provide trays, but schools had not received this guidance in advance of the sessions. Another facilitator felt that Content 1 and 2 better supported students with the practical aspects of the workshop, so they continued to use the earlier materials to support Content 3:

It's a lot more helpful to do the workshops in a lab sort of environment, where you have sinks, things like that, as in a science class really.

Case visit facilitator

Case visit facilitators reported that some schools did not receive the correct materials and/or the correct quantities to support the practicals:

EUK provides glitter for one of the experiments which is not environmentally friendly and is not popular with schools. It would therefore be better to ask schools to provide a jug of dirty water or soil for this element.

The amount of materials provided to schools is not always appropriate. For example, delivery partners sent a small bag of gravel to schools which was only sufficient for one experiment, not a whole class.

The paper list of items does not include oranges, which is a required element for the fruit battery experiment.

There does seem to be a discrepancy in terms of what is thought to be needed and what is actually needed for the practicals. Usually I would just blame the school, but after EUK sent over that stuff, it's clear that there's a bit of confusion amongst them of what's actually needed for this experiment as well.

Case visit facilitator

A key change for Content 3 was to offer students a choice of practical activities. However, none of the facilitators interviewed felt able to run three practical activities simultaneously if they were delivering the session alone (i.e. with no volunteer nor school support staff). As a result, most facilitators did not offer the full choice of three practicals to students. Instead, they focused on one mandatory activity and then a

choice of two activities. Alternatively, they would deliver the three practical activities with the whole group sequentially. Case visit teachers did not necessarily view student choice to be an advantage, although most students liked being able to choose which activity they undertook.

How I tend to run it is I will ideally get them all to do the fruit battery experiment and then after that they'll all do the water filtration task. I skip option B, which is the shelter design task. That method seemed to work well.

Case visit facilitator

Non-practical activities

The non-practical activities are designed to develop students' knowledge and awareness of the range of roles in engineering and demonstrate how students' interests could lead to a career in engineering. Mirroring the Content 1 and 2 findings, students perceive the Content 3 non-practical activities to be slightly less interesting than the practical tasks. Older students in Year 9 consistently rate the non-practical activities as less interesting than do younger (Year 7) students.

Meeting an engineer

Integrating volunteer engagement with a focus on sourcing relatable role models working in jobs related to green skills was more of a focus for Content 3 than for previous versions of the workshop. This section of the workshop is designed to provide students with the opportunity to meet a 'real' engineer (in person or via a pre-recorded video) and to ask about the problems that they solve in their jobs. It is the penultimate activity before the workshop is completed. Less than one fifth of workshops (n = 66, 18%) were attended by an engineering volunteer, highlighting that it remains challenging to engage volunteer employers in person.

Consistent with previous versions of the workshop, students perceive the opportunity to 'meet an engineer' to be the most interesting aspect of the non-practical activities (mean interest = 6.5).

The regression analysis shows that the following characteristics are associated with higher interest levels in the 'Meet an engineer' activity:

- Enjoyment of the workshop
- Students who participate in STEM activities outside of school
- Students in Year 7
- Students who would choose to study three or more STEM subjects
- Students who identify as male
- Findings from the EQ teacher survey show that most teachers (93%) agreed or strongly agreed that EQ highlighted the variety of careers in engineering and technology.

Some case visit students reported that they found the 'Meet an engineer' activity to be engaging because it provided them with interesting information on the different types of engineering careers that are available. In one case visit school, students

who reported being more aware of how to get into engineering roles after the workshop felt that it was the ‘Meet an engineer’ activity that raised their awareness. Furthermore, students from another school described how this activity helped them to develop a fuller understanding of what STEM means. In contrast, some case visit students found this activity to be less interesting. They described how watching videos and commenting on the content was an activity that they remembered from primary school and that it was too young for them.

Case visit teachers generally felt that this was a particularly useful element of the workshop in terms of career information, even if it was less engaging for students:

I found it useful because it's quite inspirational for the students. They don't often get to see and talk to people that are in any industry and talk about their careers [...] it gives a firsthand account of someone who's in engineering, rather than someone divulging what they've been told regarding these people in engineering and their careers.

Case visit teacher

Facilitators also reflected that this activity was important in educating students about engineering careers, although a couple commented that the new video was less engaging for students than were previous versions. One of the teachers interviewed also felt that the video ‘lacked something’, particularly for younger age groups. They recommended covering more dynamic and more varied jobs, not merely ‘big city’ jobs in the UK:

Showing the videos of three people that do desk jobs and stuff like that, there is definitely a disconnect there. I would struggle for a Year 7 to be excited by that.

Case visit teacher

The new [video] for the ‘Meet the engineer’ session I thought was really hard work. In it there's one girl and they say [to her], ‘How do you use your skills in everyday life?’ She says, ‘Oh, I made some LED lights for my bedroom’. They [students in the workshop] were looking all over the place. You know when you've started to lose your audience.

Case visit facilitator

One facilitator working in Wales, however, felt that covering hydroelectricity was highly relevant in some of the communities in which they worked.

Only one of the case visit schools had a physical visit from an engineer. In this school, the teacher felt that it was useful to have someone attend in person, and the students enjoyed speaking to someone new. However, they also felt that the talk would have benefitted from the use of visual aids, as it failed to engage some of their Year 7 students, particularly the lower-ability students.

Overall satisfaction with the content and delivery of EQ

Overall, levels of enjoyment of Content 3 are slightly higher than those of Content 2 and 1. In particular, more students strongly agree that Content 3 was enjoyable in comparison to Content 1 and 2 ([Figure 3](#)).

Just under three quarters of students (71%) agree or strongly agree that they enjoyed the Content 3 workshop ([Figure 3](#)).

Year 7 (31%) and 8 (28%) students are more likely to strongly agree that they enjoyed the workshop than are older students (Year 9) (17%).

There were no significant differences between girls and boys related to workshop enjoyment. Students, however, who identify as non-binary, questioning or a self-described gender (12%) are more likely to strongly disagree that they enjoyed the workshop than are male (2%) and female (2%) students.

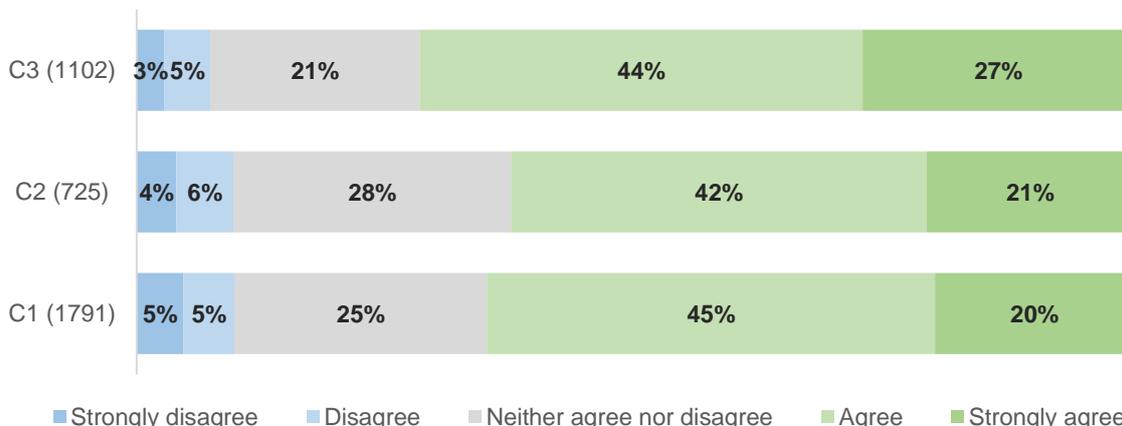
Findings from the EQ teacher survey show that most teachers (96%) rated their overall experience of the workshop as excellent (67%) or good (29%). Only 3% rated their experience as neutral and 1% as poor. Insights from the school case studies suggest that teachers thought that the facilitators were engaging and ran the sessions well.

The majority of teachers (95%) who responded to the EQ teacher survey also agreed that the workshop was engaging for their students. The school case studies reflect these findings — teachers thought that the workshop materials and delivery worked well for students across the different year groups, particularly the practical elements of the session. However, both teachers and students conveyed that they would have liked more practical content. Several teachers suggested that the scheduling of the activities could also be revised to maintain student interest. For example, once students have engaged with the practical activities, they are less interested in the video content that follows. Teachers felt that the overall workshop plan could be more effectively built around the practical aspects.

There was just too much of it. There was one [non-practical activity] before the first practical, then there's a big talk activity in the middle, and then there was another one after the practical. So I think cutting those times down, maybe just having an interaction session where the students can maybe get together and write quick notes after the talk activity, would be better.

Case visit teacher

Figure 3: Student agreement with the statement 'Energy Quest was enjoyable'



Post-workshop engagement

School staff at the case visit schools expressed that they would likely maintain connections with EUK and there was an appetite to run similar enrichment events like EQ with their students. Encouragingly, two of the case visit teachers specifically mentioned the value of the Neon Futures website in signposting them to other EUK resources, while another teacher planned to use additional EUK resources to guide future STEM activities with their students.

I think by taking part in the EQ workshop reinforces us to wanting to keep our relationship going with EUK most definitely.

Case visit teacher

However, one teacher conveyed that EUK could be more proactively promoting their resources via regular updates to teachers, as school staff lack the time to locate the resources independently:

I don't have hours to be trawling through to find different bits and pieces. So I think just advertisement of different stuff and actually the knowledge of things that are out there would be really handy.

Case visit teacher

Views on potential future delivery formats

A key aim of the school case visits and the EUK teacher survey was to explore staff views on running EQ independently without a facilitator.

- 63% of teachers who responded to the EUK teacher survey reported that they would probably (44%) or definitely (19%) consider running the EQ workshop themselves, without an external facilitator, if they were provided with guidance and online resources.

- Just over one quarter of teachers (28%) reported that they would not consider running the workshop themselves (23% probably not and 5% definitely not) and 9% reported that they were not sure.

Teachers who reported that they would consider running the workshop themselves were asked in which ways they would most likely use Energy Quest resources. Two thirds of these teachers (39 out of 59) were unsure as to how they would use the resources to run the workshop themselves. Others also reported 'running the workshop as an off-timetable activity' (29 out of 59), 'doing the hands-on activities only' (29 out of 59), and 'running the full workshop in class time' (18 out of 59).

Three main issues were raised by school staff and facilitators during the school case visits:

1. There was agreement amongst both teachers and facilitators that school staff, particularly specialist science teachers, would be capable of delivering the content. However, school staff would require much more upfront support to effectively plan the workshops and source the necessary equipment. Case visit staff and facilitators expressed that the current workshop guidance is too complex and lengthy and that the equipment provided is not always suitable.
2. The facilitator role was described as complex and challenging. Teachers valued the expertise that the facilitators offer and they often bring additional equipment to more effectively deliver the workshops. There was general consensus among teachers and facilitators that it is unrealistic to expect all school staff to have the skills required to successfully deliver sessions. In the absence of specialist skills, the workshop may not have the same intended impacts. Facilitators suggest that it would be difficult for inexperienced staff to run multiple activities and maintain student engagement, particularly with more challenging student groups and lower-ability students:

Facilitating — there are so many things involved in terms of being able to arrive at a new school: think on your feet, being able to judge, not just the class, but quite often teachers will not mention if they have SEN students, or students with specific needs, and you have to be very astute and empathetic and understand straight away, whilst being able to keep control of the classroom, exactly the energy of the class or specific students.

Case visit facilitator

3. There is also an intangible benefit of having someone outside of the core school faculty working with students. Teachers expressed the value of having an external facilitator to deliver the session, as this offers a sense of novelty for students. EUK could explore the feasibility of the facilitator role being filled with the support of volunteer engineers. However, this could be a risky strategy, given the historical shortages of sourcing engineers.

The students don't know you; they've never met you; you have the potential to entertain and interest and then inspire them. They've already made up their minds about their science teacher and they might not have a positive relationship with them.

Case visit facilitator

It's nice to have someone come in and do the workshop to give the students a different experience, a different perspective.

Case visit teacher

Impact of EQ on student knowledge

This chapter summarises findings from the post-workshop student survey, the EUK pre–post survey, and draws on insights from the school case visits. It explores students’ perceptions of their knowledge of engineering and the extent to which they perceive that it has increased because of taking part in EQ.

Key findings

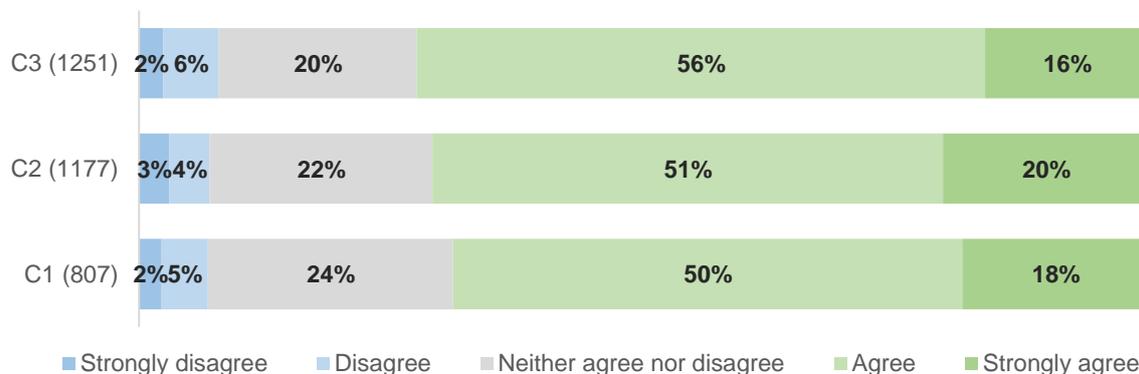
- The Content 3 workshop is positively associated with increased student knowledge. Eight in 10 students (81%) report having more knowledge of renewable energy and technologies and 87% report having more knowledge of the range of engineering careers as a result of taking part in EQ.
- The EUK pre–post survey suggests that students are 87% more likely to agree that they know about the different types of things that engineers can do in their jobs after taking part in the workshop. Though students know slightly more about the role that engineers play in developing technologies for renewable energy sources, the workshop is not currently converting significant numbers of students towards knowing about engineers’ roles in creating greener technologies.
- Enjoyment of the workshop and participating in STEM activities outside of school are positively associated with knowledge of engineering.
- Student demographics are not associated with self-reported increases in knowledge of engineering. This suggests that students are just as likely to report that the programme improved their knowledge, regardless of their characteristics or the type of school that they attend.

The EQ workshop aims to provide students with accurate and timely knowledge of the crucial role that engineers play in developing technologies for renewable energy as well as the range and diversity of careers that engineering can offer. Furthermore, the workshop aims to provide students with information on the different educational pathways into engineering.

Knowledge of renewable energy and green technologies

After taking part in the Content 3 workshop, nearly three quarters (72%) of students agree or strongly agree that they know about the role that engineers play in developing technologies for renewable energy sources ([Figure 4](#)). This reflects the perceptions of those who participated in the Content 1 and 2 workshops.

Figure 4: Level of student agreement with their knowledge of 'the role that engineers play in developing technologies for renewable energy sources'



Insights from the case visits suggest that students engaged well with the content on green technologies. For example, students from one of the focus groups cited that the session sparked their interest in green issues, which made them want to learn more about renewable energy and the different ways in which electricity can be created. One of the facilitators felt that it would be beneficial to increase the content on green energy and that this could be achieved by developing a practical activity that specifically considers sustainability in the design stage.

Findings from the regression analysis show that knowledge of the role that engineers play in developing technologies for renewable energy sources is positively associated with:

Enjoyment of the workshop

Students who would choose to study three or more STEM subjects

Students who participate in STEM activities outside of school

Similar to the Content 1 and 2 findings, none of the student demographics are significantly associated with knowledge of the role of engineers in developing technologies for renewable energy sources. This is a positive finding and suggests that after the workshop, students' knowledge of engineers' roles in developing renewable energy sources is high, irrespective of their demographic characteristics and the type of school that they attend.

Knowledge of engineering careers

EQ is specifically designed to increase students' awareness and knowledge of the types of things that engineers do in their jobs as well as the range of careers that engineering can offer. Like previous versions of the workshop, eight in 10 students (79%) agree or strongly agree that they know about the different types of things that engineers can do in their jobs ([Figure 5](#)). Findings from the regression analysis show that knowledge is associated with:

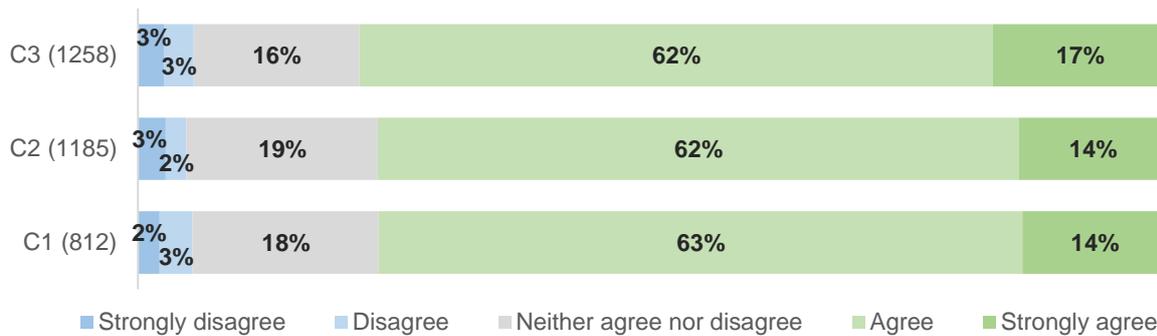
Enjoyment of the workshop

Students who participate in STEM activities outside of school

Non-priority (EDI) schools

These findings suggest that after the workshop, students' knowledge of engineering careers is high, irrespective of their demographic characteristics. This differs from the Content 2 findings, where older students were more likely to agree with this statement.

Figure 5: Level of student agreement with the statement 'In general, I know about the different types of things that engineers can do in their jobs'



Findings from the case visits reflect the survey findings — students described being more aware of the different STEM careers available and the qualifications needed for these careers after taking part in EQ. In one school, students highlighted the usefulness of the 'Meet the engineer' video in introducing different engineering careers, and felt that this improved their understanding of these roles.

One case visit teacher reflected that the workshop clearly demonstrated the practical applications of science beyond the classroom:

I think it was really useful in showing them that science is more than just what we learn in the classroom, that there's actually, like, a wider world to it, which I think is really helpful and obviously broadening their understanding of STEM. Having the STEM volunteer come in was really good because he put a real-life spin on it, which is fantastic.

Case visit teacher

Moreover, there is evidence that the in-person visits from a volunteer may support students to understand not only engineering careers, but also the wider applications of science. Encouragingly, there is also some evidence that the workshop effectively inspires girls as to the diversity of STEM and engineering careers, which is a key aim of EQ. For example, one case visit teacher felt that the workshop benefitted female students through hearing about the different engineering careers available:

The big impact, I think, was the girls. It was really great to see some of the girls realising engineering was broader than they believed in terms of careers, and for some it sparked interest in future careers.

Case visit teacher

Increased knowledge of STEM and engineering careers extends beyond students. It is encouraging that case visit teachers expressed that the EQ workshop had

increased the profile of STEM within their schools and stimulated greater interest in and appetite for STEM careers and related activities. In some cases, this has resulted in involving non-specialist staff in extracurricular STEM activities, which has increased the volume of STEM-related activities delivered. Raising the profile of STEM among non-specialist staff through EQ could provide the momentum for more extracurricular or linked activities. In one school, for example, a school trip to the Big Bang had seen an excellent uptake which the teacher felt was likely to be a result of the workshop:

I think it definitely opened doors in terms of, like, future STEM projects, if you know what I mean. It actually put an awareness into it. I do think that now we've obviously done EQ, that there will now be options then to do, like, more within the school and actually trying to get STEM more promoted.

Case visit teacher

Another teacher described how they had learnt a lot from the materials on engineering careers, which would better equip them to provide career advice to their students:

I've had a look over the EQ quiz and the supporting information and there are bits in it where I was like, 'Oh, I didn't know that — that's really interesting'.

Case visit teacher

Change in student knowledge

Reflecting previous versions of EQ, Content 3 is positively associated with knowledge acquisition.

Approximately eight in 10 (81%) students perceive that they have 'a bit more' or 'a lot more' knowledge of the role that engineers play in developing technologies for renewable energy sources ([Figure 6](#)).

Most students (87%) report that they have 'a bit more' or 'a lot more' knowledge of the different types of things that engineers can do in their jobs ([Figure 6](#)).

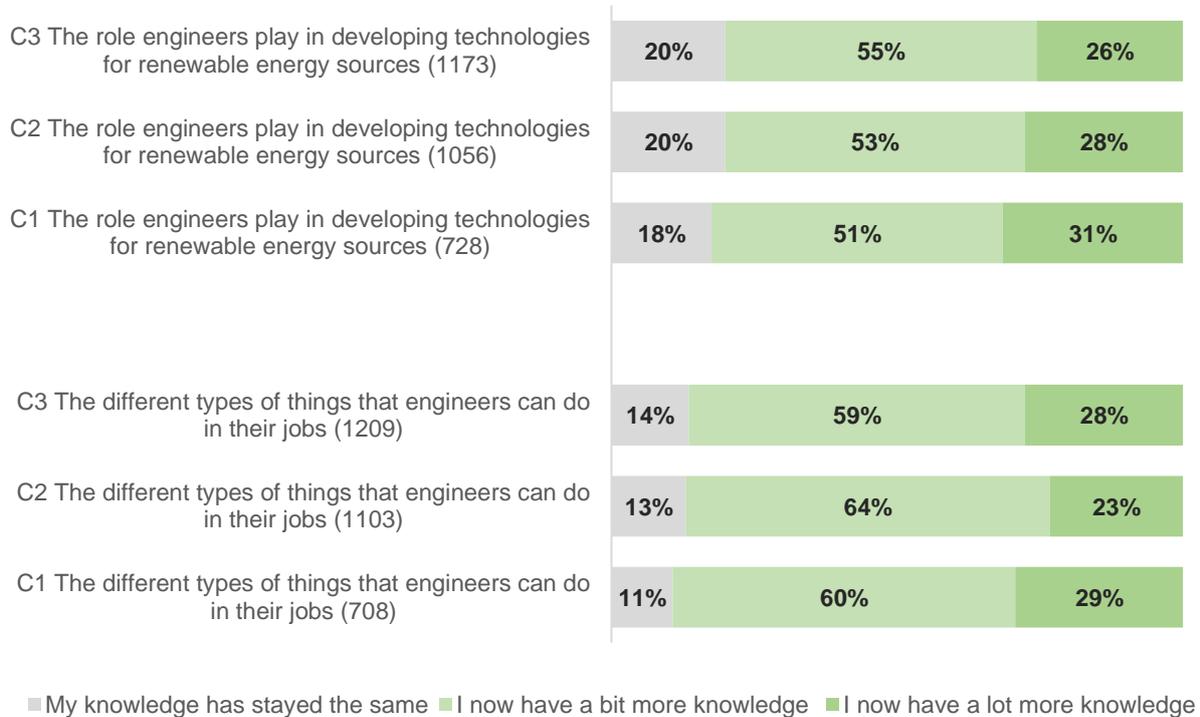
Similarly, the EUK pre–post survey finds that students were 87% more likely to agree that they know about the different types of things that engineers can do in their jobs after taking part in the workshop ([Appendix 3](#)).

The regression analysis shows that change in students' self-reported knowledge is not significantly associated with any of the student or school characteristics except for enjoyment of the workshop. This suggests that the workshop has a positive impact on increasing students' perceptions of their knowledge, irrespective of their demographics or school characteristics²⁴.

²⁴ This contrasts with the Content 2 findings, where students who identified as non-binary or questioning were less likely to agree that their knowledge had changed regarding the role that engineers play in developing technologies for renewable energy sources.

However, the EUK pre–post survey shows that students were no more likely to agree that they know about the role that engineers play in developing technologies for renewable energy sources after taking part in the workshop ([Appendix 3](#)).

Figure 6: Extent of change in student knowledge of engineering careers and renewable energy technologies because of taking part in EQ



Insights from the case visit schools find that, unsurprisingly, the knowledge gains were lower amongst students in schools with greater ongoing commitment to STEM provision. In other case visit schools, however, students learned a lot about the breadth of engineering careers available:

Before the workshop I knew it was about STEM and stuff, but I came out of there knowing, oh you know, engineers do this and this. But before I did the workshop, I was like, ‘What is an engineer?’.

Case visit student

The Content 2 post-workshop survey included a series of questions to explore students’ understanding of the educational pathways to engineering careers. However, these questions were removed from the Content 3 survey to reduce the length. Content 2 findings indicated that the workshop supported students to understand the pathways to engineering careers, with over two thirds (69%) of students perceiving that they had more knowledge of the pathways to engineering because of taking part in the workshop. Female students in particular were more likely to agree that their knowledge had increased because of taking part in EQ.

Interest in and aspirations towards STEM careers

This chapter draws on the findings from the post-workshop student survey as well as insights from the school case visits. It explores the impact of Content 3 on students' interest in and intentions towards STEM careers.

Key findings

- Students are most interested in technology careers (53%), followed by science careers (47%) and engineering careers (42%). This reflects the Content 1 and 2 findings.
- Content 3 appears to have a positive impact on students' level of interest in STEM careers as well as engineering careers in particular. Over two in five students (45%) reported being more interested in engineering careers because of taking part in EQ.
- EQ inspires some students to want to find out more about STEM-related careers and participate in more STEM activities irrespective of whether students are male or female.
- However, the EUK pre–post survey shows that students are no more likely to say that they are interested in careers that involve science, technology or engineering after the workshop.
- Higher levels of self-reported change in interest towards STEM careers are consistently associated with workshop enjoyment, taking part in STEM-related activities outside of school, and choosing to study three or more STEM subjects.

Student interest in STEM-based careers

Workshops such as EQ are specifically designed to stimulate student interest through delivering a range of practical activities to showcase the diversity of engineering careers on offer and how they can make a meaningful contribution to the economy and society.

After taking part in the Content 3 workshop:

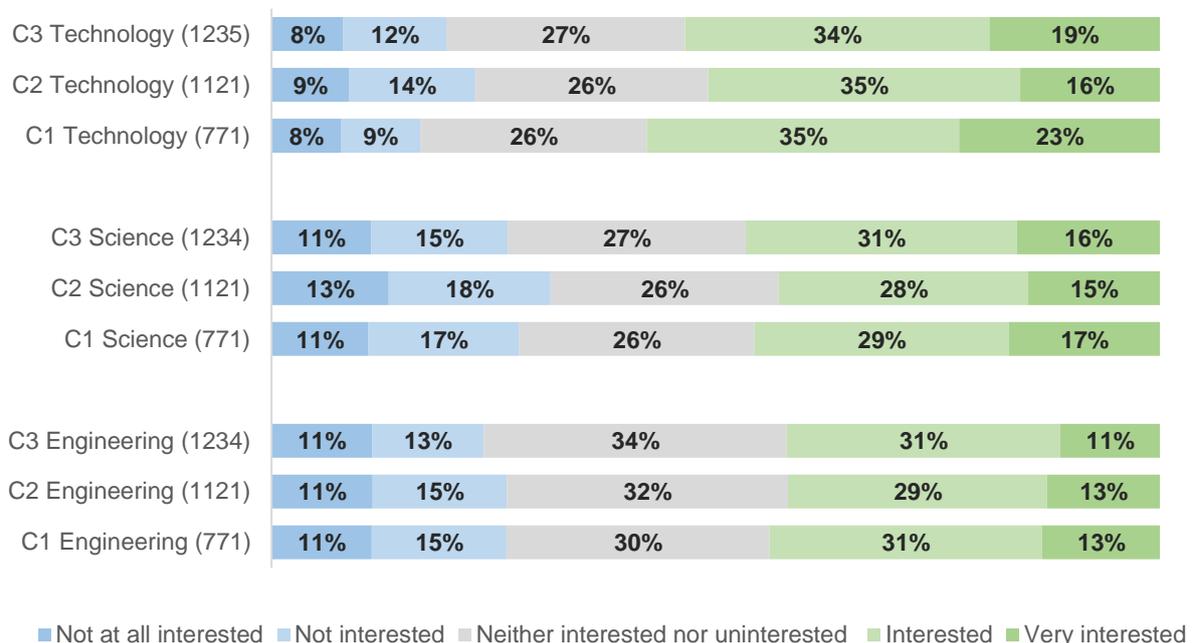
Students report being most interested in a future career that involves technology (53% interested or very interested), followed by a career in science (47% interested or very interested) and engineering (42% interested or very interested) ([Figure 7](#)).

The Content 3 findings are similar to student perceptions from Content 1 and 2. Student interest in engineering careers is the same, irrespective of the version of EQ in which they took part.

The regression analysis shows that higher interest in:

- Engineering and technology careers is associated with students identifying as male, white students, enjoyment of the workshop, choosing to study three or more STEM subjects, and participating in STEM activities outside of school.
- Science careers is associated with enjoyment of the workshop, choosing to study three or more STEM subjects, participating in STEM activities outside of school, and priority schools. The converse was found for Content 2, namely that lower interest in science careers was associated with priority schools. This is a positive shift for Content 3 and suggests that EQ is successfully inspiring students from priority schools to be interested in science careers.

Figure 7: Students' levels of interest in careers in technology, engineering and science.



Change in interest levels towards STEM careers

Overall, the Content 3 workshop has some impact on increasing students' interest in STEM careers, with students reporting that their level of interest in these careers had increased because of the workshop ([Figure 8](#)). However, a large proportion of students also report that their interest levels have remained the same since EQ.

Content 3 appears to have a positive influence on increasing students' interest in engineering careers, with more than two in five students (45%) stating that they are now more interested because of taking part in EQ ([Figure 8](#)).

Over one third of students (36%) reported being more interested in technology careers and over a quarter (28%) more interested in science careers ([Figure 8](#)).

Students who participated in Content 3 report higher changes in their interest in engineering careers than do students who took part in Content 1 or 2. This suggests that this version of the workshop may be successfully stimulating student interest in engineering careers.

However, the EUK pre–post survey shows that after the workshop, students were no more likely to say that they were interested in careers that involve science, technology or engineering ([Appendix 3](#)).

Findings from the regression analysis suggest that self-reported increased interest because of taking part in EQ in:

- Engineering careers is associated with enjoyment of the workshop, white students, choosing to study three or more STEM subjects, participating in STEM activities outside of school, and non-priority (EDI) schools.
- Technology careers is related to enjoyment of the workshop, students identifying as male, choosing to study three or more STEM subjects, and participating in STEM activities outside of school²⁵.
- Science careers is associated with enjoyment of the workshop, choosing to study three or more STEM subjects, and participating in STEM activities outside of school.

Most students involved in the case visit focus groups indicated that they were now more interested in STEM and engineering careers because of taking part in EQ. When asked why this was so, students felt that finding out more about what was involved in these careers had sparked their interest. For example, students said that they were now more interested because:

It showed us in more depth about what you would be doing in STEM careers.

Case visit student

I was given more information about what engineering is, and then listening to people on videos saying about what they're doing really helped.

Case visit student

Case visit students perceived that the workshop successfully stimulated their interest in STEM careers. In one school, the workshop was run on the same day as that of a science lesson on hydroelectricity. Students reported finding this topic to be particularly interesting and that the workshop helped to reinforce the content covered in the science lesson. In another school, students felt that seeing engineering careers that could involve teamwork elements was attractive, which was an aspect of STEM jobs of which previously they had been unaware:

I already liked science and technology and all that beforehand, but because of EQ, I actually learned that I might want to do it more because it was quite interesting.

Case visit student

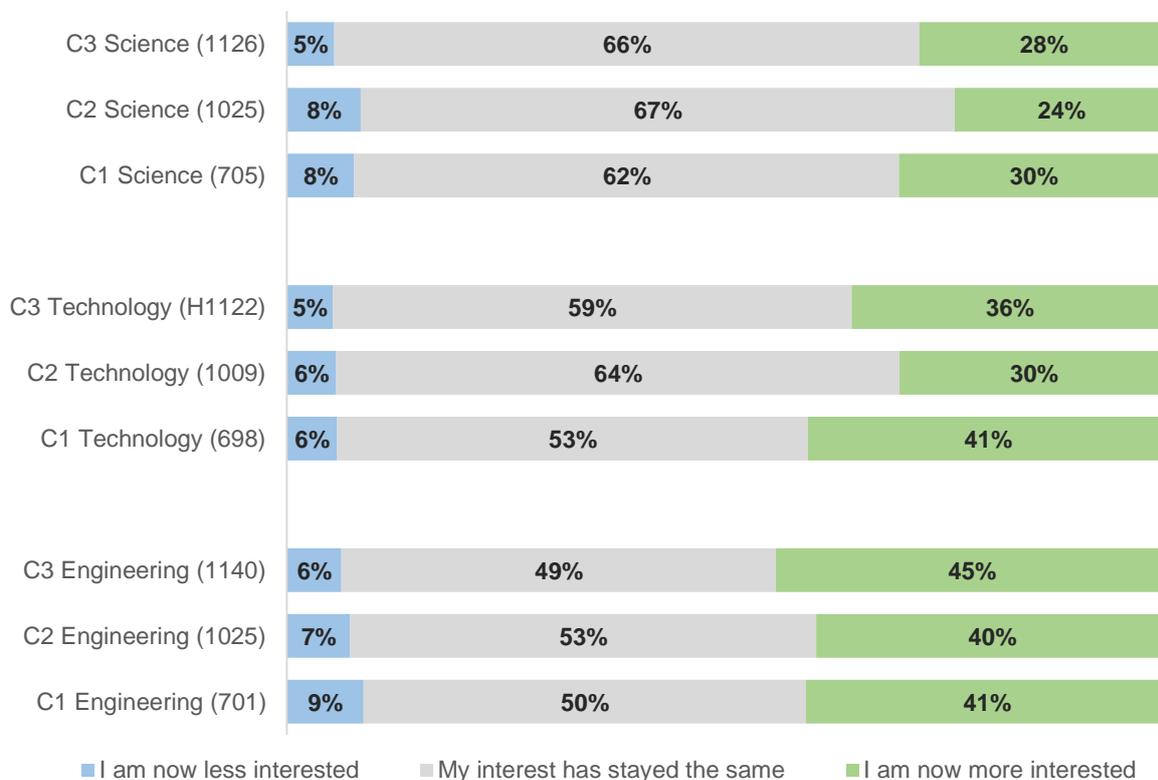
²⁵ Year 9 students (in comparison with Year 7 students) are less likely to perceive that their interest in *technology* careers has increased because of taking part in EQ.

Teachers also observed that the workshop offers students a broader perspective on the role of engineers as well as the types of careers that they do than what students are typically exposed to. Teachers described how students' perceptions of what it means to work in an STEM and engineering career helped them to appreciate the practical application of their science learning beyond the classroom:

From talking to the children, I think it's opened their eyes a lot more to, actually, different careers that they didn't think that they were eligible to do, in a way, almost, 'Oh, I could do that job', and then that relies on science, and then they might go down that route.

Case visit teacher

Figure 8: Change in students' interest levels towards STEM careers because of the EQ workshop



Intentions to do more STEM and find out more about related career pathways

A further objective of EQ is to inspire students to want to find out more about STEM and engineering careers and engage in STEM-related activities. Students' perceptions are mixed, which suggests that the workshop may be successfully inspiring some students to pursue an STEM-related or engineering career pathway, but not others.

Nearly half of students (46%) agree or strongly agree that EQ has made them want to find out more about engineering as a career ([Figure 9](#)). The perceptions of

students after taking part in Content 3 are slightly higher than those who participated in Content 2.

Approximately one in five students (18%) disagree or strongly disagree that Content 3 has made them want to find out more about engineering as a career ([Figure 9](#)).

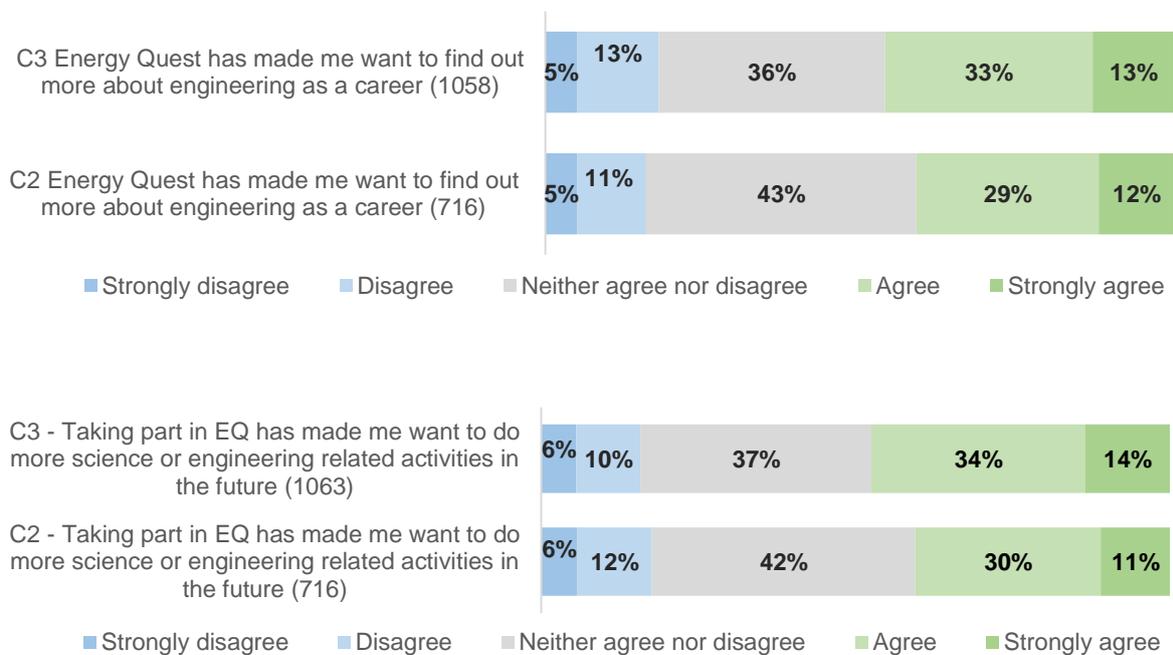
Nearly half of students agree or strongly agree (48%) that taking part in Content 3 has made them want to undertake more science- or engineering-related activities in the future ([Figure 9](#)). Student perceptions of Content 3 are slightly higher than those who took part in Content 2.

Over one in 10 students (16%) disagree or strongly disagree that the workshop has made them want to undertake more science- or engineering-related activities in the future ([Figure 9](#)).

The regression analysis finds that there is no significant association between gender, but that the following characteristics are associated with higher levels of agreement with both wanting to find out more about engineering as a career and wanting to undertake more science- or engineering-related activities in the future because of participating in EQ:

- Enjoyment of the workshop
- Students who would choose to study three or more STEM subjects
- White students
- Students who participate in STEM activities outside of school

Figure 9: Student agreement with wanting to find out more about engineering as a career and doing more STEM-related activities in the future



Several case visit teachers conveyed the view that the workshop had a positive impact on students' intentions to pursue future STEM-related activities and find out more about career pathways. They attributed this to students having a positive and engaging workshop experience which stimulated their interest and an openness to STEM and engineering:

We run STEM clubs in school. We've got an engineering option as well in Year 9. So hopefully in the future, having the workshops is going to increase our uptake in those subjects and more interest in science and asking deeper and more meaningful questions. We've also got a trip to the Big Bang at the end of this month. We've had a fantastic uptake. So hopefully that's been off the back of Energy Quest.

Case visit teacher

Intentions to study STEM subjects

Inspiring students to study STEM subjects at Key Stages 4 and 5 that facilitate access to careers in engineering is a further key aim of the workshop.

Students are most likely to choose to study design and technology (53%), followed by mathematics (45%) and computing/computer science (39%) (Figure 10). This pattern reflects similar choices among students who participated in Content 1 or 2, although the proportions are higher for Content 3.

'Traditional' science subjects (including biology, chemistry and physics) are less popular choices among students who took part in Content 3 and are similar to Content 1 and 2 perceptions.

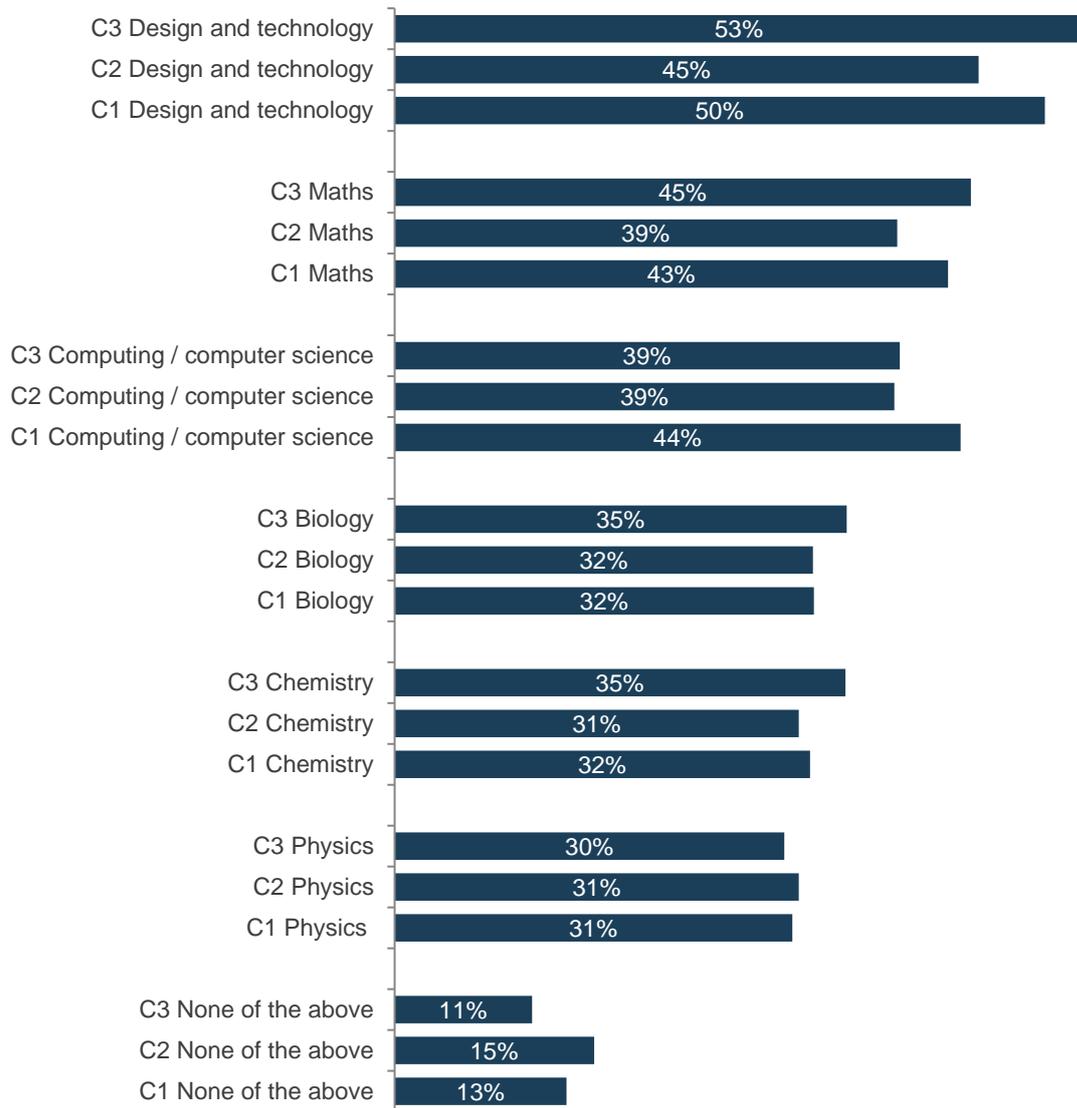
One in 10 students who took part in Content 3 would not choose to study any STEM subjects, which is a slightly lower proportion than the Content 2 and 1 findings.

Case visit findings suggest that the workshop successfully stimulates students' intentions towards pursuing STEM-related subjects. Most case visit students cited that they were now more likely to pursue an STEM subject because of taking part in EQ. Students perceive that the fun and interesting nature of the workshop broadened their view of what science and engineering entail and will help them to decide which STEM subjects to choose. In several schools, students discussed how having developed a greater awareness of what engineers do has positively influenced their desire to pursue STEM subjects at GCSE. In one school, where an Engineering GCSE was available, pupils felt that they were now more interested in this option because it would allow them to explore some of the topics raised in the workshop in more depth:

I actually want to go into engineering and stuff, but, like, knowing a bit more about it makes me want to learn more about it and push myself further.

Case visit student

Figure 10: Students' STEM subject choices (bases: C2 = 1041; C1 = 2,034)



Desirability of engineering careers

This chapter summarises findings from the post-workshop survey and the school case visits to explore the impact of Content 3 on students' perceptions of the desirability of engineering and engineering careers. Views on whether engineering careers are open to people from different backgrounds and whether they offer opportunities to be creative are also explored.

Key findings

- Students broadly, particularly those identifying as female view engineering careers to be an option that is open to people of all backgrounds, and that these careers provide opportunities to be creative.
- A higher proportion of students in the Content 3 cohort regard a career in engineering as desirable (42%) than in the Content 2 (32%) and Content 1 (38%) cohorts. A similar proportion (43%) perceive it to be *more* desirable as a result of taking part in EQ, which is also higher than for Content 2 (32%) and Content 1 (38%). Higher desirability towards STEM careers is not significantly associated with student demographics or school characteristics.
- Over half of students who took part in Content 3 did not change their views on pursuing an engineering career. Additionally, the EUK pre–post survey suggests that the workshop does not change students' perceptions of the desirability of engineering careers.
- The impact of the workshop on students' confidence to become an engineer is mixed. The post-workshop survey shows that over four in 10 students (43%) state that they feel more confident that they could become an engineer after taking part in EQ. However, the EUK pre–post survey reports no effect on students' views of their ability to become an engineer.
- Students are most likely to want to aspire towards a career in technology and least likely to want to pursue a career in engineering. However, findings from the post-workshop survey suggest that EQ is most impactful on changing students' likelihood of choosing an engineering career in comparison to science and technology careers.

Student perceptions of engineering

STEM enrichment activities such as EQ can play an important role in supporting young people to acquire accurate knowledge to enable them to make an informed decision as to whether an engineering career is the correct option for them.

- Students who took part in Content 3 broadly agree that engineering careers are an option for everyone (81% agree or strongly agree), which is slightly higher than students' perceptions from Content 1 and 2 ([Figure 11](#)). A new statement introduced in the Content 3 post-workshop survey also shows that students view

there to be opportunities to be creative in engineering careers (86% agree or strongly agree) ([Figure 12](#)).

- Findings from the regression analysis suggest that agreement that engineering careers are open to people of all backgrounds and that there are opportunities to be creative is associated with:
 - Students identifying as female. This is a positive finding and suggests that the workshop may be successfully supporting girls to acquire accurate perceptions of what engineering careers involve.
 - Enjoyment of the workshop.

The regression analysis also shows that choosing to study three or more STEM subjects is associated with perceptions that there are opportunities to be creative in engineering careers.

Figure 11: Student agreement with the statement 'Engineering careers are open to people of all backgrounds'

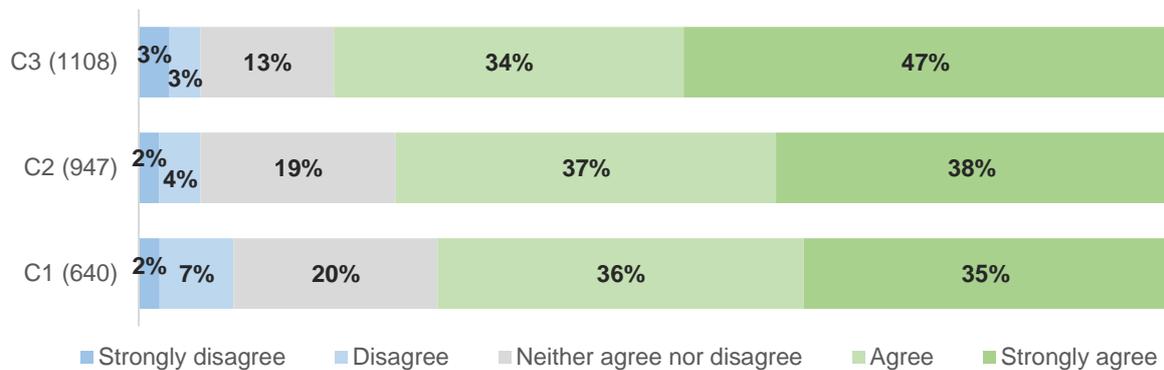
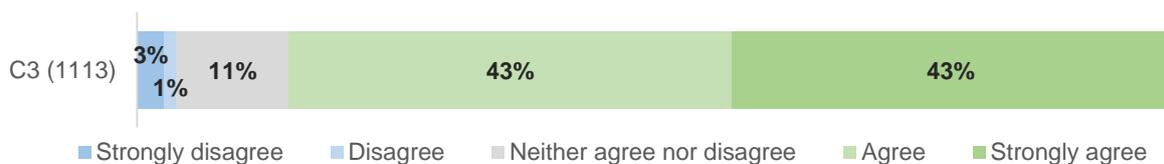


Figure 12: C3 student agreement with the statement 'There are opportunities to be creative in engineering careers'



Desirability of engineering careers

Four in 10 students (42%) view a career in engineering to be desirable or very desirable, which is a slightly higher proportion than students who took part in Content 1 (38%) or 2 (37%) ([Figure 13](#)).

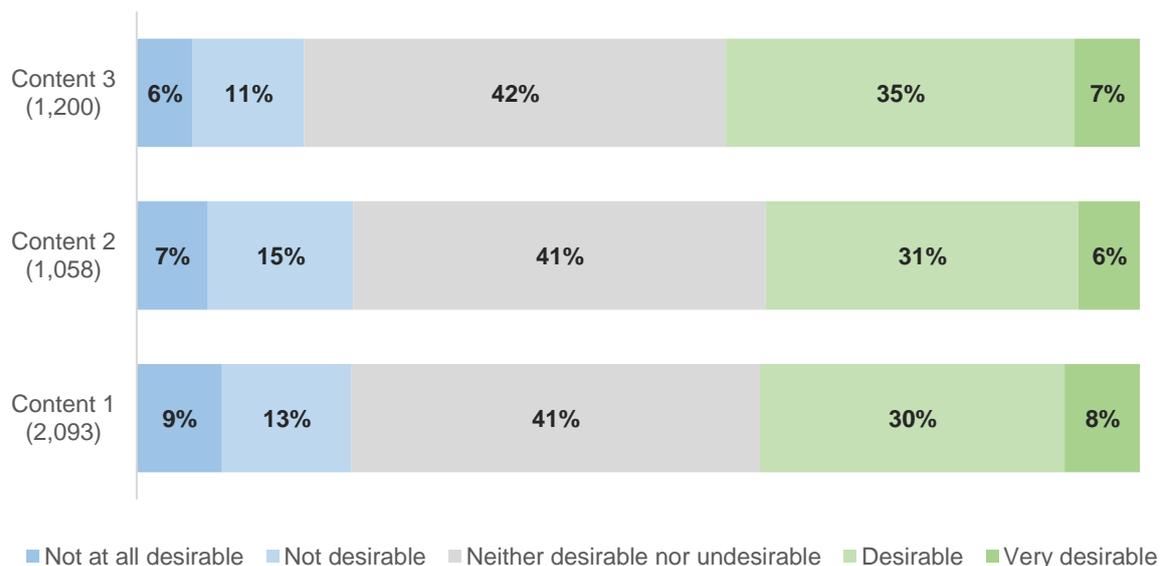
A similar proportion of students (42%) neither agree nor disagree that a career in engineering is desirable after taking part in EQ ([Figure 13](#)).

Just under one in five students (17%) perceive a career in engineering to be not desirable or not at all desirable. This is a slightly lower proportion than student perceptions after taking part in Content 1 or 2 ([Figure 13](#)).

Insights from the regression models suggest that higher desirability of engineering careers is associated with:

- Students who identify as male
- Students who would choose to study three or more STEM subjects
- Students who participate in STEM activities outside of school
- Students who know someone who works in an STEM career
- Enjoyment of the workshop

Figure 13: 'How desirable do you believe a career in engineering to be after taking part in Energy Quest?' Bases in parentheses.



Change in desirability of an engineering career after EQ participation

Content 3 appears to have a positive impact on some students' perceptions of the desirability of a career in engineering, which is higher than the perceptions of students who participated in Content 1 or 2. This suggests that Content 3 may be effectively showcasing a range of engineering careers to support students to view such careers to be an attractive option for them:

Over four in 10 students (43%) perceive a career in engineering to be more desirable because of taking part in EQ. This is higher than perceptions from both Content 1 (38%) and 2 (32%) ([Figure 14](#)).

Just over half of students (51%) who took part in Content 3 said that the workshop did not change their views, which is slightly higher than students' perceptions from Content 2 ([Figure 14](#)).

A minority of students (6%) perceive an engineering career to be less desirable because of EQ ([Figure 14](#)).

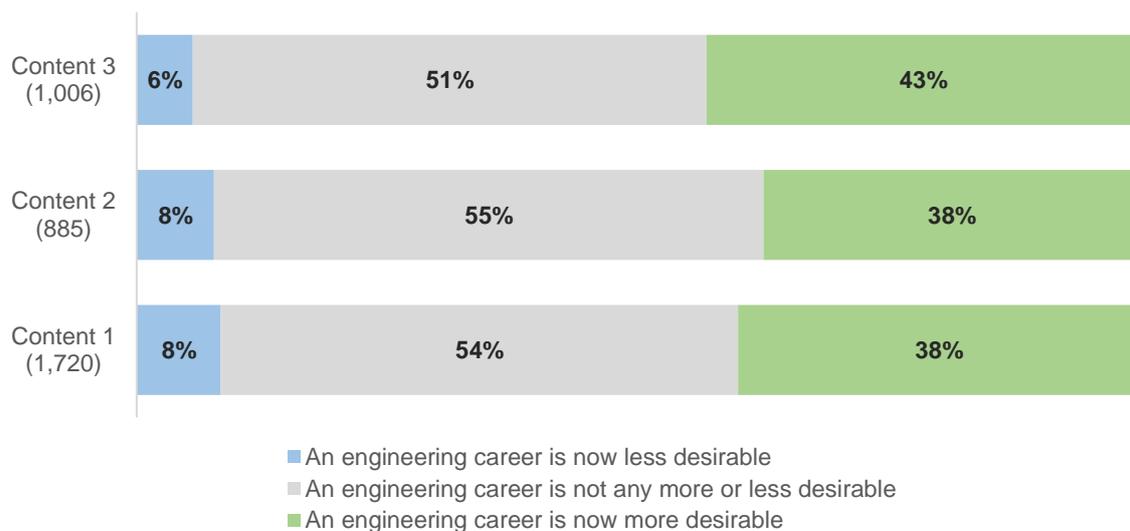
Findings from the EUK pre–post survey indicate that students were no more likely to say that engineering is a desirable career after taking part in the workshop ([Appendix 3](#)).

Results of the regression analysis suggest that higher desirability because of taking part in the workshop is associated with:

- Students who would choose to study three or more STEM subjects
- Students who take part in STEM activities outside of school
- Enjoyment of the workshop

Facilitators from the school case visits described how students were particularly interested in the earnings of engineers as well as the level of demand for engineering skills. By drawing attention to these positive and tangible benefits, facilitators believe that students who previously might have dismissed these types of opportunities could perceive STEM careers to be more desirable. This messaging was more powerful when substantiated by a volunteer engineer who showcased their career trajectory and salary.

Figure 14: ‘Has the extent to which you view a career in engineering as desirable changed because of taking part in Energy Quest?’ ‘Don’t know’ response category excluded from analysis. Bases in parentheses.



Confidence to become an engineer

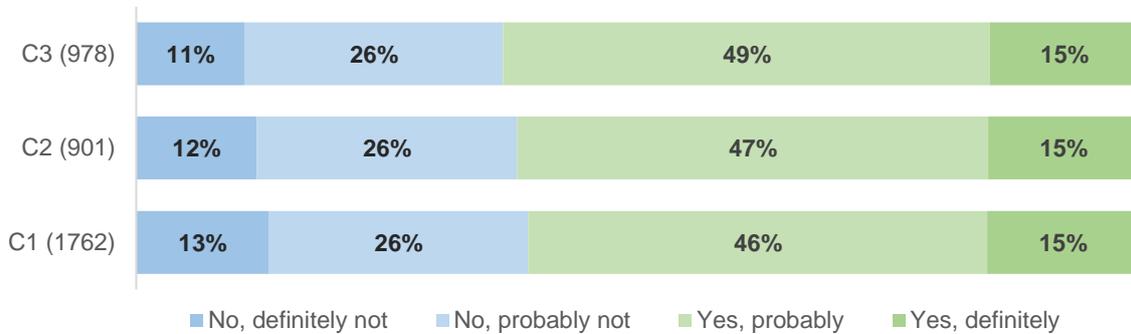
In addition to equipping students with knowledge of engineering careers, EQ aims to help students to positively identify with engineering and develop the confidence that they could become an engineer by exposing them to different role models and industries.

Students’ confidence that they could become an engineer is relatively high after taking part in Content 3, with nearly two thirds of students (64%) indicating that they could ‘probably’ or ‘definitely’ become an engineer ([Figure 15](#)).

One in 10 students (11%) perceive that they could ‘definitely not’ become an engineer if they wanted to, which reflects the Content 2 findings ([Figure 15](#)).

Findings from the EUK pre–post survey indicated that students were no more likely to say that they could become an engineer if they wanted to following the workshop ([Appendix 3](#)).

Figure 15: Student agreement with statements on confidence in becoming an engineer after taking part in EQ



- The regression models indicate that higher student confidence that they could become an engineer if they wanted to is associated with:
 - Students identifying as male
 - Students who would choose to study three or more STEM subjects
 - Students who take part in STEM activities outside of school
 - Enjoyment of the workshop

Some students also perceive that Content 3 has had a positive impact on their confidence:

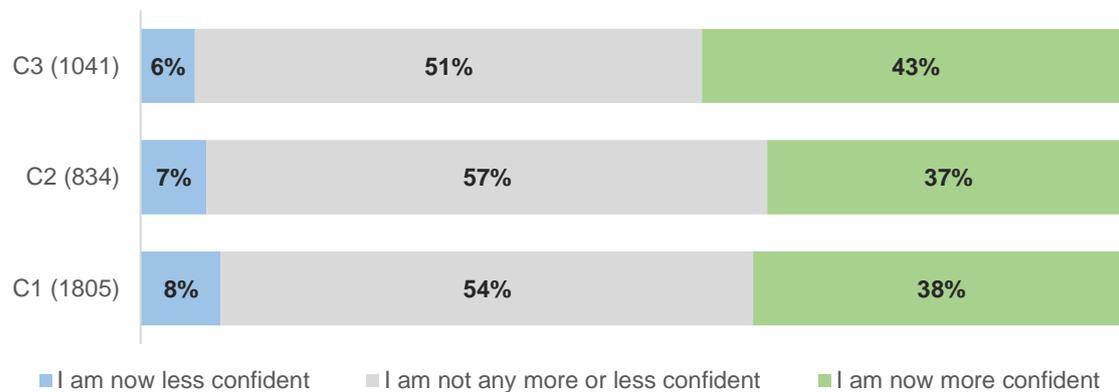
Over four in 10 (43%) students report being more confident that they could become an engineer as a result of taking part in EQ ([Figure 16](#)).

Over half of students (51%) perceive that their confidence has not changed ([Figure 16](#)).

A minority of students (6%) are less confident because of EQ ([Figure 16](#)).

Students' perceptions of their confidence are higher after Content 3 than the perceptions of students who took part in Content 2.

Figure 16: 'Has taking part in Energy Quest changed how confident you are about whether you could become an engineer if you wanted to?'²⁶



Insights from the regression models suggest that increased student confidence because of the workshop is not significantly associated with gender, but is related to:

- White students
- Students who take part in STEM activities outside of school
- Enjoyment of the workshop

Some case visit students cited being particularly attracted to non-academic routes into engineering careers, and highlighted that prior to the workshop they did not know that such opportunities existed. Gaining information on alternative routes has made STEM careers a more realistic and more desirable option for some students, particularly those who are less academically minded. Facilitators also described that students were particularly interested in apprenticeship routes and scholarships. When volunteer engineers outlined their route into engineering, students could identify with this, and tended to 'switch on' more to the pathways open to them, and that they could obtain this type of job if they wanted to.

The workshop boosted the confidence I had in myself.

Case visit student

Some case visit students suggested that highlighting which GCSEs are required to gain entry to different engineering apprenticeships would be particularly beneficial. Further suggestions included a greater focus on the non-academic routes in STEM careers supported by real-world examples. This would help to increase the confidence of students that STEM careers are for people like them.

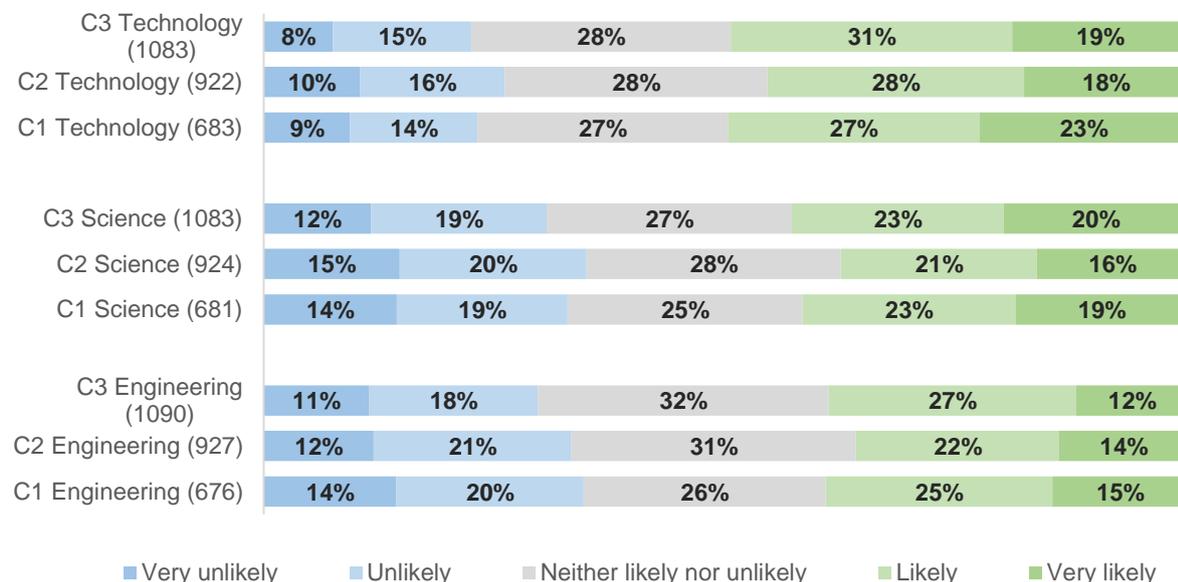
²⁶ Student perceptions of their confidence in becoming an engineer were added for the Content 2 and 3 surveys and were not included in the Content 1 survey.

Likelihood of pursuing a career in engineering

EQ seeks to inspire and encourage young people to consider an STEM career pathway through the provision of creative and engaging hands-on practical activities.

- Students who responded to the post-workshop survey are most likely to aspire towards a career in technology (50% likely or very likely) ([Figure 17](#)).
- Students are least likely to aspire towards a career in engineering (39% likely or very likely) ([Figure 17](#)).
- The regression analysis shows that:
 - Students who would choose to *study three or more STEM subjects and participate in science-related activities outside of school* are more likely to want to pursue an STEM career in science, technology and engineering.
 - *Enjoyment* of the workshop is associated with being more likely to choose a future career in technology and engineering than in science.
 - Student characteristics associated with the likelihood of pursuing an STEM career include identifying as *male* (for technology and engineering careers), *white students* (for engineering careers), and older *Year 9* students (for engineering careers). None of the student demographics are significantly associated with the likelihood of pursuing science careers.

Figure 17: Student likelihood of choosing a career in technology, science and engineering



In addition to fostering students' interest in STEM careers, some case visit students found that the workshop helped to consolidate and extend their existing interest in and future plans towards STEM and engineering jobs. One group of students, for example, felt that the inner engineer career quiz was particularly helpful because it highlighted the specific aspects of engineering that would suit them.

I think the workshop opened my mind that there's other jobs out there. I want to work with animals at some point and I know that I want to do something to do with biology and so I was like, 'Okay, I want to do that'. But after the workshop I was kind of like, 'Okay, there's more options with biology than just to work with animals and I can do other things with it'.

Case visit student

At first I was thinking, 'I want to be a NASA engineer', and then after the Energy Quest session I was like, 'Yes, I'm certain I want to become a NASA engineer'.

Case visit student

Change in views on future STEM careers

A positive finding is that EQ appears to be most impactful on students' aspirations towards engineering careers.

Four in 10 (41%) students report that they are more likely to choose an engineering career because of the workshop, which is higher than student perceptions for C2 ([Figure 18](#)).

The lowest change in students' aspirations is towards science careers, with 32% of students reporting that they are more likely to choose such a career because of EQ ([Figure 18](#)).

A minority of students (6–7%) report being less likely to choose an STEM-related career because of taking part in the workshop ([Figure 18](#)).

Students' perceptions after taking part in Content 3 with regard to their likelihood of choosing an STEM-related career are generally higher than students' views after participating in Content 1 or 2.

Aspirations towards all three STEM career areas remain unchanged for most students.

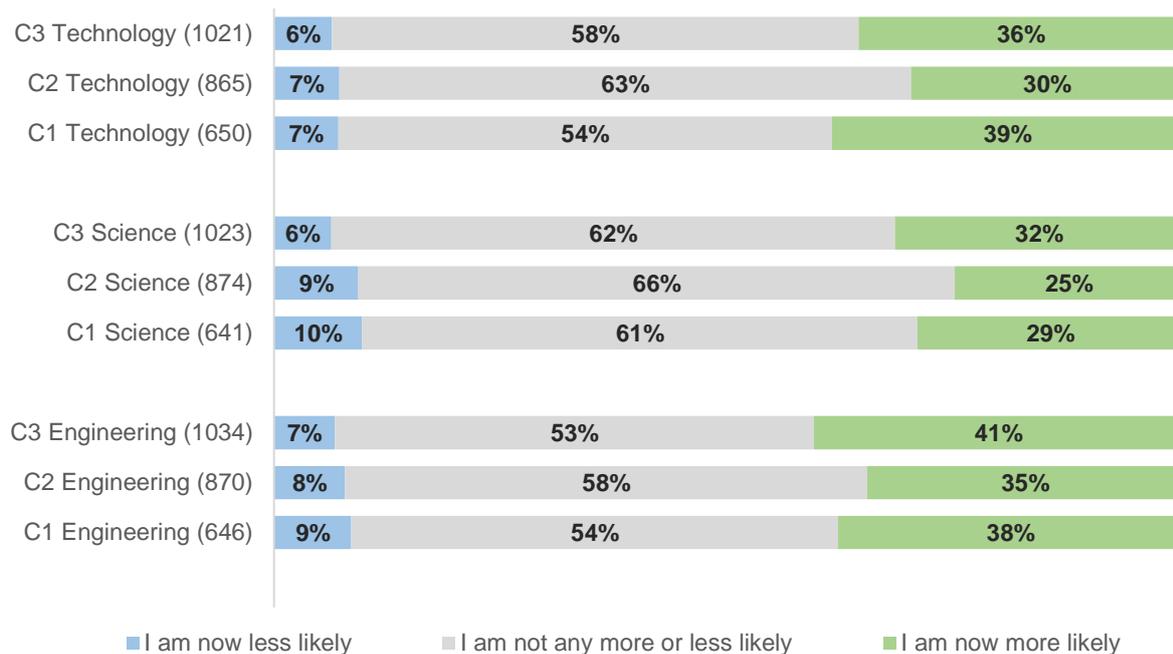
The regression analysis finds that:

- Students who would choose to *study three or more STEM subjects* and who *enjoyed the workshop* is associated with being more likely to pursue a career in science, technology and engineering.
- Students who *participate in science-related activities outside of school* is related to being more likely to pursue science and engineering careers than technology careers.
- Identifying as a *female student* is associated with being more likely to report that the workshop has made them want to pursue science careers, but less likely to want to pursue technology and engineering careers²⁷.

²⁷ Girls who responded to the C2 survey were less likely to state that they wanted to pursue a career in any of the three areas.

- Being a *white student* is associated with being more likely to report that the workshop has made them want to pursue a career in engineering, science and technology.
- Students *not in receipt of FSM* is associated with being more likely to report that the workshop has made them want to pursue an engineering career.

Figure 18: Change in student likelihood after taking part in Energy Quest of choosing a career in technology, science and engineering



Some of the case visit teachers felt that the workshop had increased the likelihood that students would be interested in pursuing careers in engineering.

I think that's one of the reasons why we do pick EQ, because it opens students' eyes and those students that haven't really considered engineering as a future career option.

Case visit teacher

In another school, the teacher who organised the workshop received feedback from other school staff that students' views on STEM careers had been expanded and that some students were now considering careers in engineering and STEM-related areas because of taking part in EQ.

I know a couple of students were highlighted by my colleague who said, 'Well, they hadn't thought about that career before and now they are', so that's quite nice, just to see them open their eyes a little bit and actually seeing the wider world connection to science.

Case visit teacher

Conclusions and recommendations

This chapter summarises the learning from the evaluation and provides recommendations to inform any future development and delivery of Energy Quest.

Programme and evaluation reach

Over the past three years, delivery partners have successfully engaged 450 schools, reaching 42,006 students in Years 7–9 across Scotland, Wales, and all regions of England. Of these, 4,782 students participated in the post-workshop survey, with an 82% completion rate. Progress against the programme KPIs was more successful for Content 3 than Content 1 and 2, with over three quarters (76%) of schools that took part in a workshop being classified as priority schools.

Although the response rate to the post-workshop survey is smaller than originally planned (7% response rate), it provides useful insights into students' perceptions of the workshop and the impact that it has had on them. The school case visits to consult with students, teachers and facilitators provide additional qualitative insights into how and why the programme has been effective, as well as areas for improvement. Furthermore, the collective evaluation findings from the last three years offer substantive evidence to inform the design and delivery of any future iterations of the programme.

Students' perceived impact of the workshop

EQ appears to be most impactful on changing students' self-reported knowledge of STEM-based careers and renewable technologies. The perceived impact of the workshop on students' interest in STEM careers, their confidence in their ability to become an engineer, the desirability of engineering careers, and the likelihood that students want to pursue a career in engineering is more limited; nonetheless this is to be expected for a single-intervention workshop.

Students who enjoy the workshop tend to report more positive outcomes, as do those who participate in STEM-based activities outside of school and study STEM-based subjects. This suggests that the workshop appeals to those who may already have an existing interest in STEM, helps to affirm students' aspirations, and supports them to refine their choices regarding future study and careers. Moreover, younger students are more likely to report higher levels of interest in the different elements of the workshop. No other demographic characteristics are consistently associated with interest in the workshop elements and with positive outcomes, implying that the workshop may be effectively engaging students of all backgrounds.

Pre-workshop engagement

School staff are largely satisfied with the pre-workshop engagement, although the volume and complexity of the information provided can be off-putting for some staff who have competing demands on their time. In particular, some staff find the information on the practical elements of the workshop to be confusing and are unsure

as to their role and the level of input required to effectively support these activities. As a key aim of EQ is to challenge perceptions of engineering and equip young people with knowledge of the pathways into engineering to inform their decision-making, it is important that school staff ensure whole classes can engage in the workshop, rather than selecting those with an existing interest in STEM and high ability students.

Recommendation: Consider reducing the amount of material that school staff are required to review ahead of the workshop. Providing a concise resource pack, together with a checklist of requirements, would help teachers and other delivery staff to better prepare for the workshops and ensure that the effectiveness of the workshop is maximised. School staff should be provided with a point of contact to address their pre-workshop queries.

- **Recommendation:** Highlight to teachers the aims of Energy Quest to help them question their unconscious bias about who engineers are and can be so that students from minority ethnic backgrounds and those who identify as female are as engaged in the workshop as white students who identify as male.

Programme content and delivery

The changes made to Content 3 informed by the previous evaluation findings included:

reducing the session length

making the session delivery more flexible

adapting the content in order to make it more accessible and more appealing for younger students (Year 7) and all abilities, and

making the non-practical activities more engaging.

Teachers continue to recognise the strong links between EQ and the national curriculum through Content 3.

Practical activities

The group-based practical tasks are the most interesting aspect of EQ for students, particularly the clean water task and the fruit battery experiment. The shelter task is not as interesting and could be enhanced if students had the opportunity to build a model of their shelter design. Students value being given a choice as to the activity in which they engage. Not all students are offered a choice, however, because facilitators find it to be too challenging to deliver three activities at the same time without support from a teacher or volunteer. Some staff experience difficulties in preparing for the practical lessons due to unclear guidance and/or inadequate practical materials being supplied.

Recommendation: Review the guidance for schools on the practical elements of the workshop to ensure that it is clear and straightforward to follow and test the refreshed guidance with teachers before launching.

- **Recommendation:** Ensure that sufficient equipment and resources are provided to schools well in advance of the session to enable any required modifications to be made (or amend the kit required to minimise the difficulty in obtaining it) and be clear about the kit requirements and who is expected to provide what.

Recommendation: Encourage schools to provide support to facilitators during the workshop so that an element of student choice for the practical activities can be maintained.

Workshop storyline

The workshop storyline is still perceived to be the least interesting element of the workshop but effectively engages younger students (Year 7). Older students, particularly those in Year 9, are not convinced by the storyline, which negatively impacts their engagement in the workshop.

Recommendation: Consider devising an alternative storyline for Year 9 students to improve workshop engagement, or review whether the workshop should be targeted at Year 7 and 8 students only.

Non-practical activities

Teachers value the non-practical activities because of their clear alignment with and focus on STEM-related and engineering career routes. Students perceive the non-practical activities to be slightly less interesting than the practical tasks, however. Adding the team-based presentation activity successfully introduced an element of competition between students, which is viewed to be a strength by students and staff.

Recommendations: Consider how to make the non-practical activities more interactive; re-emphasise the role of engineers in the energy sector in the workshop content; reduce the amount of time that facilitators spend on talking to students; and continue to build on the competitive element of the workshop for both the practical and the non-practical activities.

The personal experiences of engineering volunteers are a valued aspect of the workshop and can impact students' levels of interest in engineering careers. Engineering volunteers have the potential to challenge students' views on how interesting, accessible and rewarding engineering and STEM careers can be. In some instances, the content of the volunteer sessions did not fully align with students' interests and future aspirations. Additionally, only a minority of schools experienced an 'in person' visit by a volunteer. The current video format, which is used in the absence of a volunteer, does not engage students to the same extent.

- **Recommendation:** Expand the number and diversity of organisations that provide volunteer engineers who can engage with students through face-to-face sessions or via live remote video link formats. Volunteers need to converse with students in a format that is suitable for all year groups (7–9), including using visual aids as well as examples of more diverse and more inspiring engineering roles.

Recommendation: To increase student engagement in the engineering volunteer session, consider increasing input on:

- The role of engineers in the energy sector.
- The potential salaries of different types of engineers to emphasise the possible financial benefits of investing in their STEM education.
- The non-academic routes into engineering, including the GCSE requirements for these routes as well as the availability of these options, so that students can determine whether it is a viable option for them.
- The scale of demand for engineers in different disciplines so that students can gauge whether these careers will provide job security.

Workshop length and flexibility

Schools value the flexibility of the workshop design and the potential to reduce the length of the session. This has meant that there has been less disruption to the school day and reduced the demands on staff to re-timetable lessons. However, the two-hour model still predominates, which has resulted in lower student engagement and, in some cases, content has had to be dropped. The dropped activities are predominantly the career-focused activities.

Recommendation: Consider redesigning the workshop content so that it can be delivered within a standard single or double period. Younger and lower-ability groups would benefit from shorter, more focused sessions, or from workshops that can be delivered across two or more sessions. This approach is also likely to suit teachers if they are required to deliver the workshops themselves, as it is likely that they would need to fit the content around existing school timetables.

School-led delivery model

This evaluation explored the feasibility of a teacher-led model. Many teachers are positive about the possibility of a future move to a school-led delivery model without an external facilitator. Some teachers, however, are more ambivalent and are unsure as to how they would engage with the EQ resources to run the workshop. With clear guidance and support, some school staff are confident that they could deliver engaging and effective workshops. However, not all schools will have the capacity and necessary resources. There is a significant risk that the impact of the workshop will be diluted, as the novelty of an external facilitator is associated with successful student engagement. In the absence of an external facilitator, teachers will require more and different types of support to deliver the workshop effectively.

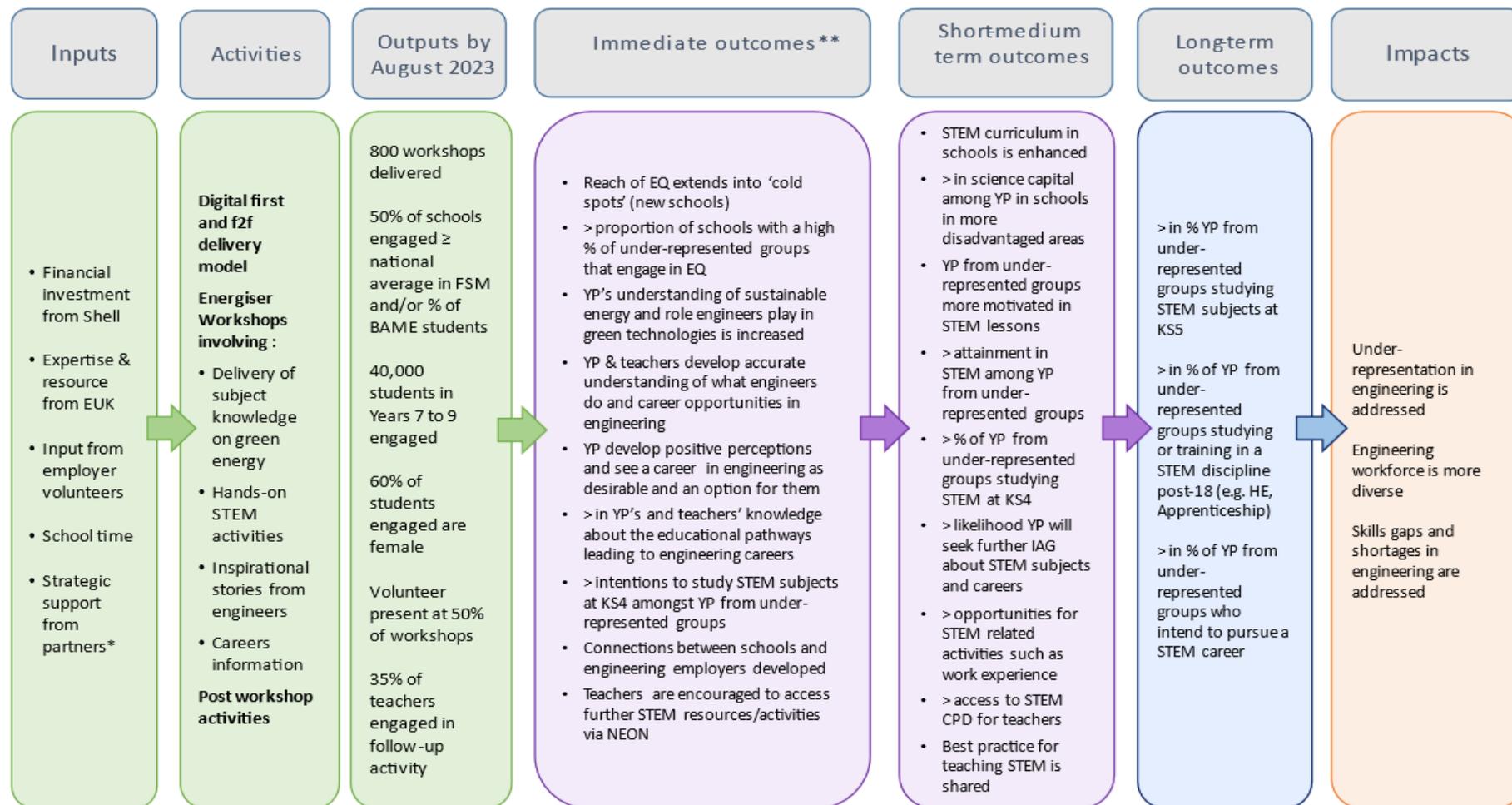
Recommendation: Consider how to simplify and condense the workshop content to ensure that it can be used by teachers and support staff as an 'off the peg' resource.

Recommendation: Consider integrating the EQ workshop as part of both the new Climate Schools and Big Bang Schools Programmes to ensure that students can engage in a programme of sustained STEM enrichment activities.

To understand how schools engage with new activity and a teacher-led EQ delivery model if it is implemented, as well as their perceptions of the impact, robust monitoring and evaluation processes will be essential.

- **Recommendation:** Develop a standardised data collection process that schools can easily follow when reporting on their participation to EUK programme teams. This will be especially important because previously it was the responsibility of delivery partners to complete a pro forma capturing monitoring data on the reach of EQ.
- **Recommendation:** Conduct school visits to observe the facilitation of school-led workshops to identify the types of additional support that they may need.
- **Recommendation:** Evaluate the impact of school-led delivery on students' interest in STEM and their career aspirations and collect teacher and student feedback on their experiences and views of the workshop.

Appendix 1: Theory of change



Appendix 2: Content 3 survey

Welcome to our survey!

This 10-minute survey is part of a study that CFE Research are doing on behalf of EngineeringUK about the Energy Quest workshop that you took part in at your school. We would like you to think about what your views were before the workshop and what your views are now. We will ask you about your views of Energy Quest, what you plan to study, and what career you may like in the future. Your school will not see any of your survey responses. If you have any questions about the survey, ask your teacher.

What will happen to my data?

It will not be possible to identify you or your school in any project reports or outputs. The information that you provide will only be used for the purposes of this study. When you take part in the survey, the data that you provide will be held in a safe, secure place. This data will only be shared with EngineeringUK and no one else. The data will be shared anonymously, so EngineeringUK will not be able to tell which responses are yours.

CFE will hold all data until the end of January 2024, six months after the study ends. We will then share the anonymised data with EngineeringUK for their records.

Please click [here](#) if you would like to read CFE Research's privacy notice or [here](#) for EngineeringUK's privacy notice.

Q0 - School check

Do you currently attend [*school name*]?

- Yes (1)
 No (2)

[IF school is not correct in background data OR school is not identified via URL]

Q0a

Please provide the name of the school that you attend and where it is located.

School (1) _____
 City/Town (2) _____

Q0b

Country

- England (1)
 Scotland (2)
 Wales (3)

Before we begin, what language would you like the survey to be shown in?

Cyn i ni ddechrau, ym mha iaith yr hoffech i'r arolwg gael ei ddangos?

- English/Saesneg (9)
 Welsh/Cymraeg (512)

What is engineering?

This survey will ask for your views about the Energy Quest workshop that you took part in, and, specifically, we will ask you about engineering, which uses maths and science. It also relates to subjects such as design and technology, computing, electronics, and construction. These types of subjects are often called STEM — this stands for Science, Technology, Engineering and Maths.

Just hover over the word *Engineering* or *STEM* throughout the survey to see a reminder of what it includes.

Please click on the forward button below to continue.

Q1

After taking part in the Energy Quest workshop, how much do you agree or disagree with the following statements?

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
In general, I know about the different types of things that engineers can do in their jobs (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know about the role that engineers play in developing technologies for renewable energy sources (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q2

How much has your knowledge changed because of taking part in the Energy Quest workshop about:

	My knowledge has stayed the same (1)	I now have a bit more knowledge (2)	I now have a lot more knowledge (3)	Don't know (4)
The different types of things that engineers can do in their jobs (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The role that engineers play in developing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	My knowledge has stayed the same (1)	I now have a bit more knowledge (2)	I now have a lot more knowledge (3)	Don't know (4)
technologies for renewable energy sources (4)				

Q3

How interested are you in a future career that involves any of the following?

	Not at all interested (1)	Not interested (2)	Neither interested nor uninterested (3)	Interested (4)	Very interested (5)
Engineering (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Science (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Technology (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q4

How much has your interest in a future career that involves any of the following changed because of taking part in the Energy Quest workshop?

	I am now less interested (1)	My interest has stayed the same (2)	I am now more interested (3)	Don't know (4)
Engineering (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Science (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Technology (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q6

How desirable do you believe a career in engineering to be after taking part in Energy Quest?

By 'desirable' we mean a career that you think is attractive or is something that you would like to do.

- Not at all desirable (1)
- Not desirable (2)
- Neither desirable nor undesirable (3)
- Desirable (4)
- Very desirable (5)

Q7

Has the extent to which you view a career in engineering as desirable changed because of taking part in Energy Quest?

- An engineering career is now less desirable (1)
- An engineering career is not any more or less desirable (2)
- An engineering career is now more desirable (3)
- Don't know (4)

Q10

If you could choose, would you choose to study any of the following subjects?

Please select all that apply.

- Biology (1)
- Chemistry (2)
- Physics (3)
- Maths (4)
- Computing/computer science (5)
- Design and technology (6)
- None of the above (8) [*Keep position ♦ Exclusive*]

Q11

If you wanted to, do you think that you could become an engineer?

- No, definitely not (1)
- No, probably not (2)
- Yes, probably (3)
- Yes, definitely (4)
- Don't know (5)

Q12

Has taking part in Energy Quest changed how confident you are about whether you could become an engineer if you wanted to?

- I am now less confident (1)
- I am not any more or less confident (2)
- I am now more confident (3)
- Don't know (4)

Q14

How much do you agree or disagree with the following statements?

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)	Don't know (6)
Engineering careers are open to people of all backgrounds (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)	Don't know (6)
There are opportunities to be creative in engineering careers (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q8

Thinking about your future, how likely or unlikely are you to choose a career in each of the following areas?

	Very unlikely (1)	Unlikely (2)	Neither likely nor unlikely (3)	Likely (4)	Very likely (5)	Don't know (6)
Engineering (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Science (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Technology (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q9

How much has the likelihood of you choosing a career in each of the following areas changed because of taking part in the Energy Quest workshop?

	I am now less likely (1)	I am not any more or less likely (2)	I am now more likely (3)	Don't know (4)
Engineering (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Science (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Technology (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q15

How interesting did you find the following aspects of the Energy Quest Workshop?

	0 - very boring (0)	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	9 (9)	10 - very interesting (10)	Don't know (11)	Did not take part in activity (12)
Storyline about Carlotta and Ruby (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	0 - very boring (0)	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	9 (9)	10 - very interesting (10)	Don't know (11)	Did not take part in activity (12)
Presenting our team's results to the class (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>										
Parachute in an Engineer activity (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>										
Hearing from a volunteer/ engineer (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>										

Q28

Please select which activity you took part in for the Act Like an Engineer design task.

- Fruit battery (4)
- Shelter task (1)
- Clean water task (2)
- Don't know (3) [*Keep position ♦ Exclusive*]

[IF Q28 = 1, 2 OR 4]

Q29

How interesting did you find the activities/activity?

	0 - very boring (0)	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	9 (9)	10 - very interesting (10)	Don't know (11)
(1)	<input type="radio"/>	<input type="radio"/>										

Q16

How much do you agree or disagree with the following statements about taking part in Energy Quest?

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)	Don't know (6)
Energy Quest was enjoyable (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I learned about the role of engineers in generating sustainable energy during Energy Quest (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Energy Quest has made me want to find out more about engineering as a career (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Taking part in Energy Quest has made me want to do more science- or engineering-related activities in the future (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q18

Do you do any of the following science-related activities outside of school?

Please select all that apply.

- Visit science exhibitions/museums (1)
- Attend a science, technology, engineering or maths club (2)
- Watch science programmes on TV or online (e.g. YouTube) (3)
- Read science books (including science fiction) (4)
- Read about science on the Internet (5)
- Listen to a podcast or radio programme about science (8)
- Create my own computer games, website or animation (9)
- Go to a science or engineering fair (6)
- None of these (7) [*Exclusive*]

Q19

Do you know anyone who works in an STEM-related career (apart from your doctor, dentist or another health professional) that you feel that you could get advice from about studying or working in engineering?

Please select all that apply.

- Yes, a parent or guardian (1)
- Yes, another family member (2)
- Yes, a friend of the family (3)
- Yes, someone else (4)
- I do not know anyone who works in an STEM-related career (5) [*Exclusive*]

[If Country = England OR Wales]

Q20a

What year group are you in?

- Year 7 (1)
- Year 8 (2)
- Year 9 (3)

[If Country = Scotland]

Q20b

What year group are you in?

- First Year (S1) (1)
- Second Year (S2) (2)
- Third Year (S3) (3)

Q26

Which of the following best describes your gender?

- Male (1)
- Female (2)
- Non-binary (5)
- Questioning (6)
- Prefer to self-describe (please describe) (3) _____ [*Other*]
- I don't want to answer (4)

Q25

What is your ethnic group?

Please choose one option that best describes your ethnic group or background.

- | | |
|---|--|
| <ul style="list-style-type: none"> <input type="radio"/> Asian/Asian British
(Bangladeshi; Chinese; Indian; Pakistani;
Any other Asian background) (1) | <ul style="list-style-type: none"> <input type="radio"/> White
(English/Welsh/Scottish/Northern
Irish/British; Gypsy or Irish Traveller; Irish;
Any other White background) (4) |
|---|--|

Black/African/Caribbean/Black British
(African; Caribbean; Any other
Black/African/Caribbean background) (2)

Any other ethnic group
(Arab; Any other ethnic group) (5)

Mixed/Multiple ethnic groups
(Asian and White; Black Caribbean and
White; Black African and White; Any other
Mixed/Multiple ethnic background) (3)

I do not want to answer (6)

Q27

Do you receive Free School Meals?

- Yes (1)
- No (2)
- I don't know (3)
- I do not want to answer (4)

i3 - Thanks and close

Thank you for taking the time to answer this survey.

Please click on the forward button below to finish and close the survey.

Appendix 3: Energy Quest 2022-2023 pre–post preliminary evaluation report

Double-click the icon below to open a PDF copy of the report:



Energy Quest, 2022
Evaluation using a pre-
post survey approach

October 2022

Appendix 4: EUK's Energy Quest 2023 teacher survey findings

Number of teacher survey responses: 96

- Most of the teachers responding taught combined science (59%), chemistry (46%), and biology (44%). About 60% of teachers indicated that they teach two or more STEM-related subjects.
- 79% of teachers who participated in the survey were from schools that met the EDI criteria and 21% were from schools that did not meet the EDI criteria.

Headline findings

- 96% of teachers rated their overall experience of the Energy Quest workshop as excellent (67%) or good (29%). Only 3% rated their experience as 'neutral' and 1% as poor.
- 95% of teachers agreed (28%) or strongly agreed (66%) that Energy Quest was engaging for their students.
- 97% of teachers agreed (30%) or strongly agreed (66%) that Energy Quest has clear links to the curriculum.
- 93% of teachers agreed (27%) or strongly agreed (66%) that Energy Quest is accessible to students of all abilities in STEM subjects.
- 93% of teachers agreed (29%) or strongly agreed (64%) that Energy Quest highlighted the variety of careers in engineering and technology.

STEM career advice

- 94% of teachers said that they are fairly confident (44%) or very confident (49%) in giving students advice on careers in **science** after having participated in Energy Quest.
- 75% of teachers said that they are fairly confident (58%) or very confident (17%) in giving students advice on careers in **technology** after having participated in Energy Quest.
- 86% of teachers said that they are fairly confident (70%) or very confident (16%) in giving students advice on careers in **engineering** after having participated in Energy Quest.
- 67% of teachers felt **more confident** in speaking to their students about careers in engineering after having participated in Energy Quest, while 31% reported no change and 2% reported 'don't know'.

Likelihood of running the Energy Quest workshop independently without a facilitator

- 63% of teachers reported that they would probably (44%) or definitely (19%) consider running the Energy Quest workshop themselves, without an external facilitator, if they were provided with guidance and online resources. Just over one fifth of teachers (28%) reported that they would not consider running the workshop themselves (23% probably not and 5% definitely not) and 9% reported that they were not sure.
- Teachers who reported that they would consider running the workshop themselves were asked in which ways they would most likely use Energy Quest resources in school. Below are the top ways in which 59 of these teachers would most likely use the resources:
 - I'm not sure (66%)
 - Running the full workshop as an off-timetable activity (49%)
 - Doing the hands-on activities only (49%)
 - Running the full workshop in class time (31%)
 - In another way (2%)

Feedback on the Energy Quest workshops/programme

Teachers were asked **'What did you like or not like about Energy Quest?'** (an open-text question). A total of 86 teachers shared their reflections.

Positives

- 'I liked the cost-free aspect. I think the scenario was very apt. I think the students were kept busy and engaged.'
- 'I liked how practical-focused it was and how they were linked together.'
- 'The content was perfectly pitched for the audience and the facilitator was excellent.'
- 'The pre-visit information was really helpful. Students found the footage of the young person convincing.'
- 'I enjoyed the practical tasks and the discussions around engineering. It was useful to think of the different types of engineers that exist.'
- 'Easy to book in, parcel sent in advance, facilitators were very understanding when we asked them to take additional students in one big space.'
- 'The providers were very knowledgeable, engaging and professional. The sessions were fun and interesting for our students.'
- 'Really enjoyed the group tasks and how the day was presented.'
- 'That it was linked to a very realistic example in which students may find themselves — made it relevant.'

Areas for improvement

- 'I was given the impression that the resources could just be reused and it wasn't clear that tidying, cleaning and resetting-up of the equipment would be required between each session and this caused a bit of stress for both the Energy Quest leader and me.'
- 'When the speakers arrived, they had very specific requirements which were not stated in the email and we had 10 minutes before the session began. This was very stressful for ALL staff, especially lab technicians. If we had known these requirements from the start, we could have had this in place.'
- 'The only criticism is that there are a lot of printed resources which are very text-heavy.'

Additional feedback

The majority of the feedback/comments given were in relation to the facilitators and the significance of their role in running the Energy Quest programme. For example, the following are quotes from teachers:

- 'Part of doing a workshop is having someone different into school. They see me every week, so don't stop employing these guys!'
- 'I have run the workshop without an external facilitator and it is the novelty of the visitor that raises the standard of the workshop — great facilitators too!'
- 'Using an external facilitator is helpful, as it gets students' attention. Otherwise they tend to view sessions as normal teacher-led lessons.'
- 'It is fantastic for our pupils to meet external professional, especially if they have a STEM background to inspire them into STEM careers.'
- 'While it might be beneficial to some, it would be a great pity if visiting providers were replaced by resources to be delivered by school staff. Having external providers in school adds a different dynamic and excitement to STEM events.'