

BIG BANG AT SCHOOL

Evaluation using a pre and post
survey approach

February 2024



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Big Bang at School is a unique STEM initiative designed for schools, providing them with the tools to organise a customised event within their own educational institutions. Participating schools gain access to various resources, guidance, and financial support for hosting the event. The overarching aim is to showcase the diversity of STEM careers and engage students in hands-on STEM activities.

ABOUT BIG BANG AT SCHOOL

A Big Bang at School (BBS) event consists of 3 collections of STEM activities, categorised based on duration and theme:

- The first collection features short hands-on activities or workshops, comprising a series of activities centred on a specific topic. These sessions typically last from 15 minutes to 6 hours.
- The second collection involves extended project-based work linked to the Big Bang Competition, enabling individual students or teams to enter a project. These activities can last anywhere from 8 hours or more.
- The third collection includes career-oriented activities such as mini careers fairs or Q&A panels, and may also feature the Meet the Future You Quiz, helping students explore engineering roles based on their skills and interests.

Schools are encouraged to choose at least 1 activity from each collection to count as a Big Bang at School event. The flexibility allows educators to adapt the programme to their preferences. As part of BBS, schools can collaborate with delivery partners, who provide dedicated assistance in selecting activities tailored to schools' specific needs and context. Their support also includes connecting educators with local STEM ambassadors and offering on-the-day assistance if required. In 2022/23, EngineeringUK's delivery partners consisted of 5 organisations based across the UK.

In addition to tailored support, schools identified as priority schools through EngineeringUK's EDI criteria were also offered bursaries to enhance the engagement of young people from groups under-represented in engineering. The bursaries were used by teachers to enhance the BBS experience through additional resources and student activities.

For more detailed information on bursary evaluation findings, please refer to the dedicated bursary report.

ABOUT THIS REPORT

This report presents the findings from our 2022/23 impact evaluation of Big Bang at School (BBS). The purpose of this evaluation is to understand the effect of the programme on students' knowledge, attitudes and aspirations related to engineering and STEM more broadly. To achieve this, we administered two surveys to students - one before participating in a BBS and one afterward. Additionally, the report includes insights from teacher surveys and interviews, offering their views and experiences of the programme.

Historically, the programme's evaluation relied primarily on post-event surveys with teachers and students. In 2021, we introduced a pre and post evaluation approach to measure any shifts in knowledge and attitudes towards engineering and gain a more comprehensive understanding of the programme's impact.

Building on the lessons learned from the pilot evaluation, we expanded the pre and post approach in 2022 to recruit a higher number of schools. In total, 9 out of the 10 recruited schools successfully completed both the pre and post surveys. We collected 380 matched student responses, ranging from 1 to 135 matched responses per school. The limited number of responses, particularly in 3 schools, may introduce some selection bias, which is a weakness of the evaluation.

To encourage participation, we gave schools the option to receive either paper copies of the student surveys or use online survey links. This strategy proved successful, as we obtained more complete data for both surveys through the paper-based approach and, overall, effectively doubled the number of matched responses compared to our pilot.

KEY FINDINGS: STUDENTS

Big Bang at School is an enjoyable experience for students.

- 79% of students agreed with the statement “I enjoyed Big Bang at School”, with 27% strongly agreeing

After participating in Big Bang at School, nearly half of students were inspired to do more STEM activities and learn more about engineering careers.

- 47% of students agreed with the statement “Big Bang at School has made me want to do more activities about science, engineering and technology in the future”
- 45% of students agreed with the statement “Big Bang at School has made me want to find out more about engineering as a career”

Our impact evaluation findings suggest that Big Bang at School is most effective at raising the awareness of engineering roles and what these consist of:

- BBS improves students’ self-reported knowledge of different engineering roles
- The event improves students’ self-reported knowledge of the role engineers play in creating green technologies

However, currently the event alone may not be sufficient to create a commitment to engineering as a career path:

- Before participating in BBS, the majority of students (64%) reported that they already knew what job they wanted to do in the future. Among these, the most popular jobs were related to healthcare, creative and media or architecture and the built environment.
- The event doesn’t seem to change students’ views on science as helpful for future careers.
- BBS doesn’t appear to change students’ interest in careers related to engineering, science or technology.
- The event also doesn’t seem to shift students’ belief in whether they could become engineers.

As evidenced by broader research, **one-off interventions alone are insufficient to support a young person in pursuing STEM pathways.** This support is fostered through various elements, such as continued participation in STEM engagement, study of STEM subjects, teacher support, and a variety of other contextual factors.

Our findings suggest that **Big Bang at School can be a helpful step in a young person’s future STEM exploration.** However, **sustained STEM engagement over time could facilitate the conversion of initial inspiration into enduring aspirations towards engineering and technology careers.**

KEY FINDINGS: TEACHERS

Teachers also have a positive experience of Big Bang at School.

- 97% of teachers rated their overall experience of Big Bang at School as being excellent (82%) or good (15%)
- 97% of teachers agreed that Big Bang at School was engaging for their students
- 95% of teachers agreed that Big Bang at School was accessible to students of all abilities in STEM subjects
- 89% of teachers agreed that Big Bang at School had clear links to the curriculum

Teachers feel more confident to advise students about STEM careers, having participated in the programme.

- After taking part in Big Bang at School, 82% of teachers said they are more likely to suggest a career in engineering to a student
- After taking part in Big Bang at School, 74% of teachers felt more confident in speaking to their students about careers in engineering having taken part in Big Bang at School

About the pre and post evaluation

Evaluation approach

This report focuses on analysing the extent to which students' knowledge, interest and aspirations changed following their participation in Big Bang at School.

Building on a pre and post evaluation pilot trialled in the 2021/22 academic year, we recruited a total of 10 schools participating in the Big Bang at School in 2022/23 for this years' programme evaluation. This approach involved engaging schools to conduct two rounds of data collection, one before their school event took place (pre) and one after the event (post).

Schools were asked to conduct pre and post data collection with at least one class in each year group, 7, 8 and 9. Only schools new to the programme were recruited to the evaluation. To improve on the survey response rates from the pilot evaluation, this year schools were offered the option to request paper copies of the surveys to disseminate with their students. We found that using this approach we received more complete and matched responses to paper-based surveys, compared to those collected via online links.

Alongside the student evaluation, we collected feedback from teachers through a survey to understand their experiences of Big Bang at School. These findings are also presented in the report.

Presentation of findings

The student surveys we used included key questions that in most cases follow a Likert scale structure, meaning young people had the option to give a response on a 5-point scale with a strong negative on one end and a strong positive on the other. The questions also included a 'don't know' response option, which has been excluded for the purpose of our analysis.

To make sense of the data, we provide 3 ways of comparing the pre and post event responses. This helps us get a better understanding of any shift on the measures of interest between the 2 time points.

Please note that significance testing has been used to look for statistical differences in responses. In our analyses, odds ratio and t-tests have been used. Where there is a significant difference between variables, that is based on a 95% confidence level. All differences noted in this report are statistically significant, unless otherwise stated.

The odds of giving a positive response

The goal of Big Bang at School is to inform and inspire more young people, regardless of their background, to consider pursuing engineering and technology careers. To achieve this, students should have positive attitudes towards STEM and STEM careers aspirations.

This is why we analysed students' positive responses (e.g. very interested or quite interested) after the Big Bang at School compared to before.

We did this by comparing these positive responses to each question with negative or neutral ones (e.g. not at all interested, not interested or neither interested nor uninterested). We then calculated the odds of students giving a positive response to understand whether there is a link between their responses and their participation in Big Bang at School.

Positive or negative movement

To conduct the remaining analysis, we coded survey response options from 1 to 5:

- Strongly disagree / Not at all interested / Not at all desirable (coded as 1)
- Disagree / Not interested / Not desirable (2)
- Neither agree nor disagree / Neither interested nor uninterested / Neither (3)
- Agree / Interested / Desirable (4)
- Strongly agree / Very interested / Very desirable (5)

Individual scores were then compared before and after the workshop. As a student could be starting from any position on the scale, comparing scores helps us understand whether participants are moving towards a more positive response or a more negative response, and the distance of this movement. This is important to evaluate as the event may be moving some students closer towards considering a future in STEM as well as further away from it.

Comparing mean scores

Finally, to measure whether there has been any change across the response scale, we calculated and compared the average (mean) coded responses for each key measure given before and after the workshop. This analysis enables us to see whether there is a genuine shift along the scale as a whole.

Sample

While this pre and post evaluation involves a larger student sample than the previous year, a more extensive dataset would better capture subtle changes and prevent unintended biases. The findings presented in this report are specific to 9 out of the 78 schools in the 2022/23 Big Bang at School. Caution is advised in interpreting findings as the programme's adaptability to individual school contexts limits our ability to generalise whether similar patterns would be observed across all schools participating in a Big Bang at School.

STUDENT EVALUATION PARTICIPATION

- **9 of the 10 schools** who were recruited for this evaluation provided both pre and post student survey responses
- **All schools involved in this evaluation were EngineeringUK priority schools**, meaning they met our equity, diversity and inclusion criteria.¹
- **All schools were new to Big Bang at School**
- **380 students completed surveys both before and after participating in their Big Bang at School.** Responses to each survey were matched using a unique identifying code. We collected over twice as many matched responses as the number of responses collected in our pilot (175 responses).
- A higher proportion of girls (67%) and students in Year 7 (56%) participated in the evaluation, compared to boys (27%) and students in older year groups (12% in Year 8, and 26% in Year 9)

How involved were participants in STEM and with STEM professionals?

As part of our evaluation, we asked young people questions to explore their pre-existing levels of engagement in STEM outside of school. For the purpose of our data analysis, we gave students a STEM engagement score based on how many of the types of STEM activities we asked about they do outside of school: low (none of STEM activities listed), medium (1 to 2 activities), or high (3 or more activities).²

When interpreting the findings presented in this report, it's worth noting that 41% of the students who took part in this evaluation reported engaging in 3 or more STEM related activities outside of school. While 37% of young people reported not knowing anyone who works in a STEM related career, most respondents said they knew a parent or guardian, a family friend or another STEM professional (63%). Their pre-existing level of interest, experience or exposure of STEM may be a contributing factor in the limited or no change observed in certain measures presented in this report.

How was data collected?

Teachers were asked to make time during the school day for students to complete a survey prior to taking part in BBS (pre-survey). Students were then asked to fill in a second survey after the event (post-survey) to capture any change in their knowledge, attitudes or aspirations towards engineering. This year teachers had the option to either request paper copies of the surveys or use online links for students to complete.

Young people who completed both surveys

	No.	%
Total	380	
Year group (n=377)		
Year 7	210	56%
Year 8	46	12%
Year 9	97	26%
Year 10	18	5%
Year 11	6	2%
Gender (n=378)		
Female	262	69%
Male	103	27%
Non-binary or other self-description	5	1%
I don't want to answer	8	2%
Ethnicity (n=379)		
Asian/Asian British	115	30%
Black/Black British	23	6%
Multiple ethnic groups	33	9%
White	181	48%
Other ethnic identity	15	4%
I don't want to answer	12	3%
Free school meals (n=379)		
Yes	73	19%
No	269	71%
I don't know	28	7%
I don't want to answer	9	2%
Disabilities (n=378)		
Yes	27	7%
No	294	77%
I don't know	40	11%
I don't want to answer	17	4%
STEM engagement (n=376)		
High	154	41%
Medium	149	40%
Low	73	19%
Knows a STEM professional (n=379)		
Yes	239	63%
No	140	37%

1. EngineeringUK defines as priority schools those who meet our equity, diversity and inclusion (EDI) criteria, based on student population with higher numbers of groups typically underrepresented in engineering. For more details, see EngineeringUK EDI Criteria (tomorrowsengineers.org.uk).

2. Our measure of STEM engagement is based on the survey question: 'Do you do any of the following science related activities outside of school?'. Respondents could choose from the following options: 'Watch science programmes on TV or online (e.g. YouTube)'; 'Visit science museums or displays'; 'Read science books (including science fiction)'; 'Read about science on the internet'; 'Attend a science, technology, engineering or maths club'; 'Create my own computer games, website or animation'; 'Go to a science or engineering fair'; 'Listen to a podcast or radio programme about science'; 'None of the above'. Question wording and options were adapted from the science capital index.

TEACHER EVALUATION PARTICIPATION

In addition to engaging students in our evaluation, we invited all teachers running a Big Bang at School in 2022/23 to participate in our feedback survey.

The survey was designed to gain insights into teachers' experiences with the programme and their perspectives on the support provided for STEM careers. In total, **40 teachers and careers staff at 32 schools** completed the teacher survey, 41% of all participating schools.

The table to the right shows the teacher characteristics of those who completed the survey in 2022/23.

- All respondents are from EngineeringUK priority schools
- Just over half of respondents (53%) are based in England
- The majority of respondents to the survey are subject teachers (58%) and a little over one-third are heads of departments (38%)
- The other roles mentioned included STEM coordinator and Key Stage lead

For the purpose of this report, we will be using the term teachers to refer to school staff who engaged in a Big Bang at School and responded to our teacher feedback survey.

How was data collected?

The teacher survey was conducted between March and July of 2023. All teachers and school staff who organized or contributed to running their school's event were invited to take part. We invited these educators to provide their feedback through online survey links.

TEACHER CHARACTERISTICS		Completed survey N (%)
Total		40
Role		
Subject teacher		23 (58%)
Head of department		15 (38%)
Careers lead/advisor/coordinator		4 (10%)
Senior leadership team		3 (8%)
Technician		1 (3%)
Other role		8 (20%)
Subject taught		
Combined science		18 (45%)
Chemistry		13 (33%)
Biology		11 (28%)
Physics		9 (23%)
Maths		4 (10%)
D&T		3 (8%)
Computer Science		3 (8%)
Engineering		1 (3%)
Non-STEM subjects		1 (3%)
Other STEM subjects		1 (3%)
Previous participation		
New to BBS		22 (55%)
Participated in BBS before		18 (45%)
UK nation/region		
England		21 (53%)
	North East	1 (3%)
	North West	-
	Yorkshire and the Humber	2 (5%)
	East Midlands	2 (5%)
	West Midlands	3 (8%)
	East of England	1 (3%)
	South East	3 (8%)
	London	6 (15%)
	South West	1 (3%)
Scotland		7 (18%)
Wales		7 (18%)
Northern Ireland		5 (13%)

Student and teacher experiences of Big Bang at School

EXPERIENCE OF BIG BANG AT SCHOOL

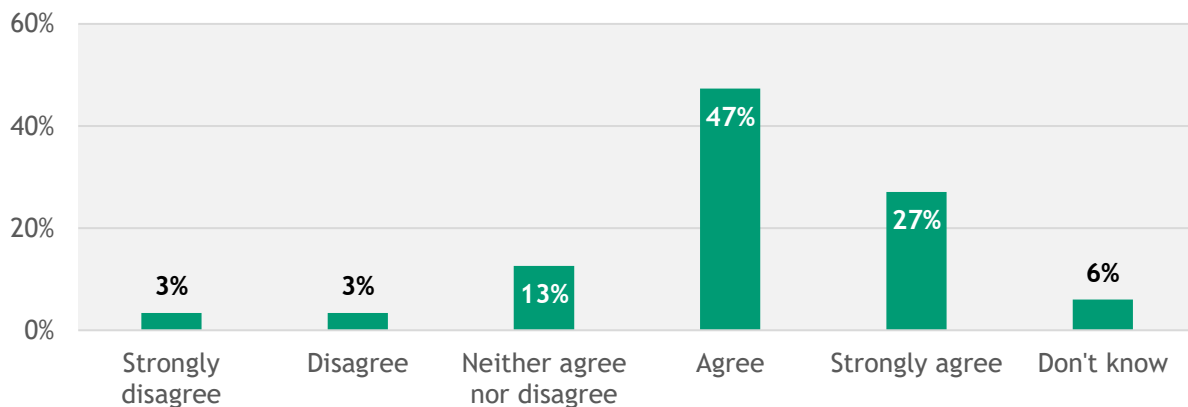
Big Bang at School aims to inform and inspire young people to consider or pursue pathways towards STEM education and careers. Providing enjoyable and engaging experiences for young people can be a key step towards achieving this aim in the short-term.

A large majority of young people who took part in our evaluation reported they enjoyed taking part in Big Bang at School (50% agree; 29% strongly agree - excluding 'don't know' responses).

KEY FINDING

- **About 4 in 5 students who responded to our survey enjoyed Big Bang at School (79%)**
- **Girls tended to enjoy Big Bang at School more than boys did**
- **Students who were actively involved in several STEM activities before Big Bang at School, whether medium or high STEM engagement, were more likely to enjoy the event compared to those who were less involved in STEM activities (low STEM engagement).**

"I enjoyed Big Bang at School (N=380)



Predictors of students' enjoyment of Big Bang at School

Overall enjoyment was high, with 79% of respondents reporting they enjoyed the Big Bang at School. We conducted further analysis to understand more about any associations between student characteristics and participants' level of enjoyment of the event.

We found that gender and STEM engagement were predictors of enjoyment of Big Bang at School, when taking into account all other characteristics.³

- Girls were about 2.5 times as likely to enjoy Big Bang at School than boys^a

- Compared to students who reported low STEM engagement, students with medium^b and high^c STEM engagement were both about 2.5 times as likely to enjoy the event

Given enjoyment can be a motivator for continued engagement in STEM activities, it is not a surprising finding that prior engagement in these activities is a predictor of the likelihood students enjoyed the event.

Encouragingly, findings suggest that the lesson may be equally enjoyable for students of different year groups, ethnicities, abilities and whether they receive free school meals or know a STEM professional.

3. Logistic regression in this report controlled for student characteristics, including gender, ethnicity, year group, disability, prior STEM engagement, receiving free school meals, whether they attend a priority school and whether they know someone working in STEM. Only significant findings are reported in this document.

Logistic regression outputs: ^a OR=2.51, 95%CI 1.08-5.81, p<0.05; ^b OR=2.67, 95%CI 1.11-6.45, p<0.05; ^c OR=2.64, 95%CI 1.05-6.60, p<0.05;

VIEWS OF BIG BANG AT SCHOOL

Big Bang at School aims to inform and inspire students for future STEM educational and career journeys. To understand students' views on the short-term impact of the event, we asked participants about their interest in STEM activities and in learning more about engineering careers following their engagement in Big Bang at School.

Nearly half of respondents reported they wanted to do more STEM activities (47%) and 45% wanted to find out more about engineering as a career, as a result of their participation in Big Bang at School.

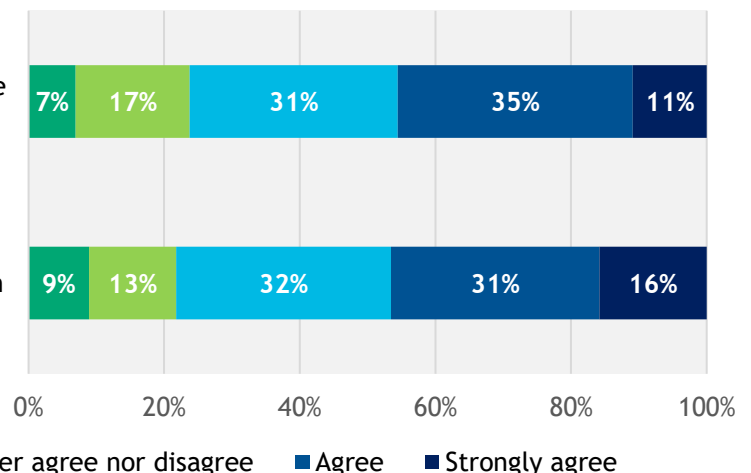
KEY FINDING

- Nearly half of students agreed that Big Bang at School had made them want to do more STEM related activities in the future (47%) and find out more about engineering as a career (45%)
- Students' level of prior STEM engagement was the sole factor affecting students' views on the impact of Big Bang at School

Young people's views of Big Bang at School

Big Bang at School has made me want to find out more about engineering as a career (n=350)

Big Bang at School has made me want to do more activities about science, engineering and technology in the future (n=346)



Predictors of students' views of Big Bang at School

Preliminary analysis showed that students' year group and ethnicity seemed to influence whether respondents were more likely to agree that the programme had made them want to find out more about engineering as a career and that it encouraged them to do more STEM activities. However, a further analysis indicated that these differences can be accounted for by students' prior STEM engagement.

In fact, the only student characteristic associated with wanting to find out more about engineering careers and to do more STEM activities after Big Bang at School was their level of STEM engagement:

- Students with medium STEM engagement were twice ^a as likely to want to find out more about engineering, and those with high STEM engagement were 3 times as likely compared to students with low STEM engagement.^b
- Similarly, students who reported medium STEM engagement were three times ^c as likely, and those with high STEM engagement were over 4 times ^d as likely to want to do more STEM activities in the future, compared to students with low STEM engagement.

Logistic regression outputs: ^a OR=2.40, 95%CI 1.01-5.73, p<0.05; ^b OR=3.17, 95%CI 1.29-7.80, p<0.05; ^c OR=3.37, 95%CI 1.31-8.69, p<0.05; ^d OR=4.72, 95%CI 1.78-12.51, p<0.05

VIEWS OF BIG BANG AT SCHOOL

Teachers are overwhelmingly positive about their experience of Big Bang at school, with 82% rating the programme as ‘excellent’ and 15% as ‘good’. This finding is encouraging, as teachers’ views of the programme do play a key role in continued participation.

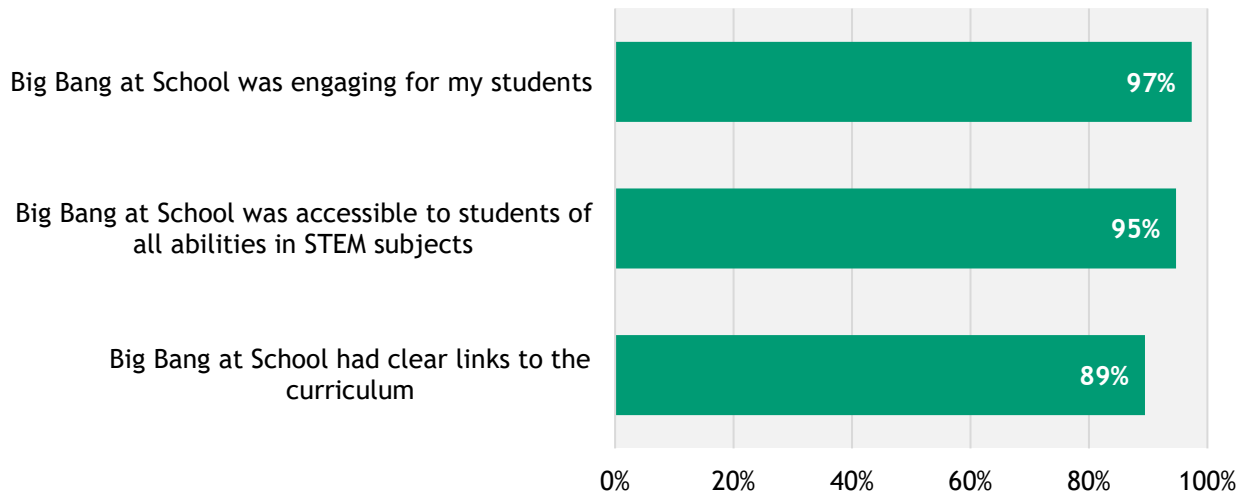
The Big Bang at School supports schools by offering resources for setting up an event, including guidance on running STEM activities and STEM careers information or links to local networks of employers. The aim is to provide an experience for young people where they can try hands-on STEM activities and visualise the variety of STEM professional opportunities.

Feedback from the teacher survey supports that teachers felt that the event met these aims.

KEY FINDINGS

- **97% of teachers who responded to our survey rated Big Bang at School as ‘excellent’ or ‘good’ overall**
- **An overwhelming majority of teachers (ranging from 89% to 97%) expressed high levels of agreement regarding Big Bang at School’s engagement, its accessibility to students of varying STEM abilities, and clear curriculum links.**

Teachers’ views of Big Bang at School (N=38)



“The Big Bang at School event gave us the opportunity to celebrate STEM across the curriculum. It enabled our students to get hands on with employers and other providers to bring STEM to life and give them experiences that they wouldn't ordinarily have experienced. [...] It has opened up our doors to new employers who would like to continue to work with us.” (Teacher)

IMPROVING TEACHERS' CONFIDENCE TO TALK ABOUT STEM CAREERS

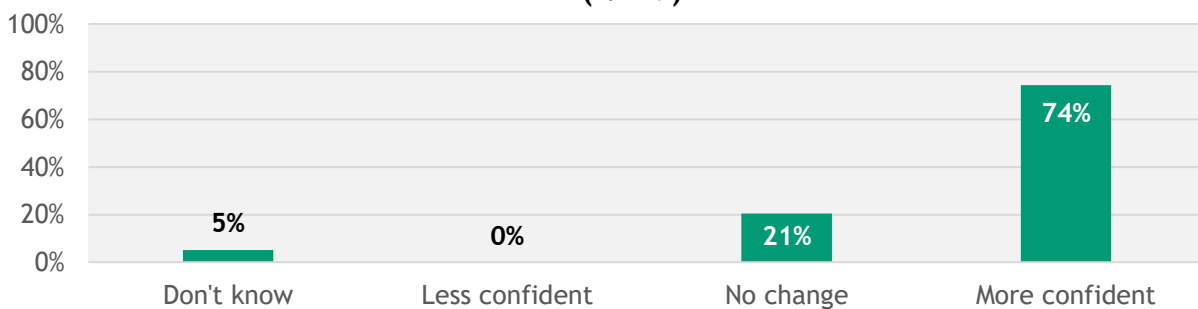
Teachers hold a crucial role in advising and steering students toward their career paths, including in STEM fields. For effective guidance, they need a good understanding of STEM careers and the confidence to provide relevant information.

As part of our evaluation, we asked teachers whether they are confident in speaking to students about engineering careers after participating in the event.

KEY FINDING

About three-quarters of teachers (74%) said that they felt more confident in speaking to their students about careers in engineering after taking part in Big Bang at School.

After taking part in Big Bang at School, do you feel any more or less confident in speaking to your students about careers in engineering? (N=39)



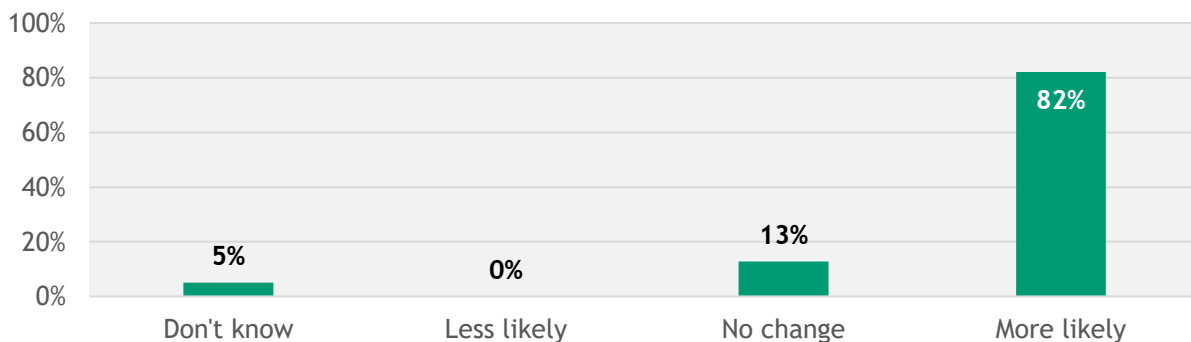
IMPROVING TEACHERS' LIKELIHOOD TO RECOMMEND A STEM CAREER

We asked respondents how likely they are to suggest a career in engineering to a student, following their participation in Big Bang at School.

KEY FINDING

82% of teachers said that they were more likely to suggest to a student that they consider a career in engineering after taking part in Big Bang at School.

After taking part in Big Bang at School, are you more or less likely to suggest to a student that they consider a career in engineering? (N=39)



Findings on the impact of Big Bang at School

KNOWLEDGE OF ENGINEERING CAREERS

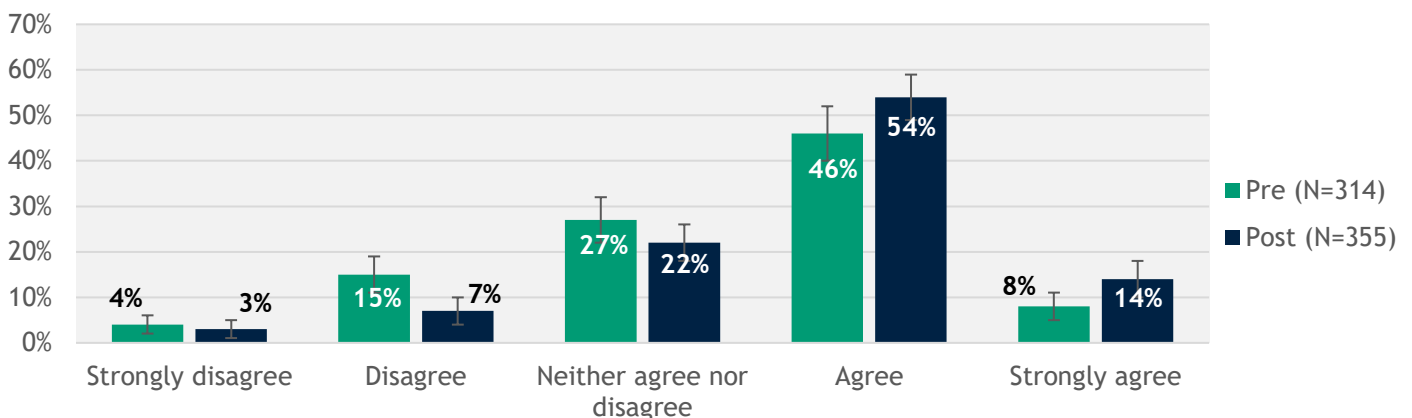
Big Bang at School aims to inform teachers and students about STEM careers, showcasing these roles and what STEM professionals can achieve. In our evaluation, we asked about students' knowledge of engineering roles to understand the potential impact of the event.

Before participating in Big Bang at School, slightly over half (54%) of students already agreed that they knew the types of things engineers do. Following the event, this rose to 68% of students. Notably, fewer students disagreed with the statement after the event (going from 15% before to 7% afterward).

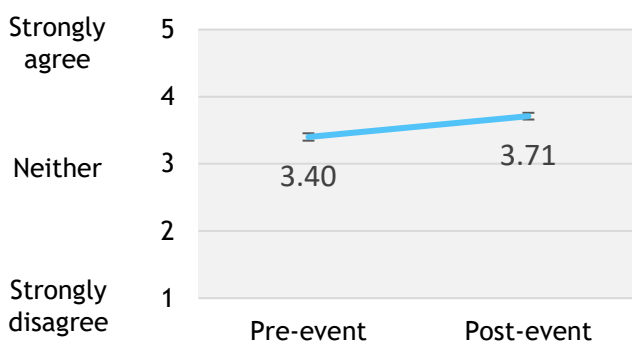
KEY FINDINGS

- After Big Bang at School, students were more likely to agree that they know about the types of things engineers do in their jobs, compared to their response beforehand ⁴
- Just over one third (35%) of students reported an increase in knowledge about engineering roles, with a positive shift observed especially among disabled students and those who don't know a STEM professional
- Overall, our analyses suggest that Big Bang at School does have an effect on students' reported gain in knowledge of the range of engineering roles

“In general, I know about the different types of things that engineers can do in their jobs”



Mean scores before and after the event



Comparing individual response scores, we found that half (50%) of respondents reported no change in their score, and 15% indicated a lower.

Overall, 35% of students showed a positive shift in knowledge of engineering roles after participating in Big Bang at School. Encouragingly, disabled students^a and those who don't know a STEM professional^b were most likely to report a positive shift, with 48% and 38%, respectively, showing an increase in knowledge of what engineers do.

Our analysis found that after Big Bang at School, the mean scores increased slightly (from 3.4 to 3.7), and this change was significant.⁵ It indicates that Big Bang at School has a small but real effect on what students know about the various things that engineers do.

4. Odds ratio: students responding 'Agree' / 'Strongly agree' vs all other responses (OR = 1.79 95%CI [1.31-2.45])

5. Paired sample t-test: $t(291) = -4.256$; $p < 0.05$

6. Positive movement across the scale vs negative or no movement: a OR=5.08, 95%CI 1.14-22.58, $p < 0.05$; b OR=2.28, 95%CI 1.17-4.44, $p < 0.05$

KNOWLEDGE OF ENGINEERS' ROLE IN CREATING GREEN TECHNOLOGIES

Alongside increasing students' knowledge of the variety of engineers' roles, Big Bang at School also features environmental themes within its activities.

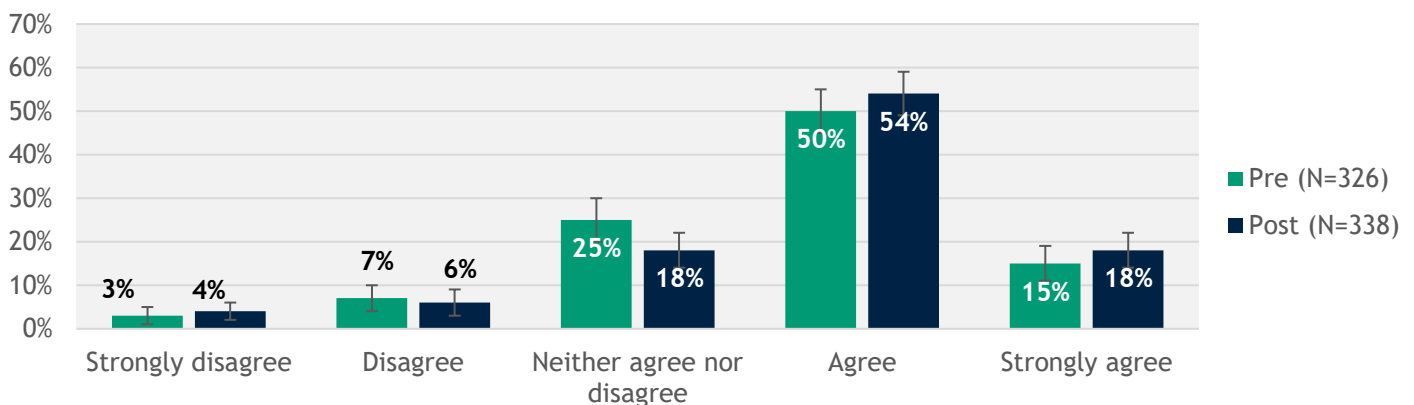
Before the event, 65% of students already agreed they know about the roles engineers play in creating green technologies. This increased to nearly three quarters of respondents (72%) following the event.

Comparing individual scores, almost half (48%) of students did not change their response to this question after Big Bang at School. Nearly one third (31%) of students reported an increase in knowledge, and 21% indicated it as lower. Our analysis found that there was no association between students' characteristics and positive shifts in knowledge.

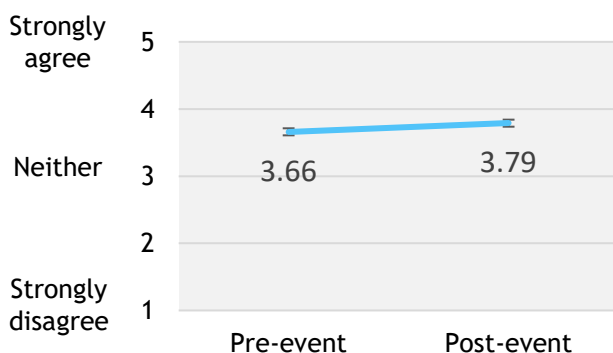
KEY FINDINGS

- After the event, students were more likely to say they know about the role engineers play in creating green technologies⁷
- Nearly one third (31%) of students reported an increase in knowledge about the role engineers play in creating green technologies.
- Our analyses suggest the event is improving student's knowledge about the role engineers play in creating green technologies

"I know about the role engineers play in developing technologies that are better for the environment"



Mean scores before and after the event



Encouragingly, when comparing mean scores, we found a slight but significant increase after the workshop compared to before.⁸ The mean score before the event was 3.7 and 3.8 after the event.

This indicates that **Big Bang at School** has a small but real effect on what students know about the role engineers play in developing technologies for renewable energy sources.

7. Odds ratio: students responding 'Agree' / 'Strongly agree' vs all other responses (OR = 1.42 95%CI [1.02-1.97])

8. Paired sample t-test: $t(292) = -2.010$; $p < 0.05$

STUDENTS' IDEAS OF THEIR FUTURE JOBS

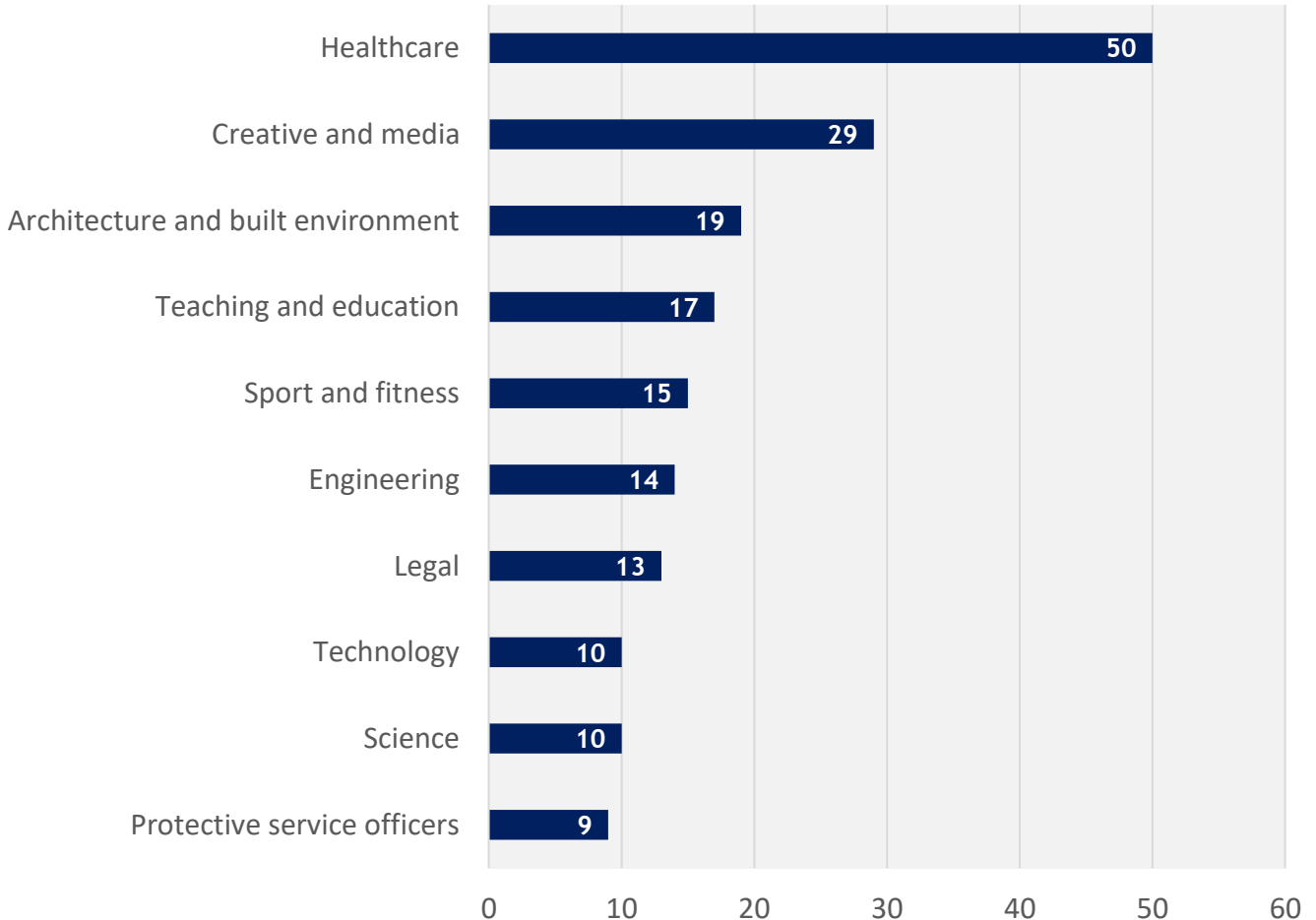
We asked students about their future career aspirations before taking part in Big Bang at School. Those who said they knew what they want to do when they are older were asked to write in the specific job or field. These responses were then categorised in broader occupational areas. The figure below illustrates the top 10 jobs categories mentioned by respondents.

- Notably, healthcare related occupations emerged as the most popular category overall (with 50 students specifying roles in this area).
- Creative and media occupations came in second (with 29 mentions)
- Architecture and build environment related occupations were the third most popular (19 mentions)

KEY FINDINGS

- **64% of students said that they know what job they want to do in future**
- **Healthcare, creative and media, and architecture and built environment related occupations were the top three job categories most mentioned by students**

Top 10 future job categories (N=186)



ATTITUDES ON THE FUTURE USE OF SCIENCE

In 2022/23 a new measure was included in the student survey with the aim to capture any change in young peoples' perceptions on the usefulness of science for their future careers.

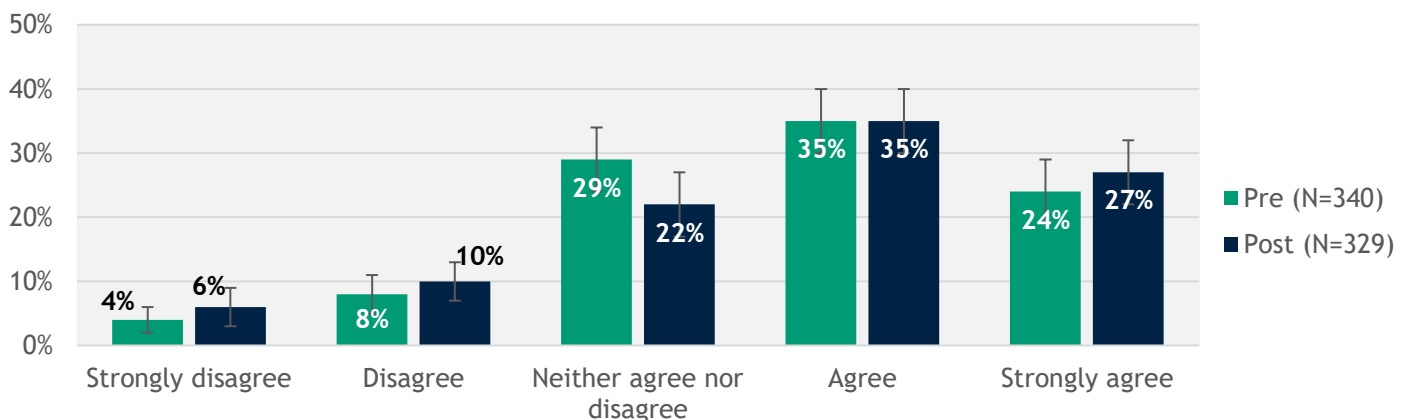
Before the event, 59% of students already agreed that learning about science will be helpful for their future job. Roughly a similar proportion of students (61%) agreed to the statement after the event.

Comparing individual scores, just over half of students (56%) reported no change in their response to this question. 23% of students reported a higher score on the usefulness of science, and 21% indicated a lower score.

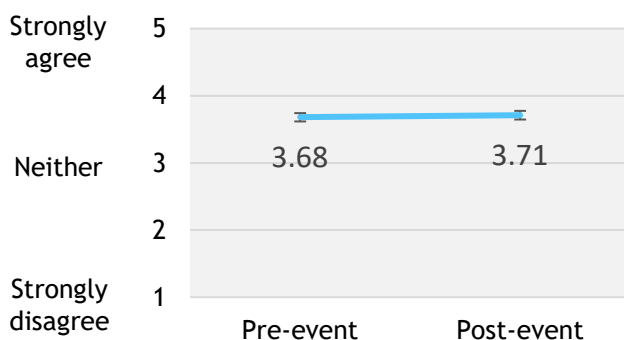
KEY FINDINGS

- After the event, students were no more likely to agree that learning about science will be helpful for their future job
- The average score for students agreeing science will be helpful in their future careers remained the same at 3.7
- Our analyses show that the event does not appear to currently change students' views on science as being helpful for future careers

“Learning about science will be helpful for my future job”



Mean scores before and after the event



When comparing mean scores, we found no significant increase after the event compared to before. The mean score on the usefulness of science in future careers before and after the event remained at 3.7.

INTEREST IN A SCIENCE CAREER

Students were asked about their level of interest in science, technology and engineering careers both before and after Big Bang at School, to capture any shifts on this measure.

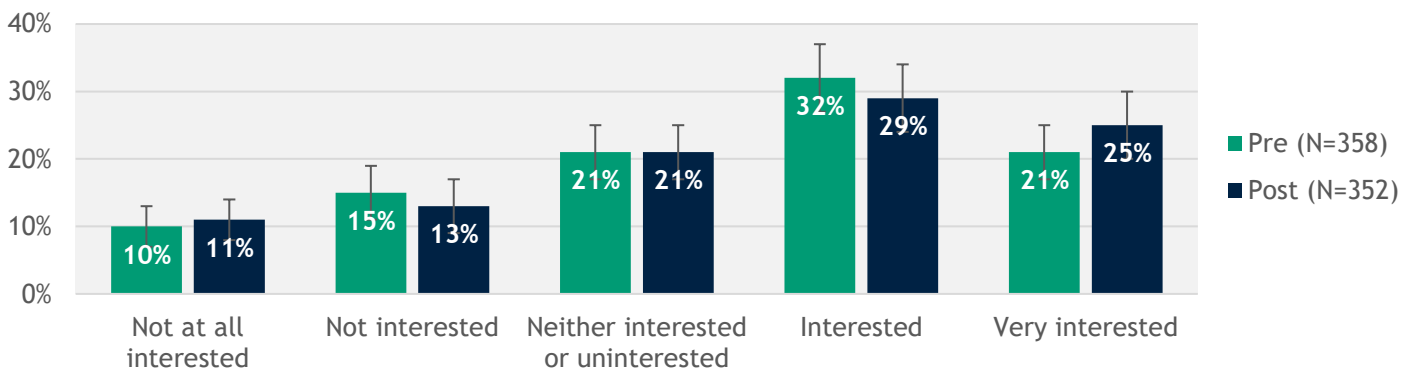
Prior to the event, 54% of students said they were interested in a career that involves science. Following the event this proportion remained roughly the same (55%).

Comparing individual scores, just over half of students (53%) reported no change in their response to this question. One quarter of students (25%) reported a higher score on interest in a science related career, and 22% indicated a lower score.

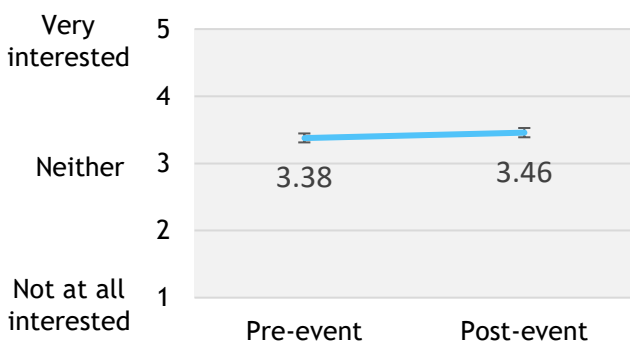
KEY FINDINGS

- After the event, students were no more likely to say they are interested in a career that involves science
- The average score for students being interested in science careers did not increase significantly
- Our analyses suggests that Big Bang at School does not currently change students' interest in a science related career

“How interested are you in a future career that involves science?”



Mean scores before and after the event



When comparing mean scores, we found no significant increase after the event compared to before. The mean score on interest in science careers remained relatively similar, with a 3.4 score before the event and 3.5 afterward.

INTEREST IN A TECHNOLOGY CAREER

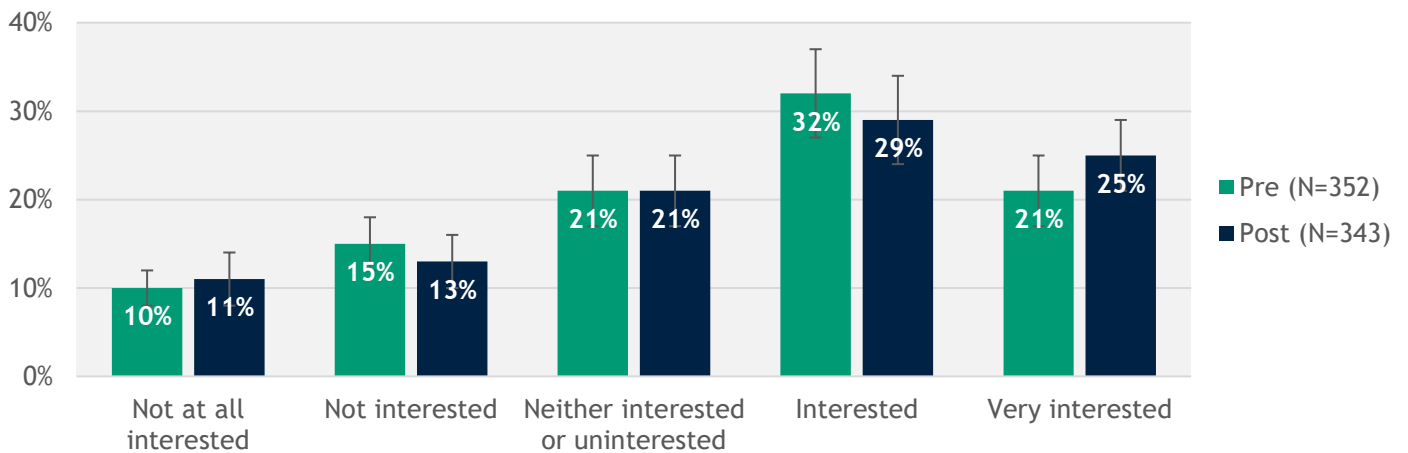
Prior to the event, 54% of students said they were interested in a career that involves technology. Following the event this proportion remained roughly the same (55%).

Comparing individual scores, just over half of students (52%) reported no change in their response to this question. About one quarter of students (24%) reported a higher score on interest in a technology related career, and 23% indicated a lower score.

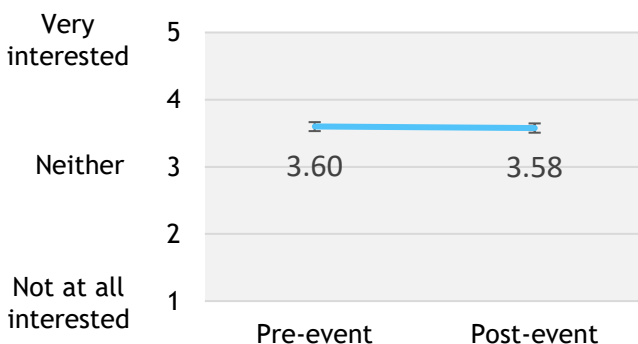
KEY FINDINGS

- After the event, students were no more likely to say they are interested in a career that involves technology
- The average score for students being interested in technology related careers remained roughly the same
- Our analyses suggests that Big Bang at School does not currently change students' interest in a technology related career

“How interested are you in a future career that involves technology?”



Mean scores before and after the event



Comparing mean scores, we found no significant increase after the event compared to before. The mean score on interest in technology careers before and after the event remained around 3.6.

INTEREST IN AN ENGINEERING CAREER

Students were asked about their interest in science, engineering or technology careers both before and after the workshop. Overall, we found that students were no more likely to say they are interested in a career in these fields after the event, compared to before taking part.

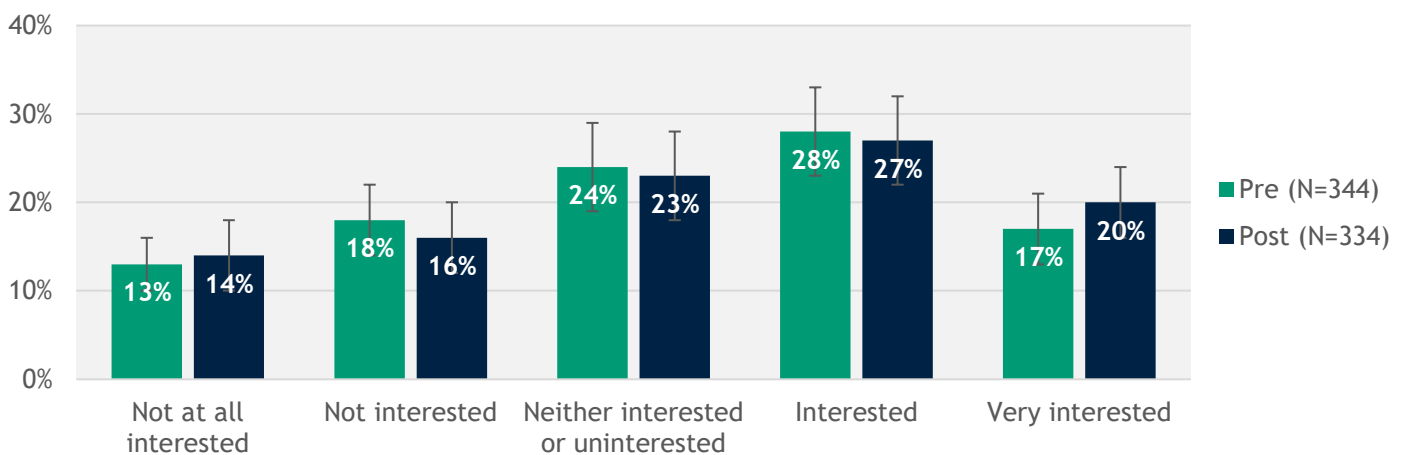
Prior to the event, 45% of students said they were interested in a career that involves engineering. Following the workshop this proportion remained roughly the same (46%).

Comparing individual scores, 47% of students reported no change in their response to this question. 30% of students reported a higher score on interest in an engineering related career, and 23% indicated a lower score.

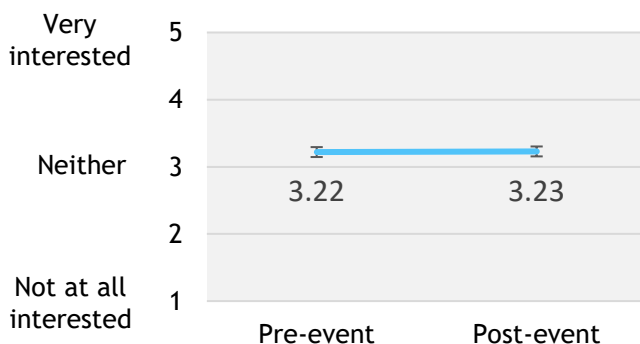
KEY FINDINGS

- After the event, students were no more likely to say they are interested in a career that involves engineering
- The average score for students being interested in engineering careers remained roughly the same
- Our analyses suggests that Big Bang at School does not currently change students' interest in an engineering related career

“How interested are you in a future career that involves engineering?”



Mean scores before and after the event



When comparing mean scores, we found no significant increase after the event compared to before. The mean score on interest in engineering before and after the event remained at 3.2.

ABILITY TO BECOME AN ENGINEER

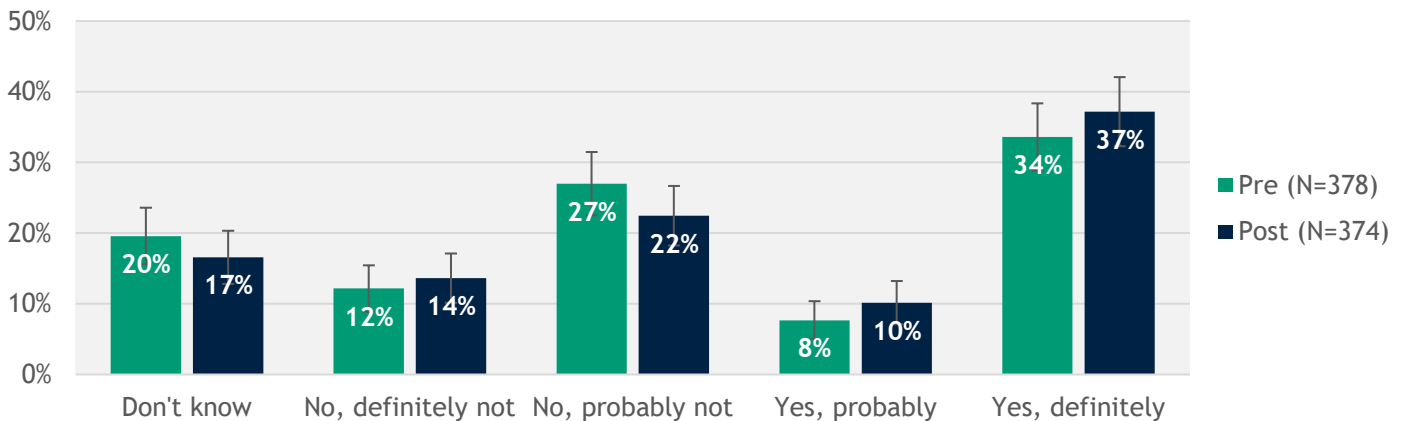
Students were asked about whether they thought they could become engineers if they wanted to. Before the event, 41% of students said they believed that they could become an engineer if they wanted to. Following the event, this has only slightly increased to 47%.

Comparing individual scores, nearly three quarters (72%) of students reported no change in their response to this question. 16% of students reported a higher score on their ability to become an engineer, and 12% indicated a lower score.

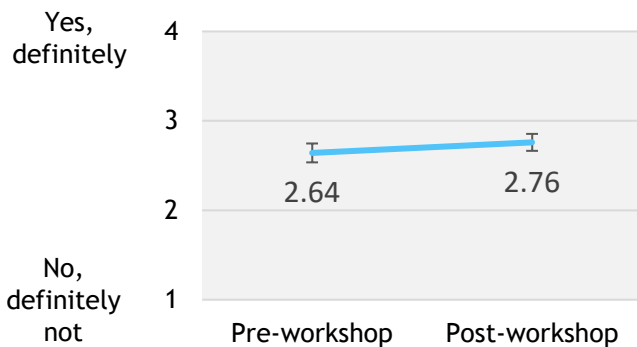
KEY FINDINGS

- After the event, students were no more likely to say they could become an engineer if they chose to.
- The average score for students' belief in their ability to become an engineer did not increase significantly
- Our analyses show that Big Bang at School does not currently change students' belief in whether they could become an engineer

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



Mean scores before and after the event



When comparing mean scores, we found no significant increase after the workshop compared to before. The mean score on belief in ability to become an engineer before the workshop was 2.6 and after the workshop this was 2.8. Don't know responses were excluded from this analysis.

Students' perceived barriers to becoming an engineer

We asked the 133 students who did not believe they could become an engineer the reasons behind their view. Among these students, 42% said it was because they are not good enough at science. Roughly even proportions of students said it was because they are not good enough at maths (32%), or because they didn't know enough about how people become engineers (31%).

A small proportion (7%) reported that people like them don't become engineers. Students also had the option to specify any additional reasons for what would stop them from becoming an engineer. Their responses mostly mentioned that they don't want to become an engineer or that they are not interested in engineering.

Learning for improvement

Teachers were encouraged to provide feedback on their experiences with Big Bang at School and offer suggestions for improving the event. Their valuable insights help us ensure consistent positive experiences in future years of programme delivery. Key themes that emerged from their responses are summarised below.

POSITIVE ASPECTS OF BIG BANG AT SCHOOL

A total of 36 free text responses were categorised to show which aspects were commonly mentioned:

Hands-on activities

The main theme throughout teachers' feedback about what they liked of the event is their appreciation for hands-on activities that make up a Big Bang at School. Teachers appreciate the range of these activities, from workshops, competitions and fair-like experiences. Respondents recognise these activities were particularly engaging for their students, who had the opportunity to also practice important soft skills, such as communication skills.

- “We love having a focussed week around STEM and careers and having the opportunity to arrange a lot of fun activities”

Engagement with STEM professionals

Several teachers highlighted the presence of STEM ambassadors and external visitors from various fields as beneficial for students, providing insights into diverse STEM careers.

- “There was a range of external visitors that helped engage students and discuss what STEM careers they can go into. Students loved the range of activities and actively participated in the sessions.”

Resources and organisation

As part of the event teachers are provided with resources on how to run a Big Bang at School and guidance from delivery partners. Several teachers mentioned they greatly appreciated the support provided and flexibility in the programme, enabling them to deliver an event tailored to their experience and needs.

- “The flexibility of the programme is very good as I can arrange the task to be carried out at a time that isn't busy in the school term. Excellent resources are provided by EngineeringUK [...]. Pupils also enjoyed carrying out The Big Bang improving their practical and communication skills.”

AREAS FOR IMPROVEMENTS

A total of 20 free text responses were categorised to show which aspects were commonly mentioned:

Variety of activities and STEM professionals

Several teachers expressed a desire for more and more varied hands-on activities for their students. Some teachers mentioned they would appreciate being linked with more STEM employers or activity providers to enable a focus of the Big Bang at School event on specific topics, such as conservation and sustainability.

Funding opportunities

Other teachers mentioned the importance of being supported to secure funding ahead of the delivery of their event. Some examples they suggested are to inform teachers of where they can apply for additional funds or support teachers with ways that they can raise money. These additional funds would help schools be able to purchase resources or secure providers for delivering hands-on activities to engage a wider group of students, such as whole year groups, at once.

Organisational considerations

While some respondents indicated no perceived improvements needed for their school, others raised specific considerations regarding their event organisation experience. Their suggestions included:

- Supporting schools with securing STEM ambassadors as backups for any last-minute cancellations or time keeping changes by external activity providers
- Offering examples of successful approaches adopted by other schools in delivering a Big Bang at School
- Improving access to the forum to make it easier for teachers to share their experiences and get support when planning their events.

Encouragingly, a substantial number of teachers who took part in a Big Bang at School and provided feedback reported increased confidence in discussing engineering careers with their students. Additionally, a majority expressed a higher likelihood of recommending a career in this sector to their students after the event. To further support teachers, we explored any additional assistance they would find beneficial in discussing engineering careers. Free text responses from 20 teachers were categorised, and the main themes are presented here.

Comprehensive careers information

Several teachers highlighted they would find it helpful to have more information and resources on the breadth of engineering careers, having an overview of the different kinds of engineering and possible careers and salaries in these fields.

Their suggestions included having access to video case studies, particularly of women in engineering, examples of different pathways into engineering, or summaries of various engineering disciplines and related careers. Others highlighted the need for a centralised overview of engineering, related career options and role models in one place for teachers to access.

One teacher highlighted the importance of also including examples for entry level engineering jobs, given some students may not be considering pursuing degrees or higher-level apprenticeships. This teacher felt it would be particularly beneficial for students with special educational needs and disabilities.

Engagement with STEM professionals

Ensuring students can engage directly with STEM professionals was highlighted as an important opportunity for students to hear first-hand experiences. Most of these suggestions mentioned having external speakers specifically from engineering or technology sectors. Others proposed having STEM ambassadors run a mock day for students to 'be engineers for a day'.

Network for local opportunities

Some teachers shared they would appreciate being linked with companies or colleges to support continued opportunities for their students beyond the Big Bang at School event itself. For example, having contacts at local companies could make arranging work experience opportunities for their students easier. Having a closer relationship with colleges in their area could help with providing information on routes and apprenticeships and hearing stories of local young people who went onto securing jobs in engineering.

Conclusions and learning

This report shows the extent to which we can see change in students' self-reported knowledge, attitudes or aspirations following participation in Big Bang at School. Our findings suggest a mixed picture, with positive signs of movement on some key measures but not on others.

Both students and teachers reported having overwhelmingly positive experiences of Big Bang at School events

Through our evaluation, we found that 4 in 5 students enjoyed Big Bang at School (79%). Additionally, almost half of the students (47%) expressed that BBS motivated them to engage in more science, engineering, and technology-related activities, while 45% indicated the event made them want to find out more about engineering careers.

Teachers echoed these positive sentiments, with 97% rating their overall experience with Big Bang at School as excellent (82%) or good (15%). BBS was widely recognised as an appealing event, with 97% of teachers agreeing the programme was engaging for their students. Furthermore, 95% of teachers felt that the event was accessible to students of all abilities in STEM subjects, and 89% agreed it had clear links to the curriculum. These findings highlight the programme's success in creating enjoyable and engaging experiences for both students and teachers alike.

Big Bang at School does show to increase young people's knowledge about what engineers can do in their jobs and the roles engineers play in creating green technologies

Creating opportunities for young people to gain knowledge about engineering careers or the role these professionals play in tackling real-world challenges is crucial for instilling interest and confidence in pursuing such professional pathways.

Our findings suggest the programme is effective at achieving its short-term outcomes linked to young people gaining knowledge in these areas. In fact, there was a significant increase in young people's knowledge about the different things that engineers can do in their jobs, notably among disabled students or those who don't know a STEM professional. We also found a significant improvement in young people's knowledge about the role engineers play in creating greener technologies, highlighting the content delivered may be successfully linking the activities to what engineers are doing in relation to environmental sustainability.

Big Bang at School is not currently shifting students' views of science as useful for their future jobs

This was a new measure introduced in this year's pre and post evaluation to capture any change in young people's views of the usefulness of science. We found that after the event, students were no more likely to agree that learning about science will be helpful for their future job.

This could be not only linked to the event per se but also dependent on the extent to which young people already have a sense of their future career. For example, it's worth noting that among students who took part in our evaluation, 64% already knew what job they want to do in future, which could be a contributing factor in not seeing a significant positive shift in this measure.

Big Bang at School doesn't currently appear to change students' interest in careers related to engineering, science or technology

While gaining knowledge of engineering careers is key, this alone is not enough to steer students toward a STEM career path at this stage in their life. Although there is some minor movement across the response scales, our findings suggest that the event is not significantly shifting students' interest towards a career in engineering, science or technology.

This means Big Bang at School is not converting students from being uninterested or giving a neutral response to being interested in any of these three STEM-related careers. However, this may be due to various factors. Between the ages of 11 to 14, young people may view it as premature to already consider their future careers or may have pre-existing interests in non-STEM related fields, even if they find the event enjoyable.

Big Bang at School doesn't currently increase students' belief in their ability to become an engineer

Our analyses suggests that the event doesn't currently change students' belief in whether they could become an engineer if they wanted to, with nearly three quarters of students (72%) reporting no change in their response and 41% of students already thinking they could become an engineer before the event.

Findings from this evaluation indicate that Big Bang at School may be most effective at increasing awareness of engineering careers as potential opportunities for young people, rather than instilling a commitment to pursue an engineering career in the long term.

Providing young people with foundational knowledge about engineering careers is crucial for nurturing interest and building confidence, yet knowledge alone may not be enough to guide students onto a STEM career path at this stage in their life.

There are many possible reasons for this. Thinking about careers may not feel relevant for young people at the age of 11 to 14. Alternatively, regardless of whether they enjoy Big Bang at School, some may already have a strong interest or preference for careers in fields that are not related to STEM.

Encouragingly, there is a positive shift in short-term outcomes and there is movement in the right direction. However, it's evident that Big Bang at School alone isn't enough to shift students' views towards pursuing STEM careers. This is in line with wider evidence about the need for multiple STEM engagements which build students' interest over time.

Big Bang at School can serve as a valuable step in introducing students to STEM careers and enabling them to understand that these are options available to them, but additional efforts may be necessary to translate this exposure into genuine aspirations. The typical half-day or one-day event structure may not be enough to shift longer-term outcomes, although students engaged in the longer project-based work may have varying experiences.

Limitations and learning for evaluation

Pre and post data is essential for us to see actual change in students' views before and after the event. Without a control or comparison group, we have to be cautious about saying that any change is caused solely by participation in Big Bang at School. However, given the short time between pre and post data collection it is likely that change may be the result of the event and related activity rather than a more general trend.

Sample

The number of students in this evaluation is relatively modest, but it does allow for meaningful analysis. A larger dataset is more likely to detect small but real shifts and to mitigate bias.

Notably, the number of participating schools involved is small. Given the inherent variability in delivering a flexible event like Big Bang at School. Confidence in the extent to which findings can be generalised to all schools participating in the programme may be limited.

Survey questions

In 2022/23, new survey questions were introduced, such as asking students about whether they know what jobs they want to pursue and their views on the usefulness of science for future jobs. These changes aimed to provide a better understanding participants' existing career perceptions and attitudes towards science.

Additionally, while measures related to knowledge offer valuable insights, they come with inherent limitations. These questions may not fully capture nuanced changes in learning, especially for young people who are already familiar with the topic. For example, our questions cannot show how students' perceptions of engineering evolved post-event, and they may not account for enhanced knowledge among those who already strongly agreed.

Despite these limitations, our findings indicate that young people perceive themselves as knowledgeable about engineering careers, presenting potential opportunities that might have otherwise remained inaccessible.

Sustainability

Implementing data collection at two time points for students entails additional effort for schools, particularly those already burdened with various responsibilities and organising an event in their school. Our pilot pre and post evaluation revealed challenges faced by some participants in accessing devices for online surveys during the school day.

Building on this experience, in 2022/23, we introduced the option for schools to request paper-based survey copies, facilitating their involvement in the evaluation. This approach has proven successful, evident in the substantial responses collected and the quality of the data received. Future evaluations should consider continuing with this option, ensuring sufficient capacity for data entry within our team and maintaining a commitment to eco-friendly practices by using recycled materials for paper-based alternatives.

Looking ahead, we will continue to gather pre- and post-event data in 2023-24 to develop further insights into the impact of Big Bang at School. For future years we will look to review and more robustly test the survey questions and look at how a larger sample could be achieved through additional practical support for participating schools.