

BIG BANG AT SCHOOL

Evaluation using a pre and post survey approach

February 2024



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About the pre and post evaluation

Student and teacher experiences of Big Bang at School

IMPROVING TEACHERS' CONFIDENCE TO TALK ABOUT STEM CAREERS

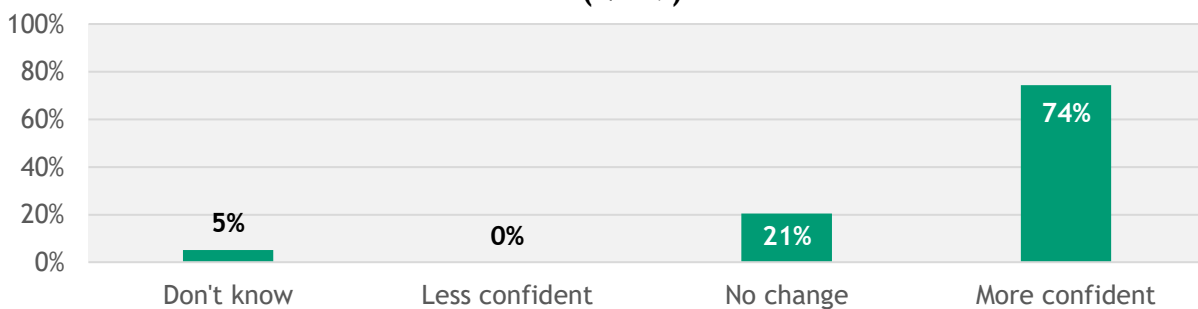
Teachers hold a crucial role in advising and steering students toward their career paths, including in STEM fields. For effective guidance, they need a good understanding of STEM careers and the confidence to provide relevant information.

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)



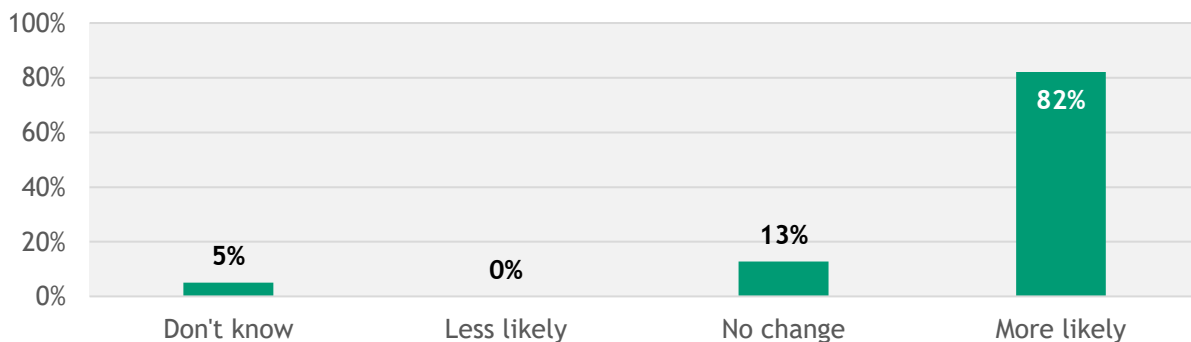
IMPROVING TEACHERS' LIKELIHOOD TO RECOMMEND A STEM CAREER

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

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.

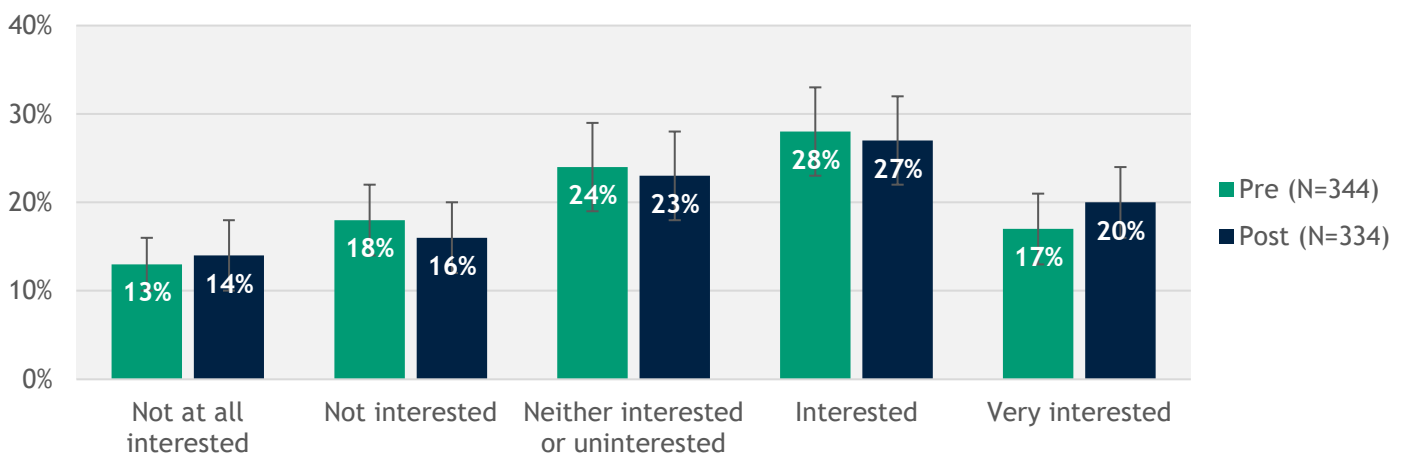
Prior to the event, 45% of students said they were interested in a career that involves engineering. Following the workshop this proportion remained roughly the same (46%).

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.

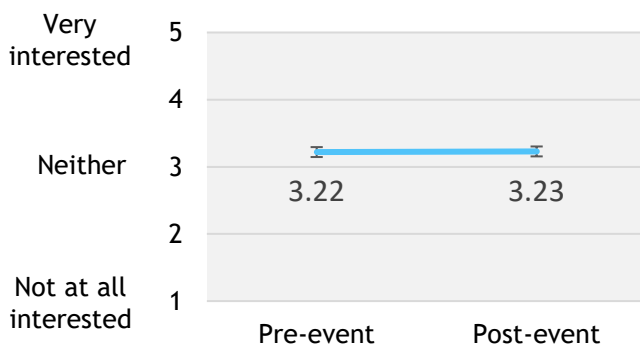
KEY FINDINGS

- 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

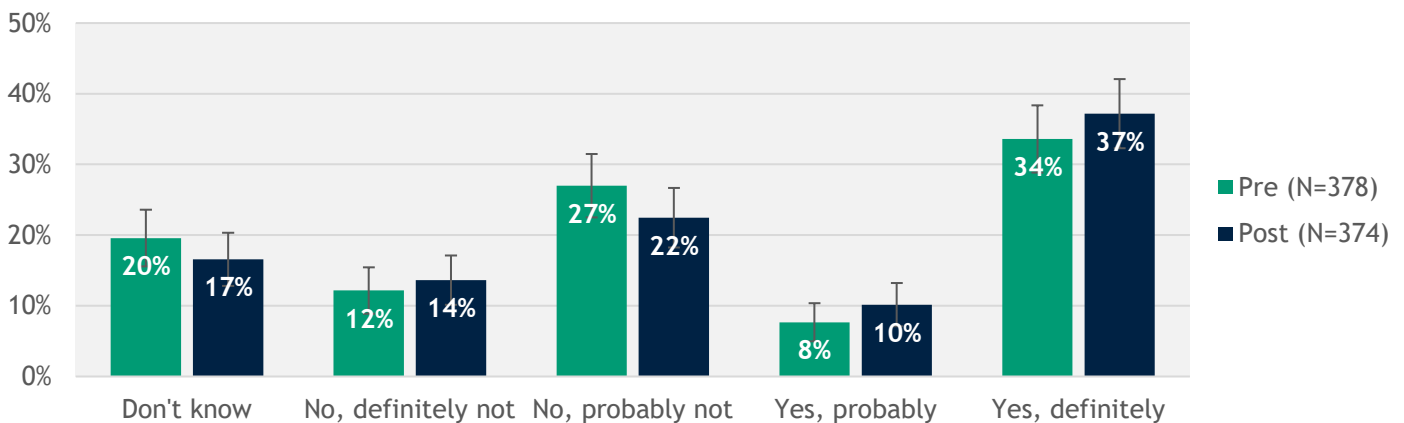
Students were asked about whether they thought they could become engineers if they wanted to. Before the event, 41% of students said they believed that they could become an engineer if they wanted to. Following the event, this has only slightly increased to 47%.

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.

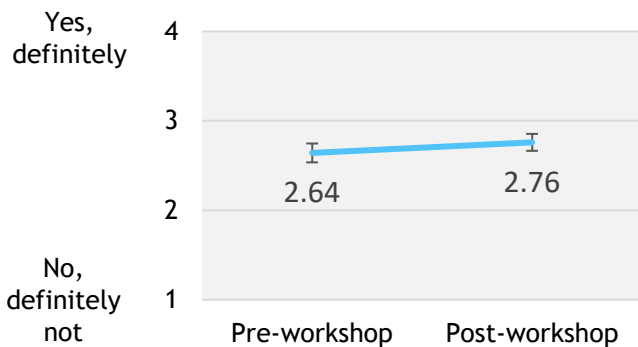
KEY FINDINGS

- 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.