Jenesys Associates

Evaluation of Impact of IET Shows

For science made simple

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Contents

1 Introduction

Throughout 2012 *science made simple* has been delivering four engineering themed shows to students in key stages (KS) 1 to 4 at schools, festivals and public events across the UK. The shows were subsidised by the IET and were described in *science made simple*'s funding proposal for IET as:

- *Izzy's Incredible Adventure* (hereafter Izzy), for KS 1 and aimed at investigating engineering in relation to travel and explaining the science behind everyday and more unusual transport.
- *Who wants to be a superhero?* (hereafter Superhero), for KS 2 and aimed at introducing audiences to six real young scientists and engineers and explaining what they do.
- *A Rough Guide to Engineering* (hereafter Rough Guide), for KS 3 and aimed at introducing secondary students to the wide range engineering careers and showing them that they can aspire to be engineers.
- *Engineering for Life – From Cradle to Grave* (hereafter Engineering for Life), for KS 3 and 4 and aimed at demonstrating how engineering improves quality of life throughout all life stages, including before we are born.

The evaluation of the shows was supported by Jenesys Associates Ltd, who were commissioned to develop specific feedback forms and questionnaires and analyse the feedback from these questionnaires and forms. The results of their analysis are summarised in this report.

2 The evaluation

The objectives of the evaluation were:

1) To evaluate the impacts of the engineering shows on:
   - KS 1 to KS 4 students
   - their teachers
2) To identify lessons and good practice which science made simple and IET can implement in the future

Further to the objectives above, the following broad questions were used to steer the evaluation:

1) What are the impacts on students? Do the shows stimulate interest and positive attitudes towards engineering and STEM subjects?
2) What are the impacts on teachers? Do the shows improve their knowledge about and attitudes towards engineering?
3) What are the success factors?
4) What factors limit any successful outcomes?

3 Evaluation methodology

Student feedback

Jenesys devised three student feedback forms specifically for these shows: one using drawings for feedback from KS 1, a primary questionnaire for KS 2 and a secondary questionnaire for KS 3 and 4. The questionnaires incorporated some Generic Learning Outcomes (GLOs) which were already used by *science made simple* in their standard questionnaires for evaluating shows.

Teacher feedback

Jenesys devised a specific teacher questionnaire which was made available in hard copy and as an e-survey to allow teachers to complete it post-event should they prefer.

Data collection

The science made simple team was responsible for all data collection. Presenters distributed the IET show forms and questionnaires (described above) at the end of selected shows. At some shows standard *science made simple* evaluation questionnaires were used for teachers and students in stead of the specific IET show questionnaires. The findings from IET and standard questionnaires are analysed in this report.

466 student drawing forms and questionnaires and 82 teacher questionnaires were collected as shown in the table below:

	Type of Questionnaire					
	IET Show KS1 Drawing Form	**IET Show Primary Student**	**IET Show Secondary Student**	**IET Show Teacher**	**science made simple Student**	**science made simple Teacher**
Izzy	47	23	19	3		21
Superhero		36		4	122	28
Rough Guide			17	2	147	18
Engineering for Life			55	1		5
Totals	*47*	*59*	*91*	*10*	*269*	*72*

Data analysis and reporting

Quantitative questionnaire data are reported graphically or in tables. Qualitative data were coded for analysis. All data in this report have been anonymised. Quotes are written in italics. Where figures are reported using percentages it should be noted that rounding can mean that totals are sometimes greater or less than 100%.

The next four sections of the report contain analyses of the feedback for each show. Section 8 summarises the overall findings and the final section presents some conclusions.

4 Findings: Izzy's Incredible Adventure

Three different forms/questionnaires were used to obtain feedback for the 'Izzy' show. All asked different questions and are reported separately in this section.

4.1 IET show KS 1 drawing form

47 primary school students completed forms which asked them to *'please write some words or draw some pictures about the show you have just seen'*. Their feedback can be categorised as shown in the following table:

Fig. 4.1 Analysis of KS 1 drawing feedback of Izzy show (n=47)

Type of response	**Number (%)**
Drawing of multiple elements of the show	21 (45%)
Drawing of a rocket	12 (26%)
Drawing of other single element of the show	8 (17%)
Drawing of multiple elements plus comments	4 (9%)
Other	2 (4%)
Total	***47***

45 (96%) drawings were of recognisable elements of the show. The forms suggest that students found the rocket to be the most memorable aspect of the show. It was the most common single element and appeared as the largest item or in the centre of the drawings containing multiple elements. The Bernoulli blower was the second most common single element.

Comments about the show indicated that students had enjoyed it and learned something, as these examples show:

> *I have seen different things like a rocket and a lazer (sic.). I never knew that songs can stop with lazer and hand.*
>
> *It told about science in a fun way. She knew what she was saying.*
>
> *It was fantastic I want to see it again.*

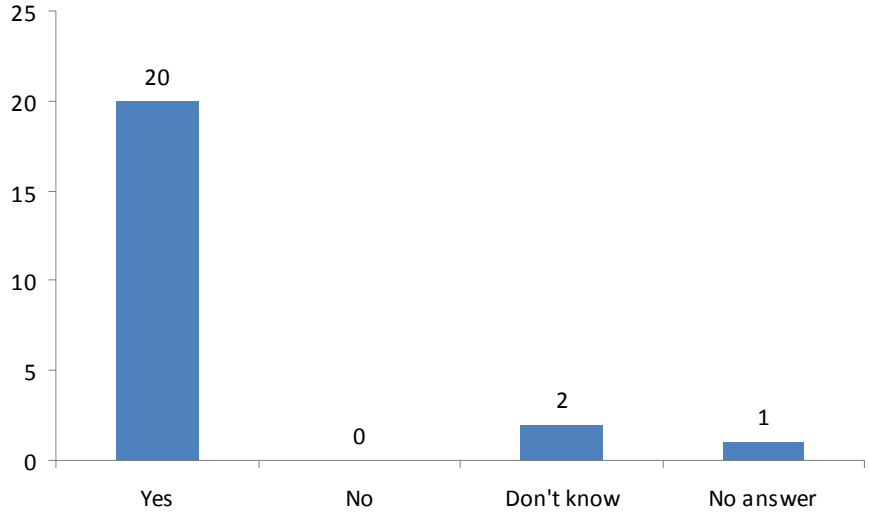
4.2 IET show primary questionnaires

23 primary questionnaires were completed by students in reception, year 1, year 2 and year 3 of primary school. 18 (44%) were completed by students in year 3. 7 (30%) were completed by females and 12 (53%) were completed by males, with 4 (17%) students not indicating their gender.

4.2.1 Enjoyment

Most students liked the 'Izzy' show. As shown in fig 4.2 below, 20 (87%) selected 'yes' when asked if they liked the show, 2 (9%) selected 'don't know' and none selected 'no'.

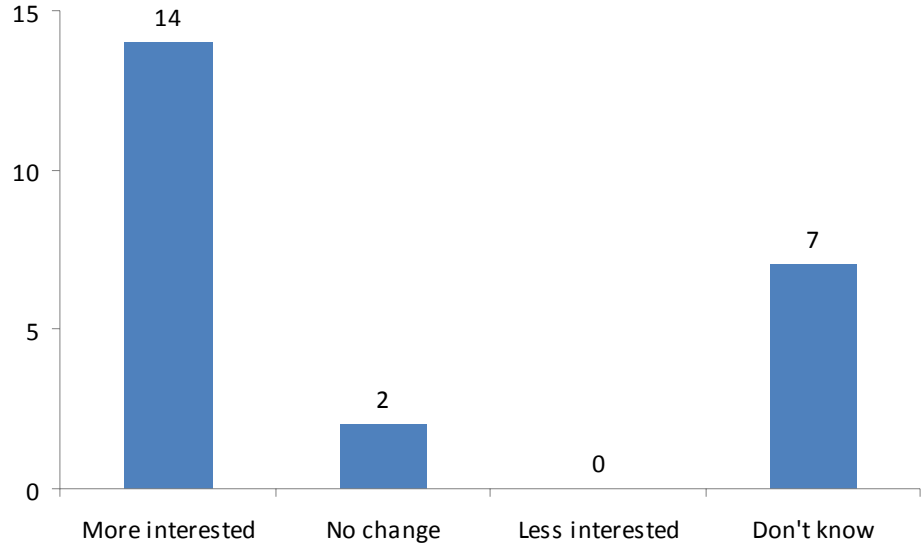
Fig 4.2 Students' enjoyment of Izzy show (n=23)



4.2.2 Attitudes

14 (61%) students said the show had made them feel more interested about engineering. 7 (30%) indicated that they don't know if it had changed their interest in engineering. 2 students who reported no change said they enjoyed the show and one said they had learnt from it.

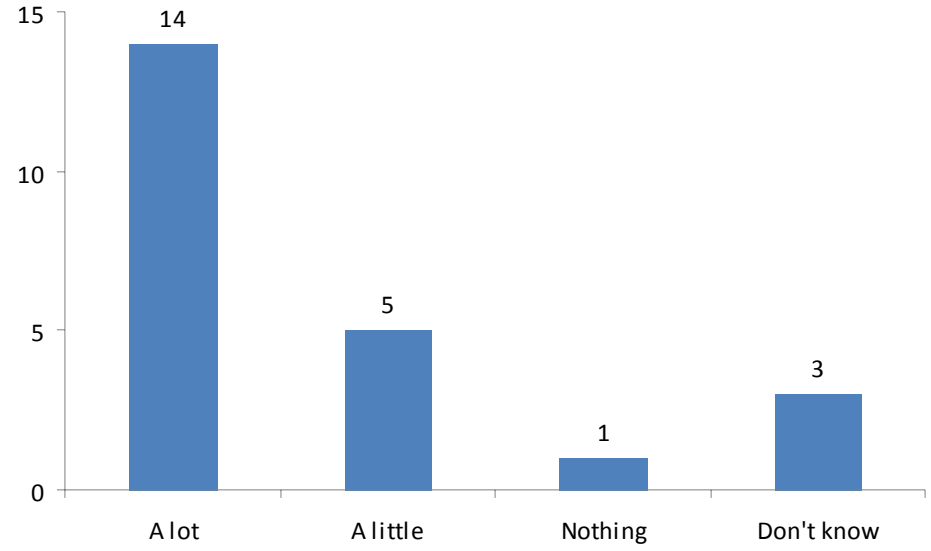
Fig 4.3 Impact of Izzy show on students' interest in engineering (n=23)



4.2.3 Learning

As shown in fig 4.4, most students reported that they learnt something from the show, with 14 (61%) selecting 'a lot' and 5 (22%) selecting 'a little'. A student who selected 'nothing' also reported that the show had not changed how they feel about engineering.

Fig 4.4 Students' learning from Izzy show (n=23)



19 students described something new they learnt from the show. The most common answers indicated that students learnt how hot air can be used to make things rise, such as:

That a rocket needs hot gas

You need hot air to fly

You need fuel and oxygen for rockets

The next most common descriptions suggested that students had learnt something general about science or technology, for example:

I learnt that science can be very fun and it is very important

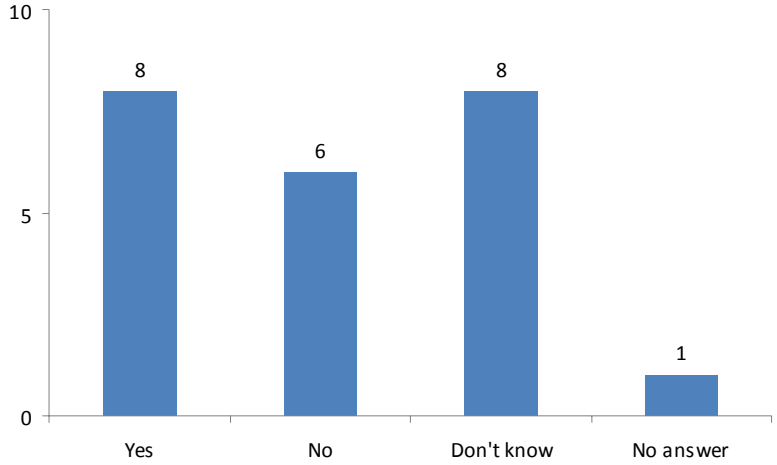
Science can help us

Technology is interesting and dangerous

4.2.4 Intentions

Compared to the show's impact on their enjoyment, interest in engineering and learning, students were less positive about wanting to be an engineer or scientist when they are older. As fig. 4.5 shows, 8 (35%) selected 'yes', 6 (26%) 'no' and 8 (35%) 'don't know'.

Fig 4.5 Students wanting to become scientists or engineers when older (n=23)



All students answered yes when asked if they would like to see another show about engineering or science, indicating they had positive intentions in this regard.

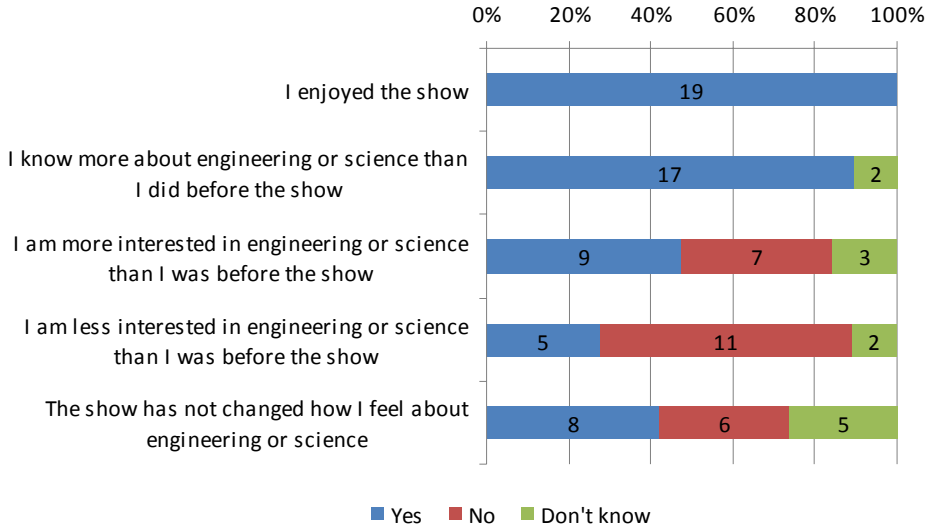
4.3 IET show secondary questionnaires

19 secondary questionnaires were completed by students in year 6 (13, 68%) and year 7 (6, 2%) who saw the 'Izzy' show. 5 (26%) of the questionnaires were completed by females and 5 (26%) were completed by males, with 9 (47%) students not indicating their gender.

4.3.1 Enjoyment and attitudes

Students were asked to select 'yes' 'no' or 'don't know' to indicate what they thought about five indicator statements regarding their enjoyment of the show and its impact on their knowledge and interest in engineering or science. Their answers are shown in fig. 4.6.

Fig, 4.6 Impact of Izzy on students' students' enjoyment, knowledge and interest (n=19)



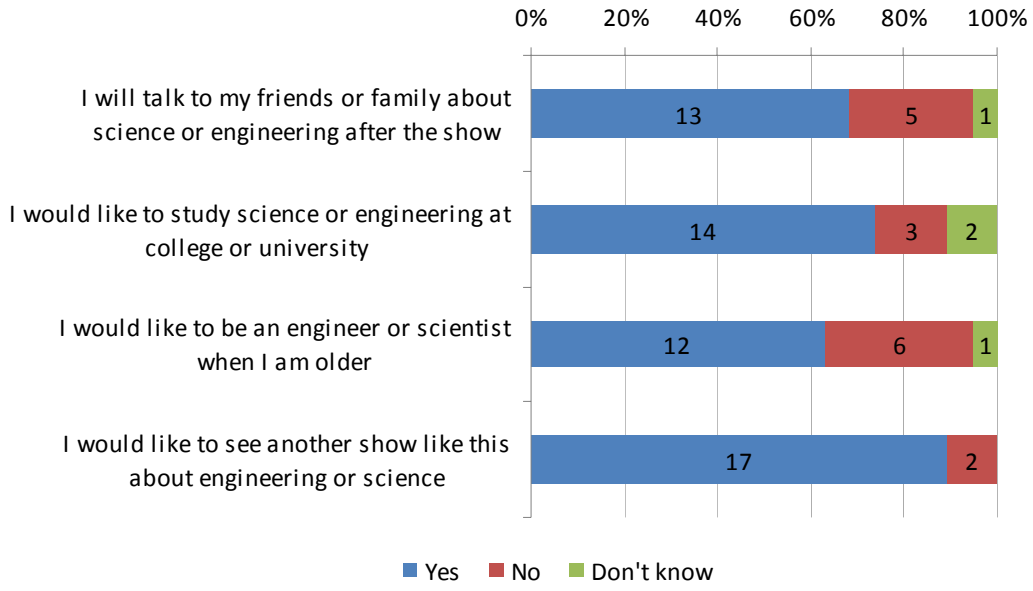
Students were most likely to be positive in relation to their enjoyment of the show and knowing more about engineering or science as a result of the show, with 19 and 17 (90%) students selecting 'yes' respectively.

In terms of attitudes towards engineering, students were most likely to select negative options in relation to being less interested in engineering or science than they were before the show, with 5 (26%) selecting 'yes' and 11 (58%) selecting 'no'. Conversely, 9 (47%) students selected 'yes' and 7 (37%) selected 'no' in relation to feeling more interested about these subjects than they were before the show.

4.3.2 Intentions

Students were also asked to indicate what they thought about four statements relating to their intentions about engineering or science. Their answers are shown in fig. 4.7.

Fig, 4.7 Students intentions in relation to engineering or science (n=19)

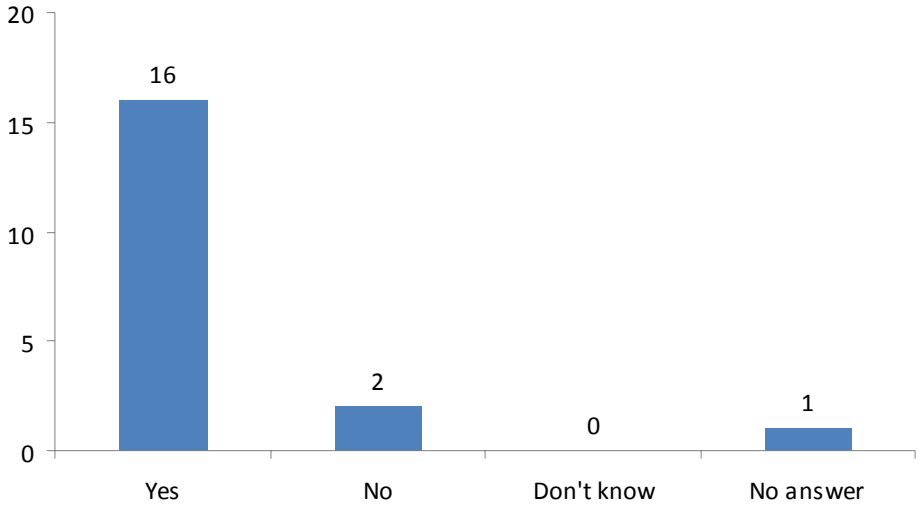


Most students reported positive intentions. 17 (90%) students said they wanted to see another show about science or engineering, 14 (74%) indicated they would like to study science or engineering at college or university, 13 (68%) intended to talk to others about science or engineering after the show and 12 (63%) suggested they would like to become an engineer or scientist.

4.3.3 Learning

16 (63%) students selected 'yes' in relation to learning something new from the show (see fig. 4.8). Both students who selected 'no' described their learning as *'science is fun'*.

Fig, 4.8 Students' learning from Izzy show (n=19)



18 students described something new they had learnt from the show. Other than science being fun, which was the most common learning described by 8 students, rocket propulsion and the importance of being good at science or maths were the joint next most common answers.

4.4 Teacher feedback

IET Questionnaire

Three teachers provided feedback on the 'Izzy' show using the questionnaire developed for the IET shows. Their ratings of different aspects of the show are summarised in the following table:

	Very good	Good	Average	Poor	Very poor
Overall impression	2	1			
Presenter	2	1			
Relevance to curriculum	2	1			
Relevance to your students	2	1			
Educational content	3				
Interactive content	2	1			
Length of session	1	1	1		

Teachers reported that the most successful aspects were:

> *The children really enjoyed the rocket/ ballon car/ hovercraft. They also enjoyed the story which joined it all together and the bits where they could join in E.g "Oh no what should I do?" It fitted in REALLY well for our work on water floating and sinking.*
>
> *The children loved the rocket and hovercraft as they did't know w what would happen next.*
>
> *Leaf blower and beach ball to simulate flight*

They identified the least successful aspects as:

> *Little bit too complex- ideas and vocabulary E.g Friction and Density (which would be ok for KS2)*
>
> *The children seated towards the back couldn't see anything demonstrated on the floor.*
>
> *Laser- volume was not as good as it could have been*

All the teachers agreed that the 'Izzy' show had increased their students' knowledge about engineering or science generally and about engineering or science in everyday life. One agreed that the show had inspired students to consider further study or careers in engineering or science and two did not answer this question. All said they would book another show.

Science made simple questionnaire

21 teachers completed this questionnaire about 'Izzy'. 8 gave the show an overall rating of 'excellent' and 13 gave an overall rating of 'very good'. All rated the science content as 'just right'. The length was rated 'just right' by 20 teachers and one rated it as 'too long'. 15 said

they would book again. Teachers who made comments about the presenter were positive and a majority made positive general comments, including:

> *Everyone really enjoyed it, teachers were impressed with the delivery and the way the children were engaged. Children were discussing which parts they liked the most.*
>
> *Liked the way story of Izzy gave science a real life context*
>
> *Great, Children loved it!*
>
> *Children said "fascinating, surprising, interesting, exciting"*

A minority of teachers suggested some ways to improve the show:

> *If you can incorporate as part of an experiment the children standing up and sitting down/leg stretch, always good idea when sitting for an hour.*
>
> *Very noisy, difficult for my pupils with ASD and sensory difficulties. Pre-warning of this aspect would have been very beneficial.*
>
> *Maybe more hands-on for children*
>
> *Just right science content for KS2, too hard for KS1*

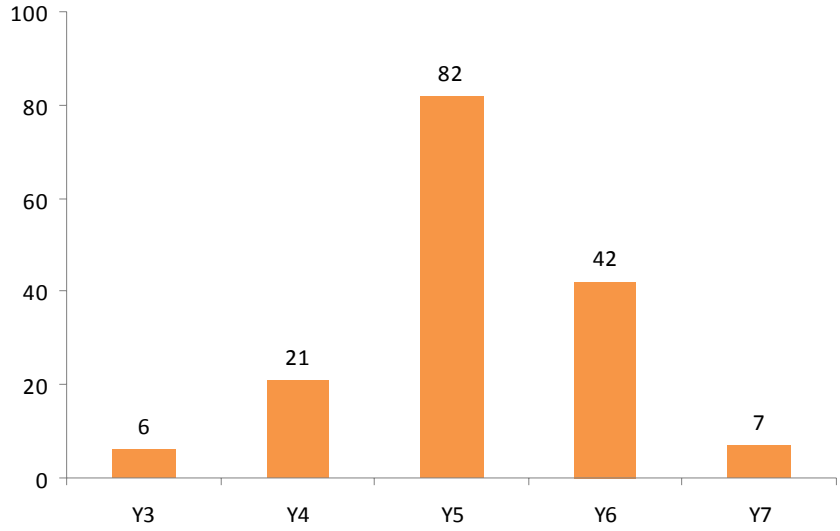
5 Findings: Who wants to be a superhero?

5.1 Student feedback

The IET show primary questionnaire and the *science made simple* primary questionnaire asked the same questions. The responses from both types of questionnaire have been combined for this section.

Questionnaires were completed by 158 students in years 3 to 7 who had seen the 'Superhero' show. Over half (82, 52%) of the students were in year 5. 72 (46%) students were female, 76 (48%) were male and 10 (6%) did not state their gender.

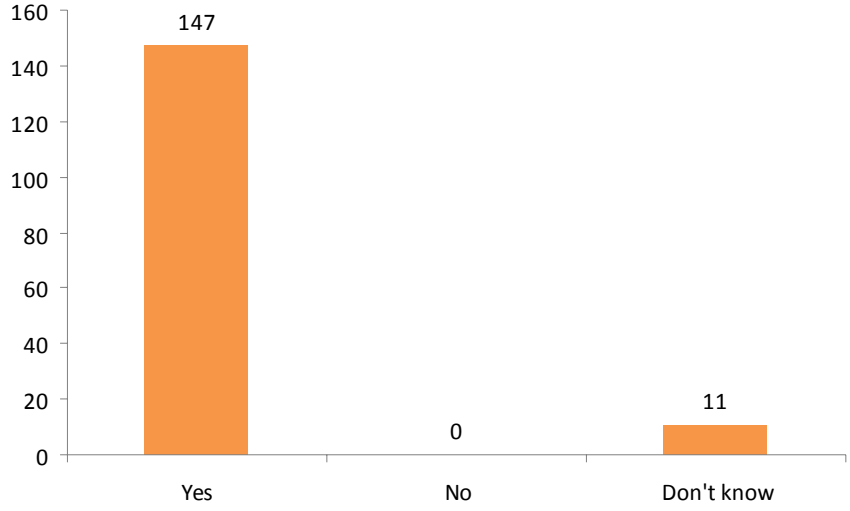
Fig. 5.1 School year of students at Superhero show (n=158)



5.1.1 Enjoyment

Students enjoyed the 'Superhero' show. 147 (93%) answered 'yes' and 11 (7%) answered 'don't know' when asked if they liked the show, as fig, 5.2 shows.

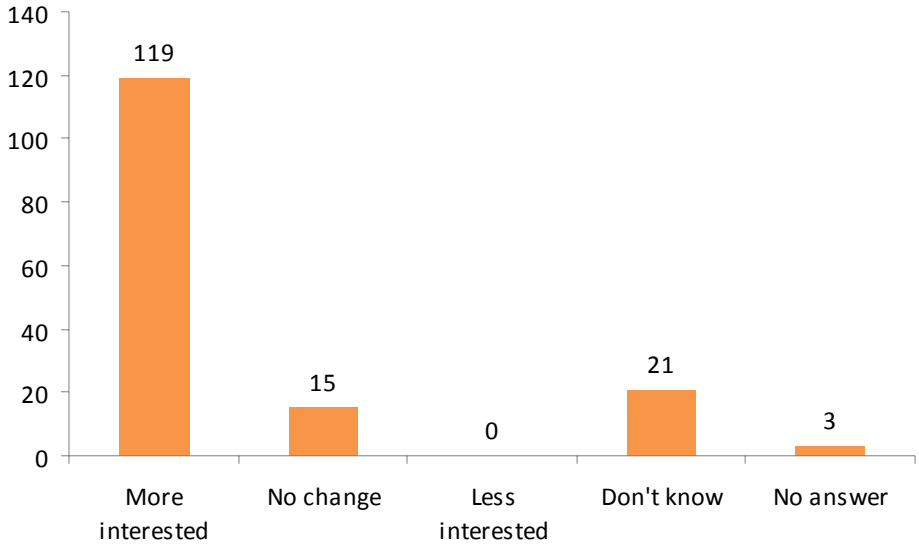
Fig. 5.2 Students' enjoyment of Superhero show (n=158)



5.1.2 Attitudes

119 (75%) students selected 'more interested' when asked if the 'Superhero' show had changed how they felt about engineering, as fig. 5.2 shows. None were less interested, 15 (9%) reported 'no change' and 21 (13%) chose 'don't know'.

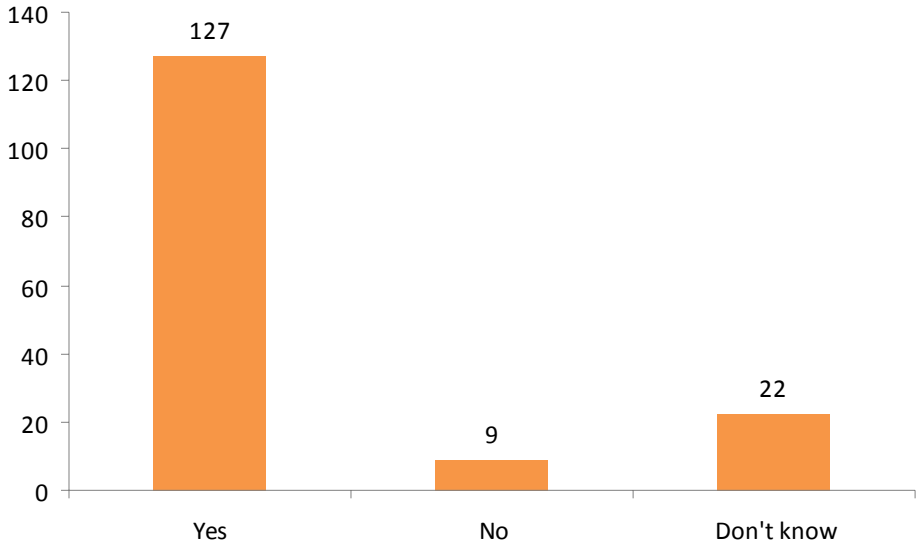
Fig. 5.2 Impact of Superhero show on student interest in engineering (n=158)



5.1.3 Learning

As shown in fig 5.3, 127 (80%) students reported that they learnt something from the show. Some of the students who reported 'no' or 'don't know' were able to describe something they learnt.

Fig. 5.3 Students' learning from Superhero show (n=158)



114 (72%) students described something new they learnt from the show. The most common answers indicated that students learnt something about lasers, particularly the use of lasers in the transfer of sound, such as:

How lasers carry music

I learnt the laser can take music and put it into a speaker.

That you can send music through a laser beam

The next most common descriptions demonstrated that students had learnt about aerodynamics, forces and bridge structures. Examples included:

That curved bridges are more stable than square bridges

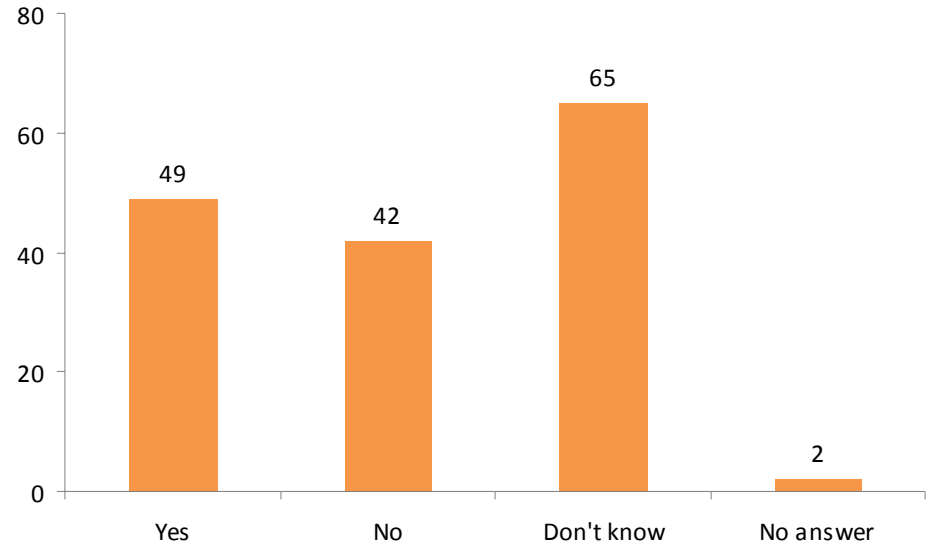
I learnt that air resistance is probably the reason planes fly

I learned a lot more about gravity and forces

5.1.4 Intentions

Students were uncertain about wanting to be an engineer or scientist when they are older. As fig. 5.4 shows, 49 (31%) selected 'yes', 42 (27%) selected 'no' and 65 (41%) selected 'don't know'.

Fig. 5.4 Students wanting to become a scientist or engineer when older (n=158)



Most students also reported that they would like to see another show about science or engineering, with 142 (90%) selecting 'yes', with 1 (0.5%) selecting 'no' and 13 (8%) 'don't know'.

5.2 Teacher feedback

IET Questionnaire

Four teachers provided feedback on the 'Superhero' show using the questionnaire developed for the IET shows. Their ratings are summarised in the following table:

	Very good	Good	Average	Poor	Very poor
Overall impression	4				
Presenter	4				
Relevance to curriculum	4				
Relevance to your students	3	1			
Educational content	4				
Interactive content	4				
Length of session	3	1			

They reported that the most successful aspects of the show to be:

The 'WOW' factor. Showing application of science in the real world.

All great and linked well with our studies.

Lots of experiments and fun

Interactive. Excellent for visual learners. Made science relevent to real life.

Two teachers reported least successful aspects, which related to the rooms used for the shows.:

No fault of presenter, but we needed room to be darker for projector

Hard to see from back- lack of suitable rooms available

All the teachers agreed that the 'Superhero' show had increased their students' knowledge about engineering or science generally and about engineering or science in everyday life. Three agreed that the show had inspired students to consider further study or careers in engineering or science and one said hopefully it had this impact and commented that their students *'enjoyed finding out how an airplane stays up'*. All teachers said they would book another show.

Science made simple questionnaire

28 teachers completed this questionnaire about 'Superhero'. 18 gave the show an overall rating of 'excellent', 7 gave an overall rating of 'very good' and one gave a 'good' rating. Two did not rate the show overall. 27 rated the science content as 'just right' and one rated it as 'too hard' but commented that this was just right, which may imply that they want students to be challenged. The length was rated 'just right' by 27 teachers and one rated it as 'too long'.

26 said they would book again. A majority of teachers made positive comments about the presenter and all who made general comments were also positive. For example:

Thoroughly enjoyable and informative

Fantastic presentation, excellent information, keep it going!

Thought the topics were relevant to the age group

An excellent show - fun, informative and encouraging children to think about Engineering.

Very knowledgeable presenter who made sure lots of children participated in the show

There was one suggestion to have fewer classes in at one time as in a big group some students at the back struggled to see.

6 Findings: Rough Guide to Engineering

The IET Show secondary questionnaire and the science made simple secondary questionnaire were used to obtain feedback on the 'Rough Guide' show. These questionnaires asked different questions and responses to both are reported separately in this section.

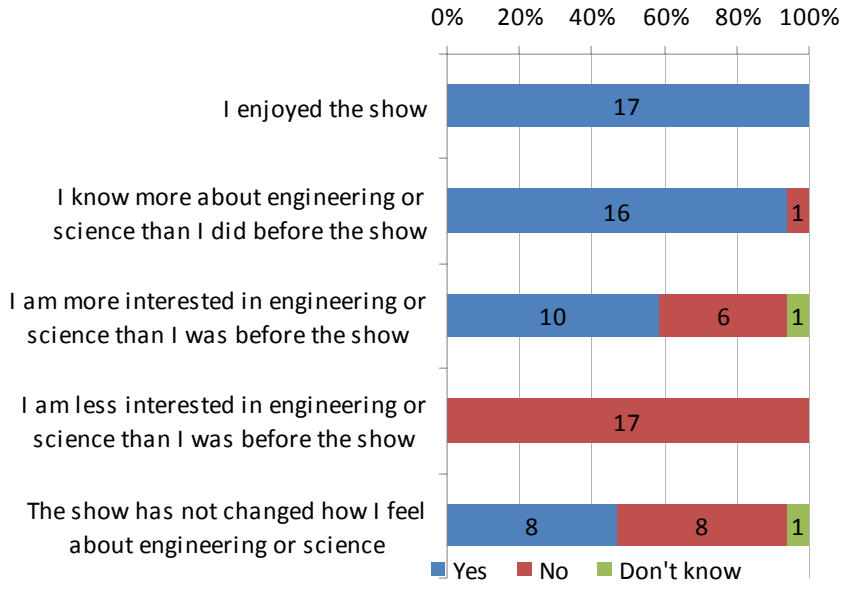
6.1 IET show secondary questionnaires

17 secondary questionnaires were completed by students in year 9 who saw the 'Rough Guide' show. 8 (47%) of these questionnaires were completed by females and 8 (47%) were completed by males, with 1 (6%) student not indicating their gender.

6.1.1 Enjoyment and attitudes

Students were asked to select 'yes' 'no' or 'don't know' to indicate what they thought about five statements about the show's impact on them and their interest in engineering or science. There answers are shown in fig. 6.1.

Fig, 6.1 Impact of Rough Guide on students' enjoyment, knowledge and interest (n=17)



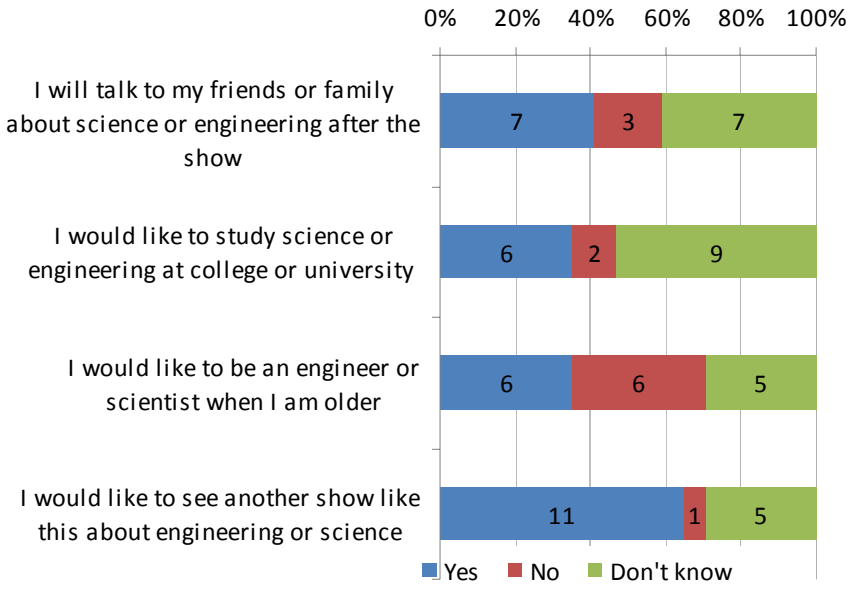
Students were most likely to be positive in relation to their enjoyment of the show and knowing more about engineering or science as a result of the show, with 17 (100%) and 16 (94%) students selecting 'yes' respectively.

In terms of the 'Rough Guide' show's impact on interest in engineering, students were positive with 10 (59%) indicating they were more interested in engineering or science than they were before the show, and 17 (100%) answering no about being less interested.

6.1.2 Intentions

Students were also asked to indicate what they thought about four statements relating to their intentions about engineering or science. Their answers are shown in fig. 6.2.

Fig, 6.2 Students intentions in relation to engineering or science (n=17)



Students intentions were uncertain, with 11 (65%) wanting to see another show about science or engineering, 7 (41%) intending to talk to others about science or engineering after the show, 6 (35%) indicating they would like to study science or engineering at college or university and 6 (35%) suggesting they would like to become an engineer or scientist.

6.1.3 Learning

17 (100%) students selected 'yes' in relation to learning something new from the show. All also described something new they had learnt from the show. The most common of these were facts about transport, earthquakes and the variety of different types of engineering that are seen. Typical examples were:

That there are more sides to engineering than I previously thought

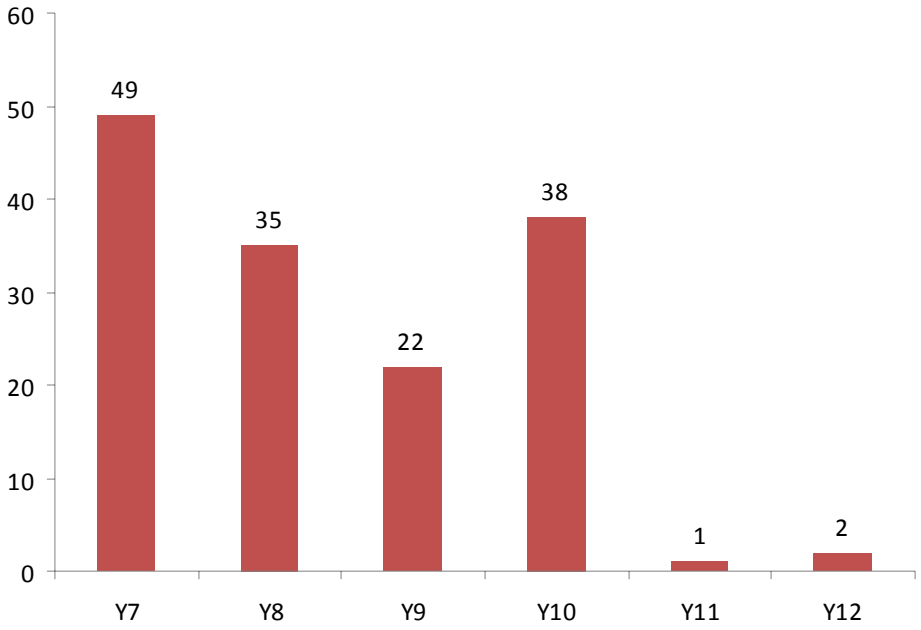
How cars and rockets are changing

The different ways in which buildings are protected against earthquakes

6.2 Standard science made simple questionnaires

147 students in years 7 to 12 of secondary school who saw the 'Rough Guide' show completed science made simple questionnaires. As shown in fig. 6.3, 49 (33%) students were in year 7, 38 (26%) were in year 10 and 35 (24%) were in year 8. 57 (39%) respondents were female and 78 (53%) were male, with 12 (8%) students not indicating their gender.

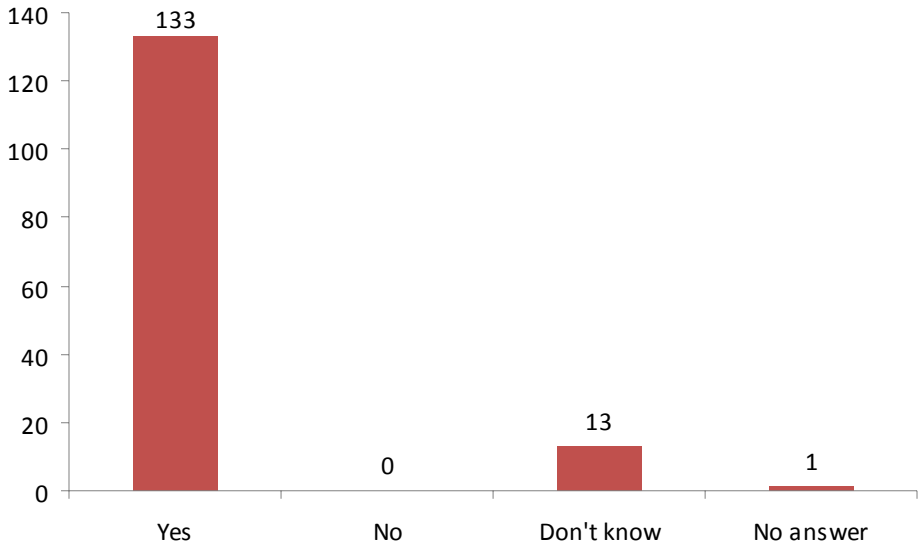
Fig. 6.3 School year of students at Rough Guide show (n=147)



6.2.1 Enjoyment

Most students liked the show. As shown in fig 6.4 below, 133 (91%) selected 'yes' when asked if they enjoyed the show, 13 (9%) selected 'don't know' and none selected 'no'.

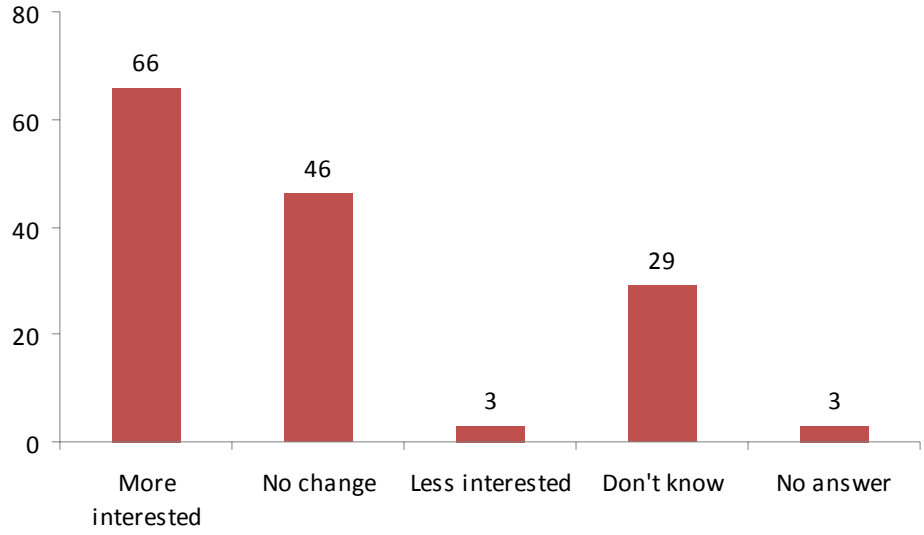
Fig 6.4 Students' enjoyment of Rough Guide show (n=147)



6.2.2 Attitudes

66 (45%) students said the show had made them feel more interested about engineering. 29 (20%) indicated that they don't know if it had changed how they feel about engineering. 3 (2%) reported that they were less interested after watching the show.

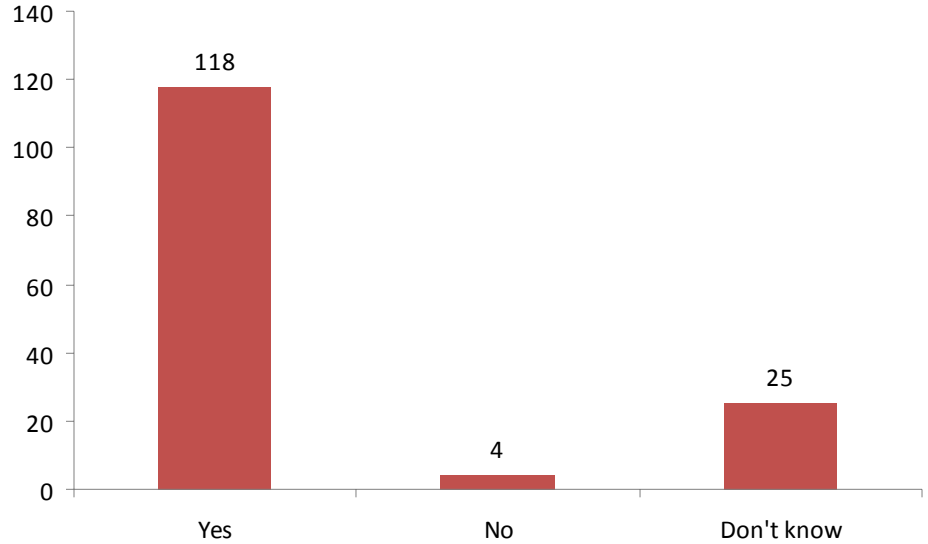
Fig 6.5 Impact of Rough Guide show on students' interest in engineering (n=147)



6.2.3 Learning

As shown in fig 6.6, 118 (80%) students reported that they learnt something new from the show and 4 (3%) reported they had not learnt anything new.

Fig 6.6 Students' learning from Rough Guide show (n=23)



107 (73%) students described something new they learnt from the show. The most common answers indicated that students learnt about transport, especially cars such as:

The fastest land car speed was 350 mph

The difference between diesel and petrol engines

Transport and new technologies

The next most common descriptions suggested that students had learnt about the variety of engineering or science, such as:

I learnt all the different types of engineering

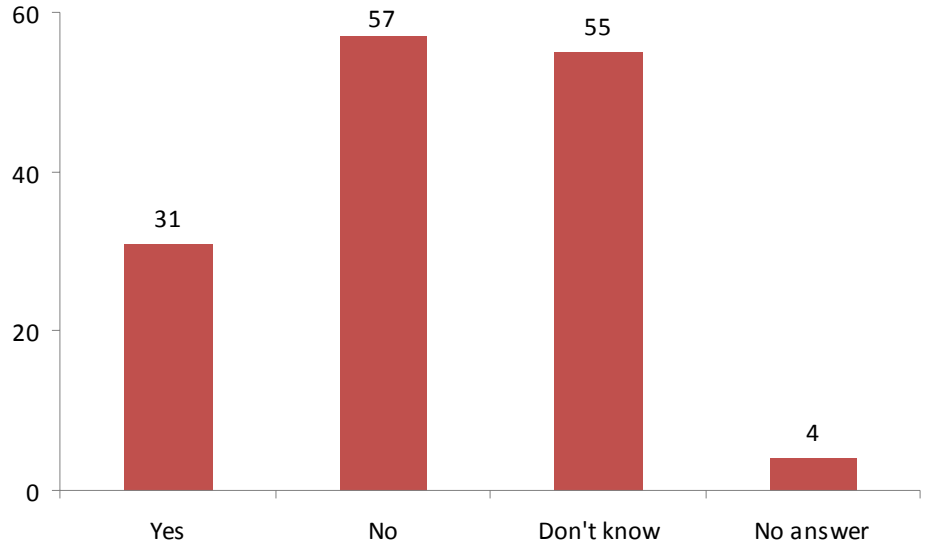
There is a lot of different jobs to engineering

I know there is lots more engineering things to do

6.2.4 Intentions

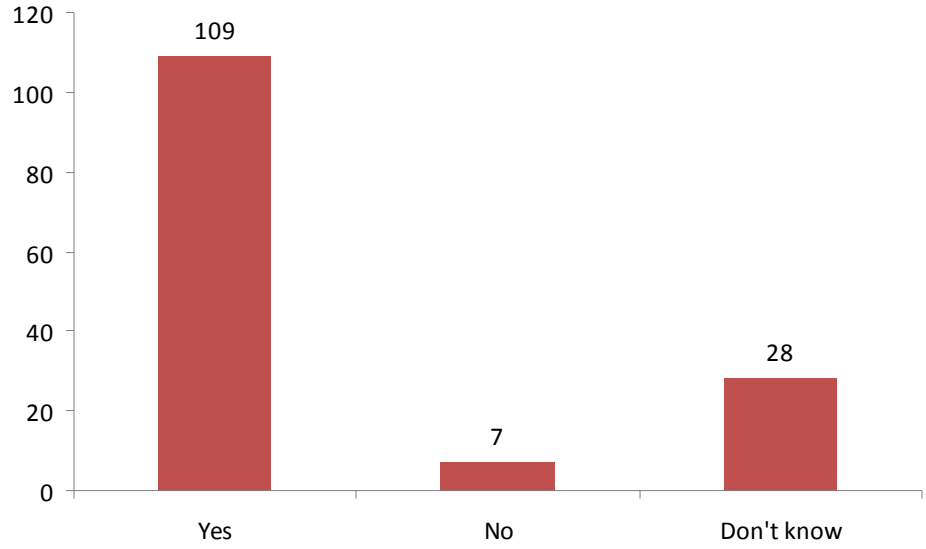
Most students were not positive or not certain when asked if they wanted to be an engineer or scientist when they are older. As fig. 6.7 shows, 31 (21%) selected 'yes', 57 (39%) selected 'no' and 55 (37%) selected 'don't know'.

Fig 6.7 Students wanting to become scientists or engineers when older (n=147)



Most students (109, 74%) answered yes when asked if they would like to see another show about engineering or science. 7 (5%) indicated they would not want to see another show like 'Rough Guide'.

Fig 6.8 Students wanting to see another similar show (n=147)



6.3 Teacher feedback

IET questionnaire

Two teachers used the IET show questionnaire to provide feedback on the 'Rough Guide' show, which they saw with year 9 students. Their ratings are summarised here:

	Very good	Good	Average	Poor	Very poor
Overall impression	2				
Presenter	2				
Relevance to curriculum	2				
Relevance to your students	2				
Educational content	2				
Interactive content		2			
Length of session	1	1			

They reported that the most successful aspects of the show were '*explaining the different types of engineering'* and '*connecting engineering to lots of different contexts'.* They identified the least successful aspect to be engagement of the female students, saying it '*did not engage many of the girls'* and '*getting everyone involved- girls were not as involved as the boys even though there were even amounts of each'.*

Both teachers agreed that 'Rough Guide' had increased their students' knowledge about engineering or science generally and about engineering or science in everyday life. They agreed that the show had inspired students to consider further study or careers in engineering or science. Both indicated they would book another show.

Science made simple questionnaire

18 teachers completed this questionnaire about 'Rough Guide'. 10 gave the show an overall rating of 'excellent', 7 gave an overall rating of 'very good' and one gave a 'good' rating. All rated the science content as 'just right'. The length was rated 'just right' by 14 teachers and 3 rated it as 'too long', with one not answering this question. 17 would book again, including one who gave the proviso *'if funding was available'*. A majority of teachers made positive comments about the presenter and most who made general comments were also positive. For example:

> *I would love to have this again next year for the new intake.*
>
> *Engine example pictures were good but maybe use an animated example to show movement or fuel tech. Howstuffworks.com?*
>
> *Awesome - Pupils. Very good presentation - pitched at appropriate level with relevance to SI-3 courses in Scotland.*

There was one suggestion that the show was possibly too long.

7 Findings: Engineering for Life – From Cradle to Grave

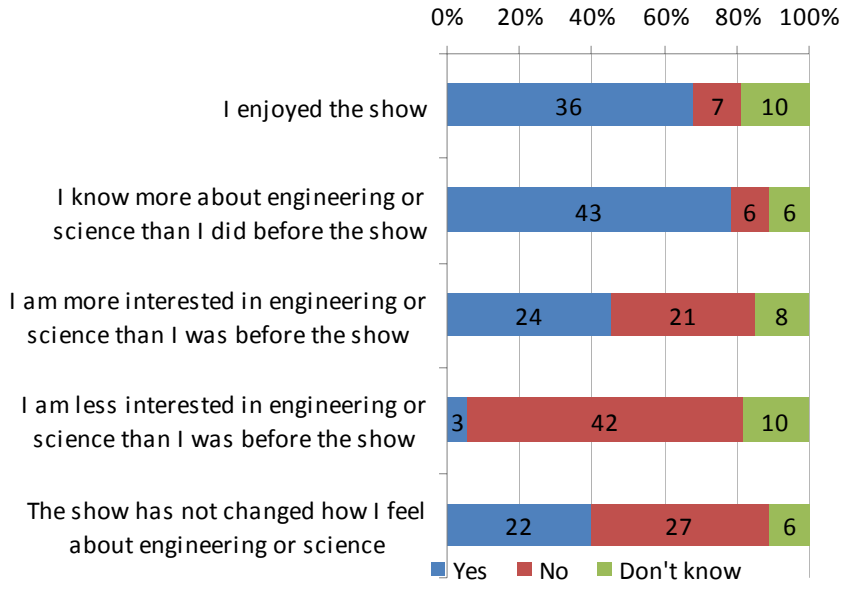
7.1 Student feedback

The IET Show secondary questionnaire was completed by 55 students in year 7 who saw the 'Engineering for Life' show. 21 (38%) of these questionnaires were completed by females and 30 (55%) were completed by male students, with 4 (7%) students not indicating their gender.

7.1.1 Enjoyment and attitudes

Students were asked to select 'yes' 'no' or 'don't know' to indicate what they thought about five statements about the show's impact on them, their knowledge and their interest in engineering or science. Their answers are shown in fig. 7.1.

Fig, 7.1 Impact of Engineering for Life on students' enjoyment, knowledge and interest (n=53 to 55)



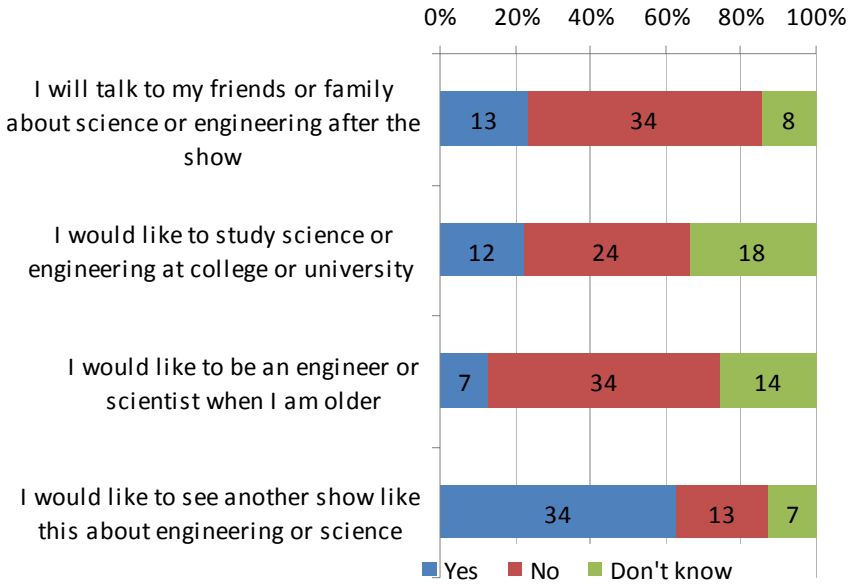
Students were most likely to be positive in relation to knowing more about engineering or science as a result of the show and their enjoyment of the show and, with 43 (78%) and 36 (65%) students selecting 'yes' respectively.

In terms of the show's impact on their interest in engineering, students were positive, with 24 (44%) indicating they were more interested in engineering or science than they were before the show, and 42 (76%) not being less interested.

7.1.2 Intentions

Students were also asked to indicate what they thought about four statements relating to their intentions about engineering or science as shown in fig. 7.2.

Fig, 7.2 Students intentions in relation to engineering or science (n=54 to 55)



Most students' intentions were not positive or were not certain, with 34 (62%) wanting to see another show about science or engineering, 13 (24%) intending to talk to others about science or engineering after the show, 12 (22%) indicating they would like to study science or engineering at college or university and 7 (13%) suggesting they would like to become an engineer or scientist.

7.1.3 Learning

48 (87%) students selected 'yes' in relation to learning something new from the show.

48 students described something new they had learnt from the show. The most common of these were the possibility of using cryogenics to preserve human bodies, followed by some facts about the properties of liquid nitrogen. Typical comments were:

That people get their bodies frozen

They freeze bodies up to -139^{o}C

How cars and rockets are changing

How cold liquid nitrogen is

7.2 Teacher feedback

IET questionnaire

One teacher completed the IET questionnaire for 'Engineering for Life', which they had seen with a Year 7 group of students.

They did not rate their overall impression or relevance to curriculum. They rated the presenter, relevance to students, educational content and interactive content as 'good', and the session length as 'very good'.

Their comments about the show were:

> *Not sure it inspired our pupils to enter engineering or science. Would have liked to have seen other aspect of science and engineering in a day to day life.*
>
> *Pupils thought it was aimed at a level above them. They didn't understand parts of the presentation. Message slightly confused?*

The teacher agreed that 'Engineering for life' had increased their students' knowledge about engineering or science generally and about engineering or science in everyday life and agreed that it had inspired students to consider further study or careers in engineering or science. They said they would book another show.

Science made simple questionnaire

5 teachers completed this questionnaire about 'Engineering for Life'. 3 gave the show an overall rating of 'excellent' and 2 gave an overall rating of 'very good'. All rated the science content as 'just right'. The length was rated 'just right' by 4 teachers and one rated it as 'too long'. 3 would book again. All who commented were positive about the presenter and generally.

8 Summary of findings

In total, feedback was received from 466 students. 47 KS 1 students provided drawings or word to represent what they saw in the 'Izzy' show. Questionnaires were completed by 419 students, of which 170 (41%) were female, 209 (50%) were male and 40 (10%) did not specify their gender. Responses did not differ for males or females.

8.1 Summary by Generic Learning Outcome

The shows had impact in four of the GLOs and the findings from the **419 student questionnaires** are summarised below using these GLOs.

Enjoyment, inspiration and creativity

In total, 89% of students reported that they enjoyed or liked the show they had seen. Enjoyment was highest for 'Izzy' and 'Superhero', with 93% of students enjoying both shows. Enjoyment was lowest for 'Engineering for Life', with 65% of students reporting they enjoyed the show.

Attitudes and values

Overall, 66% of students were more interested in engineering or science after seeing a show. 'Engineering for Life' had the highest impact here, with 78% of students reporting that they were more interested. 'Rough Guide' had the lowest impact on interest, with 50% of students saying it had increased their interest in engineering or science.

Knowledge and Understanding

Across all four shows, 82% of students had learnt something new from the show. 'Engineering for Life' had highest impact on learning, with 87% of students reporting that they learnt

something new. Learning was lowest for 'Superhero' with 80% of students reporting that they learnt something new from the show.

Activity, behaviour and progression
27% of students at all shows said they wanted to be an engineer or scientist when they were older. This view was highest for students at 'Izzy', where 48% answered yes when asked if they would like to be an engineer or scientist. It was lowest for 'Engineering for Life' where 13% answered yes.

In total, 75% of students said they would like to see another similar show about engineering or science. Wanting to see another show was highest for 'Izzy' at 95% and lowest for 'Engineering for Life' at 25%.

91 students who completed the IET show secondary questionnaire at 'Izzy', 'Rough Guide' and 'Engineering for Life' were asked if they would like to study engineering or science at college and if they intended to talk to their friends or family about science or engineering after the show. Overall, 35% of students said they would like to study engineering or science and 36% said they would talk to friends and family, with these intentions being highest for 'Izzy' (74% and 68% respectively) and lowest for 'Engineering for Life' (22% and 24% respectively).

8.2 Summary by show

In this section the findings from the **419 student questionnaires** are summarised by show.

Show Name & audience who provided feedback	% of students who enjoyed the show	% of students who were more interested in science or engineering	% of students who learnt something new	% of students who want to be a scientist or engineer	% of students who would like to see another show
Izzy KS 1 and 2	93	74	83	48	95
Superhero KS 2	93	75	80	31	90
Rough Guide KS 3 and 4	91	50	82	23	73
Engineering for Life KS 3	65	78	87	13	25
All shows	89	66	82	27	75

9 Conclusions

All shows were well received by students and teachers. The evaluation indicated that they are having a positive impact on students' enjoyment and attitudes towards engineering and science. Having a variety of shows has enabled audiences in KS 1 to 4 to experience shows developed specifically for them. Teachers also rated the shows positively and indicated that it was important for shows to be engaging, appropriate to the age and Key Stage and have equal appeal to females and males.

For students, the evaluation provided strongest evidence of the shows having positive impact against two of the GLOs: enjoyment creativity and inspiration; and knowledge and understanding. Most students enjoyed the shows and described a wide range of learning impacts.

Students' descriptions of what they learnt provided evidence that memorable content, such as launching a rocket or relating content to everyday activities, such as travel, helps to ensure greater impact in terms of enjoyment and learning.

Attitude and behavioural changes are best measured by long-term study, which was outside the scope of this evaluation. Even so, it may be worth considering the use of a two-part pre- and post- event secondary questionnaire in the future to assess more effectively the impact of the KS 3 and 4 shows on students being interested in or wanting to talk about engineering or science or intending to study or work as engineers or scientists. It would also be useful if any future evaluation could use the specific IET questionnaires for all engineering shows, both for consistency and to enable more accurate comparison of all data across different schools.