

I'm an Engineer, Get me out of here

Evaluation report

The screenshot shows the website's homepage with a grid of five engineer profiles:

- Paige Brown**: Winner! (Profile picture, Bio: Me and my Work, Status: Students, Read more about me, Latest Question: How are jumpers and hoodies made from empty coke bottles?, Latest Comment: Do you ever get frustrated when there's something you want to do on the computer but can't do it using your software? (1 comments))
- Martin Wallace**: (Profile picture, Bio: Me and my Work, Status: Sad about not winning, but really enjoyed the event. Congratulations Paige, you deserve it!, Read more about me, Latest Question: If it was compulsory that you were not allowed to open a workshop in schools would you still consider making ergonomic, Latest Comment: Where did you work when you were working on rides? (1 comments))
- Joanne Davies**: (Profile picture, Bio: Me and my Work, Status: Loved this event! I'm going to miss you all :(OUCH! Off to console myself with some chocolate. Good luck Martin and Paige., Read more about me, Latest Question: What GSCE grade did you get in product design?, Latest Comment: Where did you work when you were working on rides? (1 comments))
- Emily Bullen**: (Profile picture, Bio: Me and my Work, Status: Go Martin and Paige! =), Read more about me, Latest Question: What is your greatest achievement?, Latest Comment: Do you find that mathematics is a big part of your every day work? (1 comments))
- Amit Pujari**: (Profile picture, Bio: Me and my Work, Status: Congratulations Paige and hard luck Martin!, Read more about me, Latest Question: What revision techniques do you suggest for exams in engineering subjects such as Resistant Materials?, Latest Comment: Would you ever consider a career in teaching Resistant Materials, or other Design and Technology subjects? (1 comments))

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creating community conversations

Foreword

Shane McCracken – Project Director

September 2012

We've always welcomed engineers on *I'm a Scientist, Get me out of here!* and running a version specifically for engineers was an obvious move that we'd been considering without acting for a while. I do need to credit Hywel Vaughan, the winner of the *I'm a Scientist* Boron Zone in June 2010, with providing the impetus to make it a reality.

With Hywel's encouragement we explored the idea in more depth and in October 2010 applied for an Ingenious Award from the Royal Academy of Engineering. In March 2011 we were informed of our success and planning could start in earnest.

The timing of the award meant that we were blessed with a very long lead time that gave us time to recruit engineers and teachers from the beginning of the academic year. The site development schedule gave us time to involve students in the design and zone choice processes. It is not often that we give ourselves so much time to prepare but it is normally worth it.

Despite considering ourselves well versed in running online engagement events of this nature there were still many unknowns for us. Would engineers want to take part? Would we be able to recruit Maths and D&T teachers? What questions would students ask?

The first question was quickly answered. By the end of the first three months we had over 165 engineers apply for the 30 places. The mix was good too. 34% were female, 50% said they had been working for just 10 years or less, and 2/3rds worked in industry. The last figure differentiates them from our scientists of whom 2/3rds work in academia - see page 19 for more details.

Recruiting Maths and D&T teachers was not so easy. We worked with DATA and NCETM. We had a good response from Maths teachers, but D&T teachers were more difficult to reach - see page 26.

The final piece of the puzzle was finding out what the students would ask. The breadth of questions in *I'm a Scientist* is always very impressive. In *I'm an Engineer* we found that students were more interested in engineering as a job than as a discipline - see page 11.

There are differences between *I'm an Engineer* and *I'm a Scientist*. It is easy to forget that it was the first time we'd run the event, and that students can't define what engineering is in the same way that they can understand science in the school environment.

There are however more similarities. Engineers emerge from the two weeks in a state of exhilaration, energised by the questions and chats. Students are buzzing at the realisation that they can ask whatever they like and get an answer from a real person, from someone who isn't a teacher.

Engineers have their outlook on life changed. Lt Emma Bould from the Royal Navy was forced to confront the no-holds-barred reality that students view a warship more as an aggressive than defensive tool. *“How many people have you killed?”*. Matt Maddock realised that his pre-event fears of taking part were groundless and exhorted his fellow engineers to do more explaining about the world through public engagement.

Reading this report confirms my instinct that *I'm an Engineer* is very successful. Now it is time to start chapter 2 and make the event sustainable and give hundreds more engineers and thousands more students the chance to get talking.

“If you get any joy from explaining the world, or think you might have some aptitude for it, then don't hesitate to apply! For the sake of a couple of weeks with a little extra work-load, the experience is an amazing one! Finding out what the students care about, what they are concerned with and how they have a genuine interest in the world around them is exhilarating. It's not nearly as daunting, tiring, troublesome or time-consuming as you might fear! I found that all my fears were groundless and all my hopes for the competition were exceeded massively!”

Matt Maddock, Engineer

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"That two weeks still very much the highlight of my year so far"

Andy Hearn, Engineer

1.0 Introduction

I'm an Engineer is a STEM engagement event developed by the team who run the award-winning *I'm a Scientist, Get me out of here!* event. *I'm a Scientist* has been running since 2008, and in that time many engineers have taken part in that event, but many more have been put off by the name and focus on science. In March 2011 Gallomanor were awarded a £30,000 Ingenious Award from the Royal Academy of Engineering to create *I'm an Engineer, Get me out of here!* and run 5 zones in March 2012. With additional sponsorship from the Science & Technology Facilities Council 6 zones were run during the March 2012 event.

I'm an Engineer is an X Factor-style competition for engineers, where students are the judges. Engineers and students talk online on this website. Engineers break down barriers, have fun and learn. But only the students get to vote. The event runs for two weeks at a time.

There are three main parts to the event – ASK, CHAT and VOTE.



Students ASK questions which the engineers then answer in their own time.



Engineers CHAT online with students, answering their questions and hearing their opinions.



Students VOTE for the engineer in their zone they think should win a prize of £500 to communicate their work

We wanted to avoid running zones themed around the different disciplines of engineering, such as Chemical, Mechanical, Civil, and Electrical, which would reinforce stereotypes of engineering. Instead we decided to base zones around common themes within engineering that engineers from all disciplines could take part in, echoing how engineers collaborate in their work.

We came up with a long list (<http://imanengineer.org.uk/2011/09/zone-selection>) of zone suggestions and asked teachers and engineers to comment on what they thought would work best. We used these suggestions to come up with the final 6 zones, also taking into consideration the research areas of engineers who had already applied.

The 6 zones run within the March 2012 event were Energy Zone, Health Zone, High Performance Zone, Measurement Zone, Transport Zone and the Water Zone.



1.1 Project aims

In the Ingenious ‘Evaluation planning template’ (see Appendix 1) prepared at the start of the project we set out the following objectives, outcomes and evaluation questions for the project. We’ll refer back to these throughout this report to assess how *I’m an Engineer* meets our initial plans.

Stated project objectives

1. To produce a high quality online event including teacher packs. ✓
2. To run 5 zones – each zone consists of 5 engineers and 20 classes, equating to 25 engineers, 100 classes and 2,000 students. Almost
3. To evaluate the project throughout, to measure if aims and objectives are being met. ✓
4. To disseminate the findings of the project, promote the project and seek funding for running beyond 2012. Ongoing

Initial evaluation questions

1. Do the engineers view their participation as a positive experience? ✓
2. Have they / do they think they have improved their communication skills? ✓
3. Has the event changed students’ perceptions of engineering? ✓

Intended project outcomes

Outcomes for engineers:

- The engineers find the event enjoyable, interesting, informative, interactive and well organised.
- Awareness: learn that young people are interested in their work, that they want to engage with engineers, and that online methods are available that are useful and efficient.
- Attitudes: Public Engagement is enjoyable, worthwhile and useful to them as engineers. To feel that online engagement is as useful and enjoyable as offline methods.
- Skills: improved communication skills particularly, but not solely, in terms of online and young people.

Outcomes for students:

- The students find the event enjoyable, interesting, informative, interactive and well organised.
- Awareness: learn about the wide range of opportunities in engineering, and that engineering is a suitable career for them. Learn about the social impact of engineering.
- Attitudes: realise that engineers are human.

Outcomes for teachers:

- The teachers find the event enjoyable, interesting, informative, interactive and well organised.
- Awareness: alternative ways of involving engineers in school. Learn that students can be trusted to debate and question responsibly.
- Attitudes: Introduce engineering into lessons.

1.2 Methodology

This evaluation used a combination of quantitative and qualitative data and methods, as proposed in the Ingenious ‘Evaluation planning template’ (see Appendix 1). Most of the methods were used as planned, although as discussed later the Flesch-Kincaid reading age analysis was not possible. The methods include:

Pre and post event online surveys for engineers, teachers and students. All engineers and teachers are asked to complete the relevant pre-event survey, and everyone (students included) is asked to complete the relevant post-event survey straight after the event. Student completion is incentivised with one student (chosen at random) winning a £20 WH Smith voucher. Slightly different versions of the surveys were produced for each group. Fifteen engineers responded to the post-event survey, ten teachers and 48 students (out of the thirty engineers, 49 teachers and 1,599 students who took part).

Sampled telephone interviews with three engineers, each from a different zone, including one zone winner and two engineers eliminated earlier in the process. Three teachers were interviewed: one Science teacher, one Maths teacher and one D&T teacher. The interviews were conducted externally.

Class visits to two schools to see in person how the students interact with the event. These two visits were conducted externally.

Flesch-Kincaid reading age analysis. By analysing the engineers' answers over the two weeks of the event we will measure how their language changes. Winners can be compared with less successful participants.

Analysis of basic web statistics on site usage will allow us to benchmark against sister events, against future events and to compare zones.

Attendance analysis, a comparison between schools and teachers who register but don't take part, and those who actively participate.

School analysis – analysing school academic record and geographical location to see if we are reaching a wide range of schools, including underperforming schools.

Engineer analysis to check that we have a broad range of engineers in terms of age, discipline, career stage, place of employment and ethnicity.

2.0 Key figures

This section shows key figures from the *I'm an Engineer* event, pageviews on the site, the levels of engagement seen in *I'm an Engineer* and information on popular topics covered in questions asked by the students.

2.1 Key figures from the event

Being online there is a vast amount of data we can collect about the event. The table below shows data for *I'm an Engineer* in March 2012 alongside data from the *I'm a Scientist* event running at the same time. Figures are for the whole of each event, and averaged per zone (there were 6 zones in *I'm an Engineer* and 8 in *I'm a Scientist*).

	IEng zone average	IEng whole event	IAS zone average	IAS whole event
Number of engineers	5	30	5	40
Number of registered students	267	1,599	330	2,626
Number of schools given places	14	81		
Number of schools that took part	8	49	10	81
Number of classes given places	22	129	22	174
Number of classes took part	12	72	14	112
% of active students (ASK, CHAT, VOTE or commented)	87%	-	89%	-
Number of questions asked	614	3,681	1,134	9,070
Number of questions approved	215	1,292	424	3,394
% of questions approved	39%	-	39%	-
Number of students that asked questions	130	779	192	1,535
Number of questions asked per student	2.3	-	5.9	-
Number of questions marked as duplicates	133	798	221	1,764
Number of questions answered	201	1,205	410	3,278
Number of answers given	510	3,062	977	7,819
Number of comments	62	371	148	1,185
Number of votes	239	1,434	334	2,669
Number of students who voted	181	1,085	242	1,936
Number of live chats	14	81	16	125
Number of lines of live chat	4,689	28,131	6,106	48,845
Number of students who chatted	169	1,013	217	1,732

We set quantitative objectives in the Ingenious ‘Evaluation planning template’, two of which were met and the third which was set too high initially as we hadn’t yet properly analysed data from *I’m a Scientist* as a benchmark to compare *I’m an Engineer* to. There is more detail explaining the learning from these objectives in the sections mentioned.

- 1. Objective: To run 5 zones, with each zone being one self-contained competition of five engineers talking to 20 classes of students.** ✓
6 zones ran, each with 5 engineers and an average of 12 classes.
- 2. Objective: 5 zones equates to 100 classes and 2,000 students.** ✗
We set a target of 400 students per zone in line with our targets on *I’m a Scientist*. Subsequent to the funding application we further analysed *I’m a Scientist* student figures and realised that 400 per zone was overly ambitious. We revised our target to 330 students per zone, but we still didn’t achieve those targets as discussed in section 4.1.
- 3. Objective: 5 zones equates to 25 engineers.** ✓
30 engineers actually involved as the STFC sponsored an additional zone. We were very successful in recruiting engineers, as described in section 3.1.

2.2 Activity on the *I’m an Engineer* site

The *I’m an Engineer* site was constructed in November 2011. All questions and engineer profiles remain up on the site after each event ends, as a potential teaching resource. Engineers and teachers can still register to take part in future *I’m an Engineer* events, so traffic flow continues on the site.

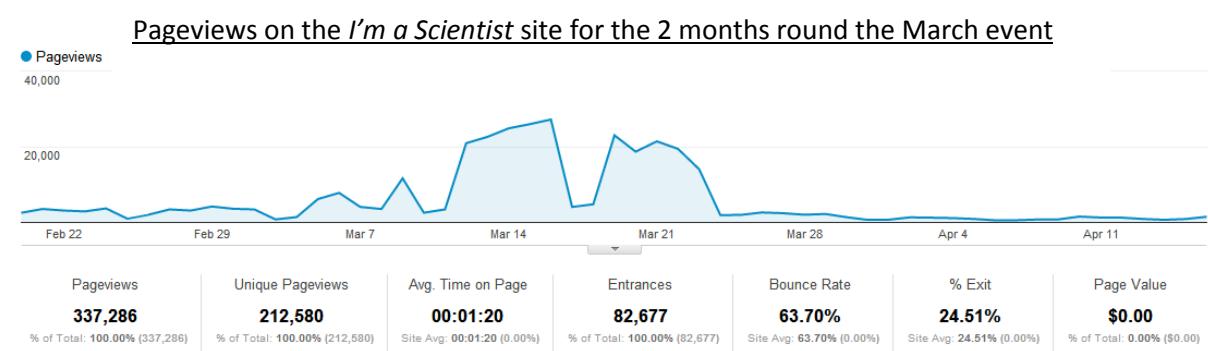
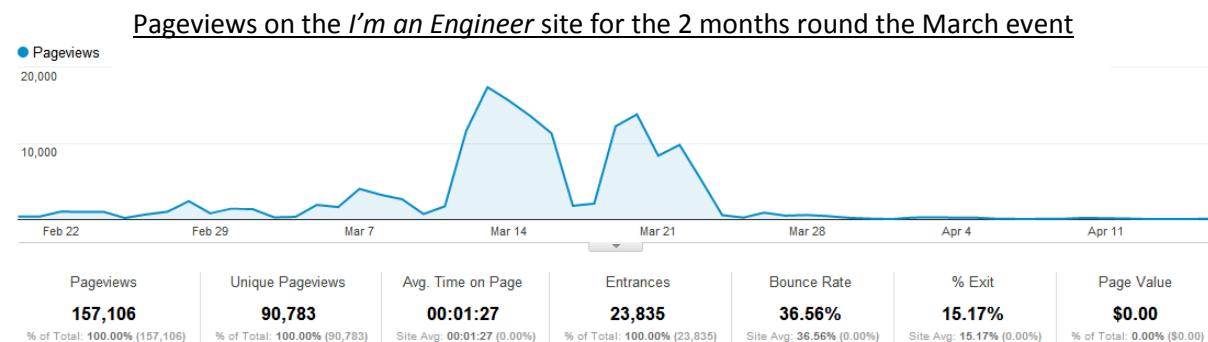
Page(s) viewed	Total visits since the site was built in November 2011 to June 2012		2 months around the March event	
	Pageviews	Unique views	Pageviews	Unique views
Whole site	183,115	111,752	126,852	90,552
CHAT pages	9,299	3,377	9,284	3,366
ASK pages	8,184	2,025	8,170	2,012
VOTE pages	6,257	3,996	6,232	3,978
Engineers	4,296	2,502	4,184	2,413
List of questions	1,974	885	1,953	870
Number of visits	34,573	21,883	23,654	12,908
Pages per visit	5.3	-	6.6	-

Activity on the site is measured in pageviews, the number of times visitors look at the site. Over the 2 months surrounding the March event the *I’m an Engineer* site received nearly 127,000 pageviews, and has received over 183,000 since it was built in November 2011. The unique views combine the

views from the same user in the same session (generally the first time a specific IP address visits the site) so are lower than the pageviews. As Google Analytics explains “A unique view represents the number of sessions during which that page was viewed one or more times”

(<http://support.google.com/googleanalytics/bin/answer.py?hl=en&answer=47813>).

The pageviews on the *I'm an Engineer* site show the same pattern as those on the *I'm a Scientist* site for the same period (we ran 8 *I'm a Scientist* zones at the same time as the 6 in *I'm an Engineer* zones in March 2012). Both events show peaks during the 2 weeks of the event and more activity in the weeks leading up to this fortnight than the weeks after. There is a clear drop at weekends when schools students aren't taken onto the site during class time. The total pageviews for *I'm a Scientist* are greater than *I'm an Engineer* but this is expected as *I'm a Scientist* has been running since 2008 so has a bigger following. We would like to compare with other STEM education sites, especially those that are used by secondary teachers, but can't find any data on this.



2.3 Levels of engagement

The extent of engagement of engineers and students can be measured using data collected from the site and post-event surveys. Figures from *I'm an Engineer* are in the green boxes, and figures from *I'm a Scientist* (which ran at the same time) are in the blue boxes for comparison.

50% of the 30 engineers filled out the post-event surveys and just 3% of students (48 out of 1,599) filled out the student survey. The link to the feedback survey was sent to students in an email announcing the winner their zone. We also encouraged teachers to get their classes to fill the survey out. However completion of the survey was (near unavoidably) self-selecting, which could skew the data towards the keen students who aren't representative of the whole student population.

87% of students that registered on the site actively participated by asking a question, taking part in a live chat, leaving a comment or voting.

89% of students actively participated

100% of students who filled in the feedback survey found *I'm an Engineer* interesting.

98% of students who filled in the feedback survey found *I'm a Scientist* interesting.

100% of students who filled in the feedback survey would recommend *I'm an Engineer* to their friends.

95% of students who filled in the feedback survey would recommend *I'm a Scientist* to their friends.

100% of engineers who filled in the feedback survey would take part again.

77% of scientists who filled in the feedback survey would take part again.

100% of engineers who filled in the feedback survey would recommend the event to their colleagues

94% of scientists who filled in the feedback survey would recommend the event to their colleagues

1,085 students (68%) voted at least once during the event, casting 1,434 votes in total, an average of 239 votes per zone. A maximum of 349 students voted more than once.

1,936 students (73%) voted at least once, averaging 334 votes per zone. A maximum of 733 students voted more than once.

63% of votes were cast in the 1st round, 11% in the 2nd, 14% in the 3rd and 12% in the final round.

59% of votes were cast in the 1st round, 13% in the 2nd, 13% in the 3rd and 16% in the final round.

The winning engineers picked up on average 41% of the votes in their zone, although this figure ranged from 31% to 53% of votes across the zones.

The winning scientists picked up on average 44% of the votes in their zone, ranging from 37% to 56% of votes across the zones.

1,013 students (63%) talked with engineers in a live chat. 28,131 lines of live chat were written by engineers and students in the 91 live chats, averaging 309 lines per live chat and just under 4,700 per zone.

1,732 students (66%) talked with scientists in a live chat. 48,845 lines of live chat were written by scientists and students in 125 live chats, averaging 391 lines per live chat and just over 6,000 per zone.

The engineers gave 3,062 answers to 1,205 questions; an average of 2.5 answers per question.

The scientists gave 7,819 answers to 3,278 questions; an average of 2.4 answers per question.

779 students (49%) asked the engineers questions that were approved (or duplicated to other very similar questions).

1,535 students (58%) asked the scientists questions that were approved or duplicated.

2.4 Popular topics covered

To see what themes came out in the questions we analysed nearly 1,300 questions that students asked the engineers in more detail. Each question was sorted by two measures: the type of question (whether the student was asking for a Fact or an Opinion) and the subject the question was on (including Career, Personal, about the Event, Workday, specific to the zone theme e.g. Health, Water).

Two thirds of all the questions asked to the engineers were asking for Facts (What? Where? and How?) and a third asked for the engineers' opinions (What do you think? or Why?). We don't have any data to compare to for other similar projects but a third of questions asking for opinions shows that students aren't just using *I'm an Engineer* to 'Google' answers to questions. They are engaging on an emotional level with the engineers as real people.

The most popular topic in questions (and live chats) was engineering as a career. Students took the opportunity to ask the engineers all about their jobs – Is it fun being an engineer? How much do you earn as an engineer? What's the best part of being an engineer? Do you need good grades to be an engineer?

Students also asked questions about the engineers' workday – Do you wear normal clothes to work? Do you do practical work? Is your schedule hectic or calm? Questions about careers and workdays made up over 50% of questions asked. Students were genuinely interested in engineering as a career, possibly because they don't know much about what it involves.

22% of the questions were specifically about some kind of engineering, most often relating to the zone theme and the engineers' work. Students would often pick up on details in the engineers' profiles about specific things they work on (e.g. the Boeing C17, nanoparticles, Formula 1 & working in Antarctica).

Other popular questions were more personal ones – What do you do in your spare time? Do you have a large family? What are your strengths and weaknesses? Gender and being a female in a seemingly male dominated world popped up just 11 times in questions, although it was also asked in live chats.

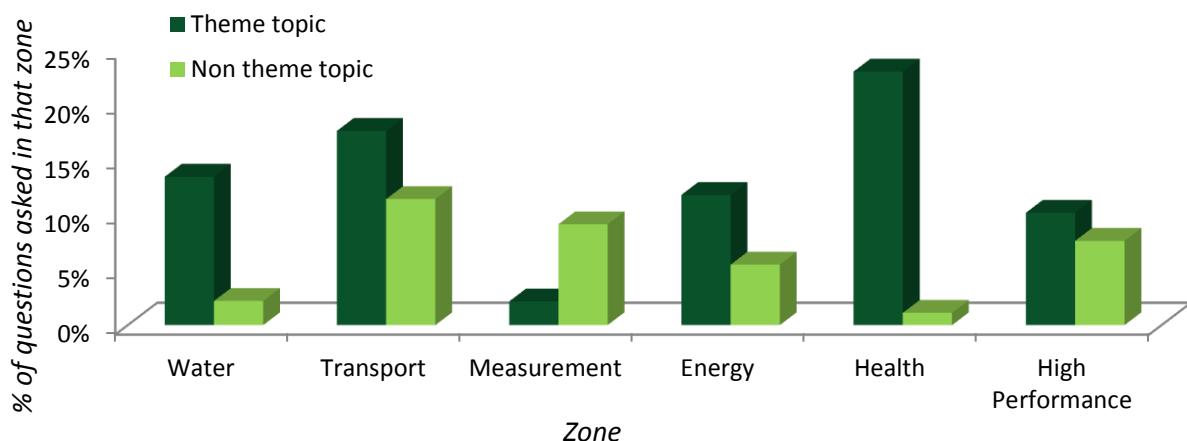
The 6 zones were all themed, and our expectation was that this would encourage more questions on that topic. Looking at the % of questions in each zone that were relevant to the theme compared to those that weren't on topic confirmed this. In all zones (except the Measurement Zone, which isn't as clear cut or obvious a topic as the others) there were many more engineering questions asked on topic than off topic. Off topic questions included any question on engineering that wasn't about the

Type of question	Count	%
Fact	850	68%
Opinion	395	32%

Subject	Count	%
Career	528	42%
Personal	214	17%
Workday	123	10%
Engineering	68	5%
Transport	41	3%
Water	37	3%
Energy	30	2%
Health	27	2%
Defence	24	2%
Space	21	2%
High Performance	16	1%
Environment	14	1%
Nanotechnology	14	1%
Particle Physics	6	0%
Measurements	4	0%
Robots	3	0%
Event	64	5%
Gender	11	1%

theme topic, but excluded questions on general engineering (e.g. What's the most useful invention ever?).

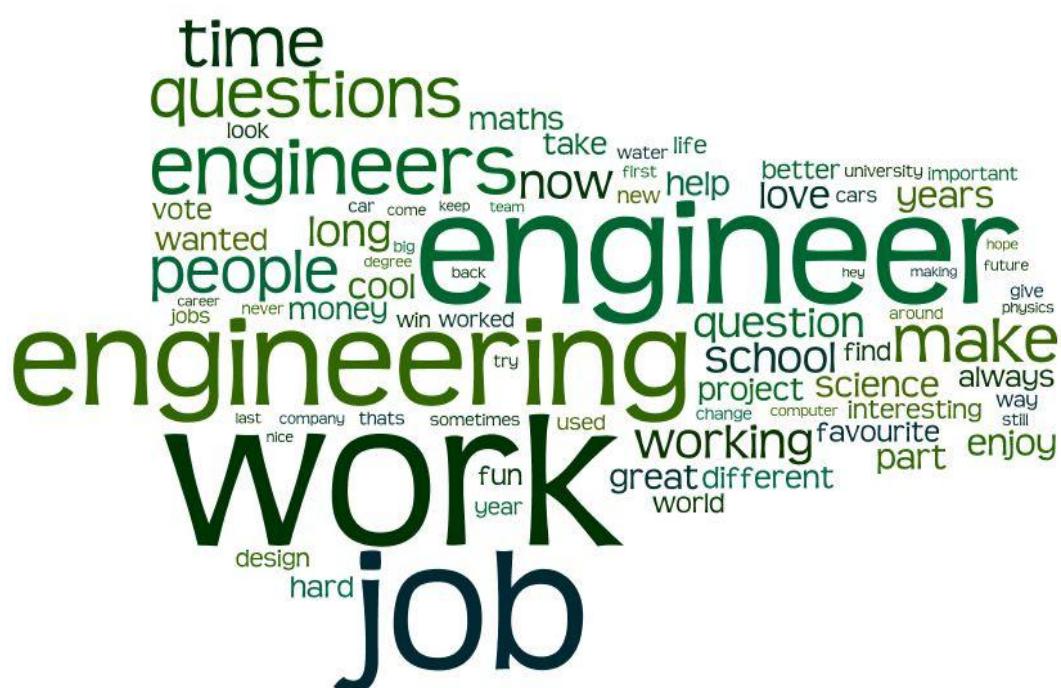
The % of questions asked on and off the theme topic in all 6 zones



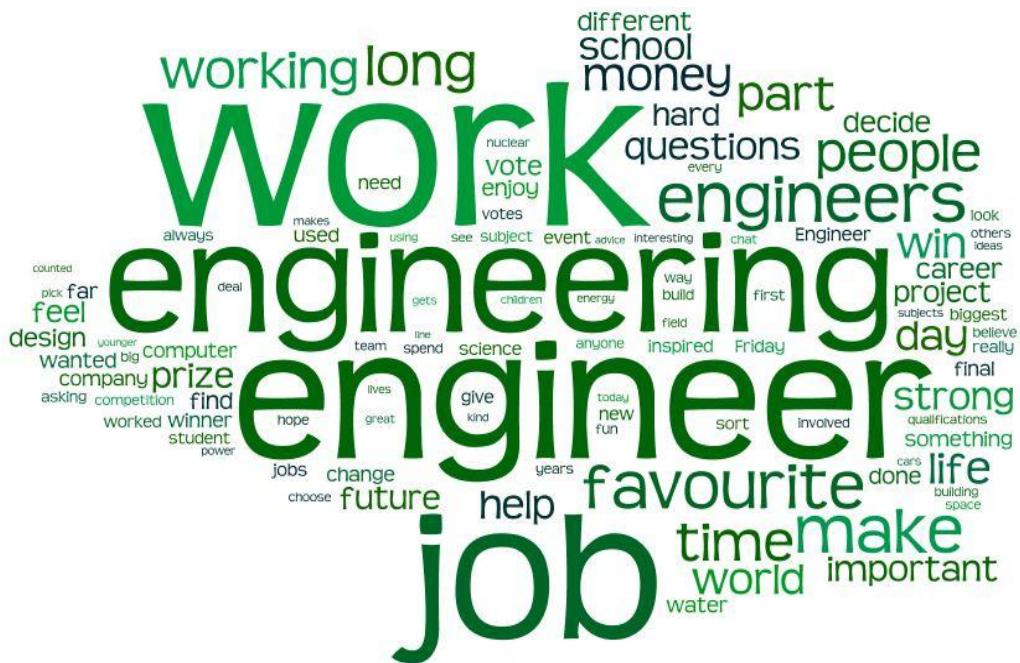
Running themed zones therefore encourages questions on that topic, in comparison to the number that would have been asked anyway. Speaking with engineers from a particular area or industry sparks interest from students on that topic. One way to get students interested in engineering is to run events on specific themes and topics within engineering.

The wordles below show the common words from live chats and questions across all 6 zones, with common words like 'and', 'hello' and 'what' removed.

The most frequently used words in live chats.



The most common keywords in questions asked to engineers.



Some examples of the range of questions asked to engineers:



Question: what is the biggest thing you've made?

Asked by conoretherden to Ant, Dan, Matt, Mike, Steph on 15 Mar 2012. This question was also asked by tarek, youngglen13.

Short link <http://bit.ly/w1T6Bg> | Comment on this question



Question: How are jumpers and hoodies made from empty coke bottles?

Asked by shivani to Jo, Martin, Paige on 22 Mar 2012.

Short link <http://bit.ly/GEGJsR> | Comment on this question



Question: How Do You Make Computers Think For Themselves?

Asked by charlotte1999 to Andy on 20 Mar 2012. This question was also asked by joelyons.

Short link <http://bit.ly/GBd0yV> | Comment on this question



Question: would you like to be an engineer in roman times ?

Asked by hannahwilson to Omar, Al, Emma, James on 21 Mar 2012. This question was also asked by sohanaveed.

Short link <http://bit.ly/GCBkBK> | Comment on this question



Question: Do you ever struggle with something at work? How do you deal with this?

Asked by hannahgrimes to Alex, Chris, Harriet, Jed, Ken on 15 Mar 2012.

Short link <http://bit.ly/zTCHj6> | Comment on this question



Question: How do you get the nano particles so small? Do you cut them with lasers or something..?

Asked by daviesl3 to Paige, Jo on 21 Mar 2012.

Short link <http://bit.ly/GCvTCZ> | Comment on this question



Question: What inspired you to work in the sector of Engineering you do today?

Asked by wainwrh01 to Bill, Rain, Andy, Grant, Kayleigh on 13 Mar 2012. This question was also asked by walkeraj15, noel1803, janjew, billydyer281197, mckenzie2468.

Short link <http://bit.ly/AEILpH> | Comment on this question



2.5 Impact cost analysis

Public engagement is too complex to measure effectiveness solely by cost per respondent, but when spending public money it is important to measure cost effectiveness where possible and compare with other projects if available.

The online nature of *I'm an Engineer* means that we can measure very accurately how much engagement has taken place. This section quantifies the engagement and looks at how much it has cost to achieve that engagement. It should be read in conjunction with section 2.4 above, that looks at the quality of engagement.

Impact cost analysis for *I'm an Engineer, Get me out of here!*

	Ingenious funded pilot	Adjusted for fixed costs	Future standard zone cost
Funding per zone¹	£6,000	£6,000	£4,000
Prize	-	£500	£500
Evaluation	-	£500	£500
Project management	-	£1,000	£750
Site development	-	£1,500	£250
Cost of engagement	£6,000	£2,500	£2,000
Engineer element²	£3,000	£1,250	£1,000
Student element	£3,000	£1,250	£1,000
Cost per student registered	£11.24	£4.68	£3.75
Cost per engineer	£600	£250	£200
Cost per active student	£12.91	£5.38	£4.30
Cost per question asked	£9.77	£4.07	£3.26
Cost per answer given	£11.76	£4.90	£3.92
Cost per registered student visit	£4.41	£1.84	£1.47
Cost per minute of registered Student visit	£0.28	£0.12	£0.09
Cost per engineer visit	£7.54	£3.14	£2.51
Cost per minute of engineer's visit	£0.43	£0.18	£0.14
No. of registered students per zone³	267	-	-
No of engineers	5	-	-
%age of students active⁴	87%	-	-
No. of questions asked	614	-	-
No. of answers given	510	-	-
No. of student visits	681	-	-

Avg minutes per visit	15.48	-	-
No. of engineer visits	398	-	-
Avg minutes per visit	17.45	-	-
Other visits⁵	5,073	-	-
Avg minutes per visits	6	-	-
Total time (hours)	507.3	-	-
Engineer to student benefit ratio	50%	-	-

The table does need some explanation.

1. Funding per zone

We've included 3 columns in the table. The first is the crudest measure which looks at the total cost per zone, based on dividing the Ingenious Award by the 5 zones it funded. The sixth zone was STFC funded. This is a crude measure because it includes a number of factors that make it an unfair comparison.

Prize - the cost of each zone includes £500 of prize money which has to be spent on further public engagement work. The evaluation doesn't include the impact of that work so the cost should be excluded.

Evaluation - evaluation is important but it isn't engagement and therefore should be excluded from the cost of the engagement.

Project Management - we have excluded an element of project management for two reasons. Firstly it is very variable depending on the level of liaison required with a funder. And secondly for purposes of comparison with other projects, much project management time would not be counted because it would be done by internal staff. The project management time incurred in the running of the zone e.g. liaising with scientists and teachers is still included in the engagement cost.

Site development - the vast majority of site development has been done as part of the pilot and as part of projects like *I'm a Scientist* that preceded it. It won't be incurred on future events. Any development that is incurred is shared amongst all the events using the site.

2. Engineer element

I'm an Engineer delivers on many fronts. It gives engineers great experience in communication and tends to encourage them to try more engagement work. It gets students excited about engineering and careers in engineering. It would be wrong to place all the cost on one aspect of engagement. For this table we have assumed equal benefit was given to the engineers as the students and therefore 50% of the cost is applied to student metrics and 50% to engineer metrics. The spreadsheet is online at

<https://docs.google.com/a/gallomanor.com/spreadsheet/ccc?key=0AuVb5bhHfdZgdE1oV1BfMmh2eFWSEN3UF9aUIY4YIE#gid=0> and you can change this ratio if you like.

3. Number of registered students per zone.

Strictly speaking this is the number of registered student accounts. Sometimes a student registers again because they've forgotten their username, but more often we find two students sharing the same account because of the limited number of PCs in the classroom.

4. Percentage of students active.

When you give an assembly to 500 students it is fairly obvious that some are engaged and listening and some are not. In a class you'll get questions and comments from a proportion of the students. It's difficult to measure but you'll have a fair idea. With *I'm an Engineer* we know exactly. We define an active student as one who writes at least one line of live CHAT, ASKs a question, leaves a comment or VOTEs. We don't know what the non-active students are doing but we expect they are at least reading the site.

5. Other visits

We have no idea who these other visits are. They could be students checking the site without logging in, engineers, science communication practitioners or simply people surfing the internet. It's most likely a combination of all. But because we can't identify them we don't include them in the impact cost analysis. They're a freebie. But a pretty big freebie that keeps on giving.

3.0 Engineer evaluation

3.1 Breakdown of engineers taking part

183 engineers applied to take part in *I'm an Engineer*. They were each rated on their one sentence summary of their work by teachers and students, to help guide the choice of the final 5 engineers in each of the 6 zones. The breakdown of applicants and participants including gender, experience, sector and ethnicity is explored below.

Number of applicants

We were very successful in recruiting engineers. With 6 applicants applying for every space we were overrun with engineers wanting to take part. When we started recruiting engineers we weren't sure what the uptake would be like. All we had to compare it to were scientists, who tend to be in more time-flexible academic roles than engineers from industry and the private and public sectors. Would *I'm an Engineer* appeal to working engineers? Could they fit it into their working day? Do engineers want to talk with students online?

The answer to all of these questions was yes. It showed, first of all, that engineers want to do public engagement. They want to talk with students about engineering and science – showing what engineering actually is, moving away from the image of engineers as mechanics in garages, and showing the range of careers in engineering.

It also showed that online engagement suits engineers. *I'm an Engineer* appeals to researchers as it can be done from the office or the lab, without wasting time travelling or taking a whole day out from meetings and work. All the time engineers spend on it is directly engaging with students. Engineers told us they like the way that in *I'm an Engineer* they communicate directly with students, rather than “*giving information and hoping it covers everyone's questions!*”.

We recruited engineers through many different channels, mostly online. We contacted the 36 Engineering Institutes and related organisations to ask them to spread the word. We decided on the 6 zones fairly early, before Christmas, and used this to help recruit engineers. Putting calls out specifically for engineers working on water or energy made the event more relevant to many engineers. We asked engineers who'd take part in *I'm a Scientist* in the past to spread the word to their colleagues, as personal recommendation is the more effective means of communication.

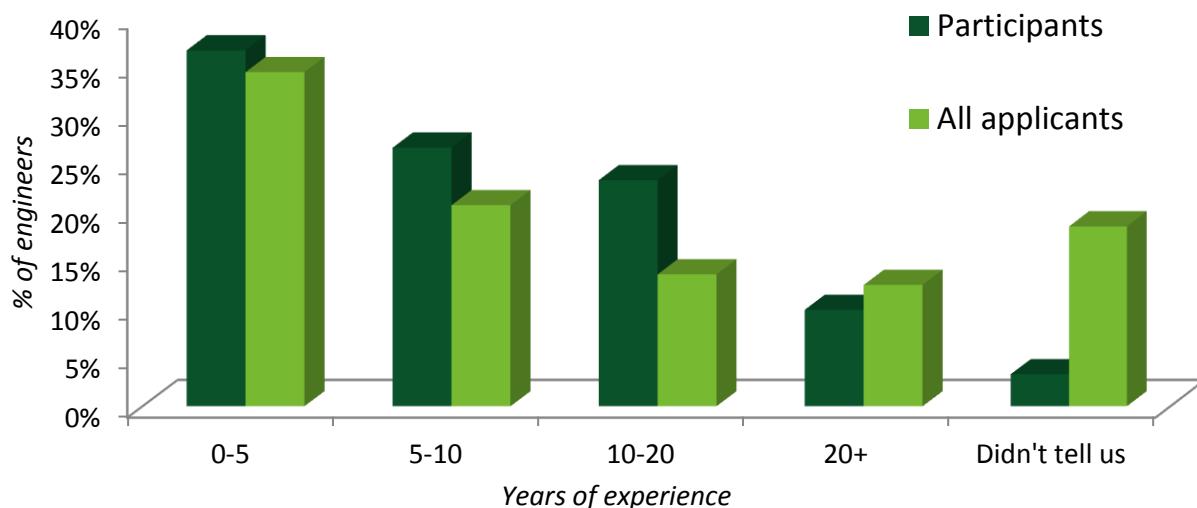
Gender

66% of applicants were male and 34% were female. Of the 30 engineers that took part 60% were male and 40% were female. There is a strong demand for females to take part in engineering engagement events, to change the stereotype of engineers being male, and to show female students that engineering could be for them.

Years of experience

Engineers with just a few years of engineering experience were more likely to apply than engineers with a lot more experience. The event appealed most to early career researchers. The final sample of engineers included a range of levels of experience. We were keen to include engineers at all stages of their career.

The number of years of experience engineers who applied and took part had

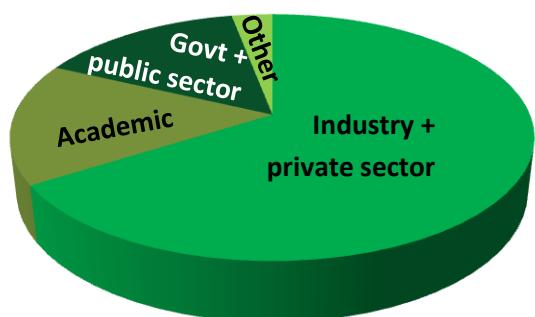


Work sector

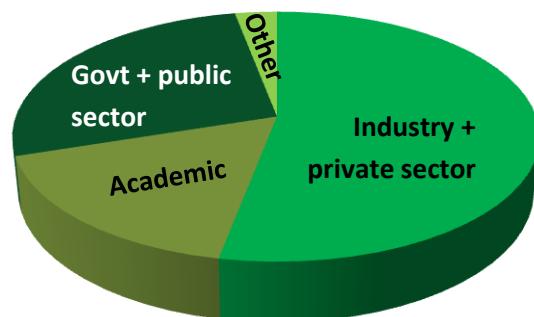
Two thirds of the 183 applicants worked in industry and the private sector. We were so successful at recruiting so many engineers from industry and the private sector because the project suits their needs for public engagement.

A lower proportion of the participants worked in industry and the private sector (53%), with more representation from government and the public sector, and academia. We tried to balance the zones so that students weren't talking to five academics or public sector workers, but we didn't deliberately try and reduce the representation of engineers from industry and the public sector. Instead the industry and private sector engineers were less able to describe their work in an interesting way so weren't selected. They may have not fitted into the 6 zone themes (Energy, Health Zone, High Performance, Measurement, Transport & Water) or conversely lots of them worked in very similar areas.

The sectors that the engineers who applied and took part worked in



Engineers who applied



Engineers who took part

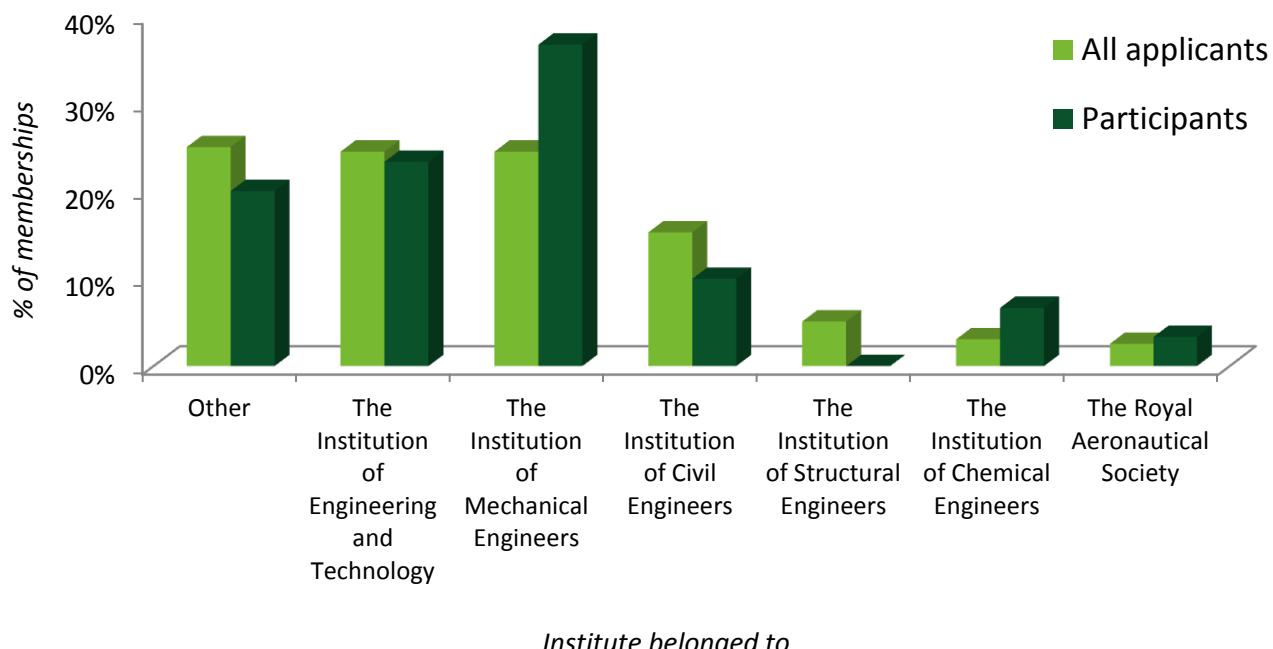
Ethnic minorities

From the data available 23 of the 183 applicants were from ethnic minorities, which is around 13%. At 13%, the same proportion of participants were from ethnic minorities (4 engineers).

Society membership

Engineers were asked which of 6 of the largest societies they were members of, and could select multiple societies. Nearly a quarter of memberships were of the Institution of Engineering and Technology or the Institution of Mechanical Engineers. Another quarter of memberships were of 'Other' institutes. A larger proportion of participants were members of the Institution of Mechanical Engineers, although the Institution of Engineering and Technology and 'Other' institutes were also high.

The societies that engineers who applied and took part are members of



3.2 Feedback from online surveys

We asked all the engineers who took part to fill in an online feedback survey after the event ended (see Appendix 5). We emailed reminders out and 15 out of the 30 engineers completed the questionnaire. The results are used below to investigate the evaluation questions posed at the start of the report.

Evaluation question: Do the engineers view their participation as a positive experience?

The engineers who responded to the post-event survey ($n=15$) were very positive about their participation; 87% said it had been a ‘fantastic’ experience and the remaining 13% thought it was ‘OK’. No engineers thought that ‘it was a bit of a chore’ or ‘it was a waste of time’.

Evaluation question: Have they/do they think they have improved their communication skills?

93% of the engineers were more confident in communicating their work after taking part, and had a better understanding of how students view engineering. All the engineers said they want to do more public engagement, and 87% are now more energised about their work.

The engineers were asked how *I'm an Engineer* compared to other forms of STEM engagement or dialogue they had previously been involved in. 12 engineers answered, and for one this was their first STEM event.

Of the remaining 11 engineers, seven thought *I'm an Engineer* was much more direct, reached a wider audience, focused in much more detail on the engineers’ work and students were much more willing to ask questions.

“this was a wonderful opportunity for dialogue... better than any other form of engagement I have been involved in”

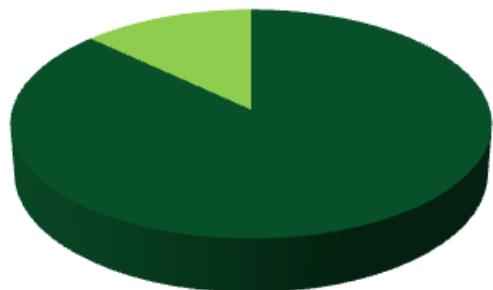
“it enabled a more relaxed atmosphere to communicate in”

“you got to know the kids and they really got to know you”

One engineer said *I'm an Engineer* was “not so direct... as students in person” and three said that online and face-to-face engagement are simply different – online “*is different from face-to-face and makes a nice change*” and it “*works very well where the teacher(s) maintained good discipline, but less so where teachers may have been overwhelmed*”.

“There are some [students] who have become seriously hooked - but isn't this what it's all about ?”
Ken Gibbs, Engineer

Overall, did the engineers enjoy taking part?



- Yes, it was fantastic
- Yes, it was OK
- Not really, it was a bit of a chore
- No, it was a waste of time

Some engineers suggested ways it could be improved, including a ‘closing ceremony’ at the end to wean the engineers off gently, making the event longer but less intense, running it more often, and improving navigation on the website.

[Taper] down the event rather than breaking everyone off so suddenly, the two weeks were intense, and friendships were formed, so to have them all cut off so soon after the ‘final’ didn’t suit us engineers – after all we do thrive on teamwork!”

It’s worth noting that whilst we sent reminders, filling out the survey was self selecting which can introduce bias, but is hard to avoid.

3.3 Other feedback from engineers

Three engineers were interviewed externally after the event, one of whom had won their zone. Engineers also left comments on the site, in emails to the organisers and in blogs written about the experience.

Outcome: The engineers find the event enjoyable, interesting, informative, interactive and well organised.

The three engineers interviewed all felt that participation offered personal achievements, such as the opportunity for them to reflect on their work and the chance to engage with the students.

“It made me think quite a lot about my own work and what I’m doing in my career, perhaps something you don’t really do that often. About how actually, a lot of the stuff I’ve done was really quite good, so that was quite nice”

“Apart from meeting one of my annual objectives of my employment, I’ve discovered that I actually have an affinity for secondary school students”

None of the engineers had any hesitation in recommending the event or colleagues or friends.

“Actually, it’s been the best thing I’ve ever done with schoolkids”
Engineer

Skills outcome: Improved communication skills particularly, but not solely, in terms of online and young people.

The main things the engineers gained from taking part were improved communication skills and increased confidence and willingness to try more engagement in the future.

“My communication skills have received a boost! [...] explaining engineering to the teenaged laity brings out knowledge I never knew I had!”

“I found that I could bounce off [the students] in a way which they seemed to appreciate – and I thought I entered their mindset far better than originally expected (especially the increasing number of years separating my age to theirs!)”

"it's such a great idea. Wish we'd had it when I was at school. But we only had one computer that was connected to the internet!"

Rain Irshad, Engineer

Awareness outcome: Learn that young people are interested in their work, that they want to engage with engineers, and that online methods are available that are useful and efficient.

I'm an Engineer gave engineers the chance to hear students' views on engineering and answer their questions on it. Engineers commented that they weren't expecting so many good questions on engineering, and that the students really got into the event through getting to know the engineers over the two weeks.

"the event exceeded expectations many-fold, highly recommended!"

Andy Hearn, Engineer

"Actually I was surprised at the ratio of engineering vs non-engineering questions. I was expecting, perhaps hoping, for more of the latter. The quality of some of the engineering questions was impressive"

"A couple of groups had more than one online chat, so we saw them a couple of times. The questions they were asking by the end were more insightful and they were really enjoying it"

"the students have interacted with an engineer that used to be just like them – doing school half-heartedly, and with fragile motivation"

"I've just received a message about comments to my answers and I am fascinated. Most of them are to say thank you for answering the question. Politeness survives"

Ken Gibbs, Engineer

As discussed in the Attitudes outcome below, engineers felt that the online engagement removed barriers to students asking questions, allowing communication to be more informal so both engineers and students could get more involved.

"It felt like you were able to speak to them and they spoke back, whereas at a careers fair, you're just talking to a group and they kind of shuffle around and look like they're not listening, whereas people were listening and they were engaging with you – it was quite obvious they were"

"I think it made it a lot easier for the kids to ask questions because they didn't have the fear of their classmates mocking them. If you're face to face it's much more difficult for someone to put their hand up and ask a question whereas online – they're used to communicating online with people – they don't feel that barrier to asking questions. So they got much more involved"

**Attitudes outcome: Public Engagement is enjoyable, worthwhile and useful to them as engineers.
To feel that online engagement is as useful and enjoyable as offline methods.**

The engineers also reflected on how taking part in *I'm an Engineer* gave them ideas of how to do future engagement.

"It was far better, the previous experience was me giving a lecture which in retrospect didn't gel with the students as well as if I did it as an informal group discussion"

"Putting in stories, funny stories about things that have happened to me, even not so great ones like falling in the river, that stuff went down really well"

"More receptive to the idea of physically going to schools and answering students' questions, even non-engineering ones"

 **Martin commented on 26 Mar 2012:**

I enjoyed this event so much! I have been able to re-evaluate why I love working in engineering and identified what I want to achieve in my career. I have seen how enthusiastic and switched-on the students have been and amazed at the high standard and range of questions asked. All in all this has been the most rewarding outreach event I have been part of and would thoroughly recommend it to both engineers and teachers – it was a great pleasure to be part of it.



2

3.5 Flesch-Kincaid readability

Engineers have told us anecdotally that they feel their communication skills have improved through taking part in *I'm an Engineer*; 93% say they are now more confident in explaining their work.

However, the empirical evidence is inconclusive. We tested the change in engineers' readability over the two weeks with 3 different Flesch-Kincaid readability tests (www.standards-schmandards.com, www.readability-score.com & www.read-able.com). Each test gave different results (which is likely due to the shortness of the engineers answers) indicating that the methodology is not sound.

4.0 Schools evaluation

4.1 Breakdown of schools taking part

81 teachers registered to take part in *I'm an Engineer* and were given places. As we had a finite number of classes to allocate we gave teachers fewer classes than they asked for, to let as many teachers take part as possible. Teachers from all over the UK could apply, and we specifically targeted D&T and Maths teachers in an attempt to achieve a more even balance of Science, D&T and Maths students (we already had lots of science teachers interested through *I'm a Scientist*).

From previous experience we expected around a third of schools to drop out because of changes to timetables, staff illness and prioritisation of other commitments e.g. exam preparation. In *I'm an Engineer* 32 schools (40%) who were allocated places didn't show up, meaning 36% of classes given places didn't take part. This high dropout meant we didn't achieve our target of 330 students per zone, instead registering 267 students per zone.

School locations

Schools took part from all over England, from Devon to Durham, along with one Welsh school and 6 in Scotland. Schools that took part are shown in yellow in the diagram, with the engineers' locations in green. The map also gives an indication of population density round the UK, with the green rural areas with low populations, and the red urban areas with higher densities.

As expected there are more schools from denser populated areas – there are few from rural Wales and Scotland, and fewer in Cornwall, Devon and Norfolk which have lower population densities than other counties.

Many of the schools are from population centres of London, Manchester, Liverpool and Leeds.

Locations of schools and engineers in the UK

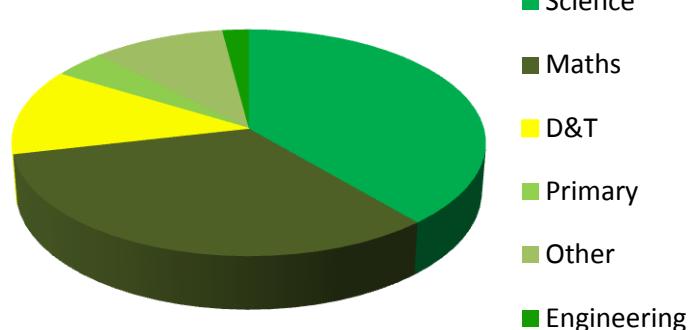


School and engineer locations are (roughly) imposed on a basic population density map of the UK (image by: Sony-youth). The redder the area the, denser the population. Green areas like lots of Scotland and Wales have a low density.

Subject taught

The breakdown of subjects in the schools who turned up is very similar to those who applied – 39% Science, 33% Maths and 12% D&T. The teachers that dropped out were spread across all subjects, indicating that the reason for drop out wasn't that the event didn't tailor towards a particular subject.

Subjects the students were studying



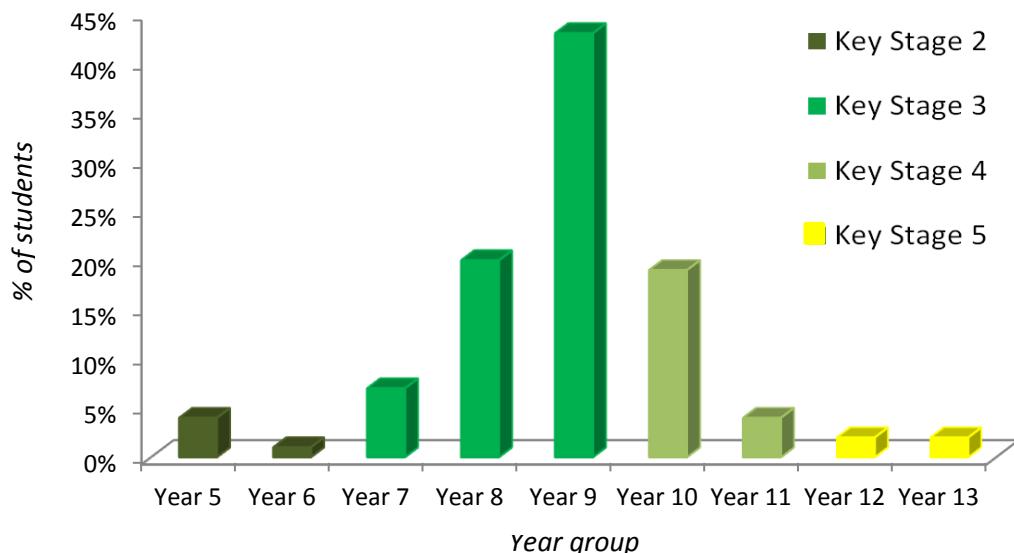
School type and student year group

The vast majority of participating schools were secondary schools (90%). Of the remaining five schools, three were 6th form colleges and two were primary schools.

I'm an Engineer was designed for GCSE age students, primarily Year 9, so the high number of secondary schools correlates very well with the age group the event is designed for. It also shows that the event appeals to other aged students, not just Year 9s. Teachers of primary and 6th form students think that their students can benefit from taking part in *I'm an Engineer*.

When students register on the site we ask them what year group they're in. The default option was Year 5, which explains the higher than expected % of Year 5 students on the bar chart below. The majority of students were Key Stage 3 (70%) and the overall pattern fits a roughly normal distribution centred around Year 9.

Student year group and Key Stage



4.2 Teacher feedback from online surveys

Outcome: The teachers find the event enjoyable, interesting, informative, interactive and well organised.

10 teachers filled in the online feedback survey after the event finished (20% of the 49 teachers that took part). This is a very small sample size but gives an indication of their views. We did send reminders asking teachers to fill out the survey but in our experience from *I'm a Scientist* it's very hard to encourage teachers to fill out feedback surveys, especially as a number of teachers taking part in *I'm an Engineer* have previously filled out similar surveys after taking part in *I'm a Scientist*. The feedback surveys were sent out just before the Easter holidays (when the event ended) which is an awkward time for teachers.

We recognise that the following findings represent a self-selecting audience which may have introduced a slight bias, although it is hard to avoid under the circumstances.

7 out of 8 of them would participate again and 7 out of 9 would recommend taking part to a colleague.

"Keep doing it and I would love to be involved next time"

"I'd definitely enrol for next year. And we asked the students afterwards if they'd like to do it again if they had a chance and they all said yes"

Attitudes outcome: Introducing engineering into lessons.

The event successfully introduced engineering into lessons. 8 teachers said their students enjoyed the event, they're now more informed about STEM careers and have a more positive view of STEM subjects, their students now see how their studies relate to the real world better, and they're now more aware of cutting edge STEM subjects themselves. One teacher said they weren't sure to all of the above.

1. To what extent do you agree with the following outcomes from taking part?

	Strongly agree	Agree	Disagree	Strongly disagree	Don't know	Responses
My students enjoyed the event	55.6% 5	33.3% 3	0.0% 0	0.0% 0	11.1% 1	9
Students are more informed about the range of STEM careers	33.3% 3	55.6% 5	0.0% 0	0.0% 0	11.1% 1	9
Students are more aware of how their studies relate to the real world	44.4% 4	44.4% 4	0.0% 0	0.0% 0	11.1% 1	9
I am more confident in using online tools in lessons	44.4% 4	44.4% 4	11.1% 1	0.0% 0	0.0% 0	9
Students have a more positive view of STEM subjects	44.4% 4	44.4% 4	0.0% 0	0.0% 0	11.1% 1	9
I am more aware of cutting edge STEM research	11.1% 1	77.8% 7	0.0% 0	0.0% 0	11.1% 1	9
I am more aware of the insights my students have into STEM subjects	33.3% 3	55.6% 5	0.0% 0	0.0% 0	11.1% 1	9
I've gained ideas for teaching in the future	11.1% 1	55.6% 5	22.2% 2	0.0% 0	11.1% 1	9
I found the event easy to implement	44.4% 4	44.4% 4	0.0% 0	11.1% 1	0.0% 0	9
Overall I was satisfied with the event	42.9% 3	28.6% 2	28.6% 2	0.0% 0	0.0% 0	7

The single most important outcomes for teachers included:

"Enthusiasm from the students" (3 teachers)

"Pupils understand what engineering entails"

"Students experiencing talking to professional adults about STEM" (2 teachers)

"Encouraged students to look at engineering as a career option"

"To get the students talking about science and engineering"

Teachers used the event in different ways – the majority (75%) used *I'm an Engineer* as enrichment their normal lesson contents, and the others used it as part of the scheme of work in a different way (but didn't tell us what that was). 8 teachers told us how many lessons they spent on *I'm an Engineer* – 4 spent 3 lessons on it, whilst the remainder spent 1, 2, 4 and 5+ lessons on it respectively. This shows that there is little consistency in how the teachers used *I'm an Engineer*, as teachers are able to be creative about how they fit the event into their scheme of work and classroom practice.

Teachers also told us what they would do differently next time:

"Get the pupils asking questions earlier"

"Involve more classes. I didn't realise how easy it would actually be to organise"

"Communicate with IAE more proactively to ensure it works"

"Book the PC suite!"

"Talk through the process more thoroughly at the start"

"After the chats the pupils could do with something to continue their enthusiasm. After the chats it kind of died"

4.4 Other feedback from teachers

We externally interviewed three teachers by phone: one Science teacher, one Maths teacher and one D&T teacher. Teachers also left comments on the site and by email.

Awareness outcome: Alternative ways of involving engineers in school. Learn that students can be trusted to debate and question responsibly.

All three teachers felt the event had a positive effect on students' views about engineering, including widening horizons, challenging stereotypes, showing links to schools subjects (especially Maths and D&T) and increasing knowledge of engineering careers.

"Nearly all of them were thinking of ... car mechanics, dirty jobs, that kind of thing [...] It really challenged their stereotypes of engineering"

"[In] the initial part of the project, the students were asked what they thought engineering was and they all thought it was repairing cars. After taking part in the activities, they had a much wider concept of what engineering is about"

"It was really worthwhile. It helped raise the profile of engineering and of DT. At the moment, DT is suffering because of the baccalaureate and the changes to the curriculum, so it helps the students see there is a pathway, it's not just a school subject, it can go somewhere, to a career."

"We did in our maths lessons and yes, some of them did say 'what's this got to with maths' ... we've done a lot of stuff on careers to do with maths and obviously if you pursue maths, engineering is obviously an option and it's more practical, more applied... if they think 'well, I'm good at maths' this is showing them how they can go on and apply it."

"The biggest plus for me was one of my pupils coming up to me three days later and saying 'I'm going through my options sheets at the moment and I'm interested in engineering' and you think 'we've won one!'"

Teacher

It also gave confidence to teachers without an engineering background to better explain the sector to their students.

"I don't have an engineering background so initially, it helped me understand what engineering is about and impart that to students. It's quite a confusing area – there's so many different roles in engineering. It helped clarify that for me"

The teachers commented that their students were very receptive to the amount of effort the engineers put in, which had a big bearing on who they voted for.

"[One engineer] added to his profile additional pictures and that was immediately picked up, they felt those people obviously cared, that they were updating and renewing, engaging interactively with them"

"If there was one engineer who hadn't populated his or her personal profile with much or any information before the event, they were looked upon very unfavourably. It would take a great deal of effort for that person to participate on an equal footing with the other engineers thereafter"

I feel it's us who should be thanking you, Ken and the others, not the other way round! The girls really enjoyed it (constant cries of 'he's answered it!' and 'that's so cool') and I think they learned a lot.

Bridget Elton, Teacher

The teachers felt that the live chats were the most effective part of the event, as their students were excited and enjoyed it, and liked the sense of having an interested person at the other end. They felt that better questions were asked in the live chats than during the question and answer section.

"[The live chat] was probably the best part. They all got involved. To begin with they got all excited but once they settled down, they asked some really good questions and they were really interested"

4.4 Student feedback from online surveys

Outcome: The students find the event enjoyable, interesting, informative, interactive and well organised.

50 out of the 1,599 students filled out the online feedback survey after the event finished. The surveys were sent out near the end of term just before the Easter holidays, which reduced uptake. We can't tell what schools these students were from as the surveys are anonymous. However, students were sent the link to the survey in an email rather than through their teacher, so we're less likely to see multiple students filling it in from the same school under the guidance of their teacher. All these students thought that *I'm an Engineer* was interesting and that they enjoyed taking part. They all said that the *I'm an Engineer* website was easy to use, and 62% of students used the site at home as well as at school. 90% of the students would recommend taking part to their friends.

*"Thank you so much for talking to us we have had such an amazing time speaking to you!
We are all so inspired by your work!!!"*

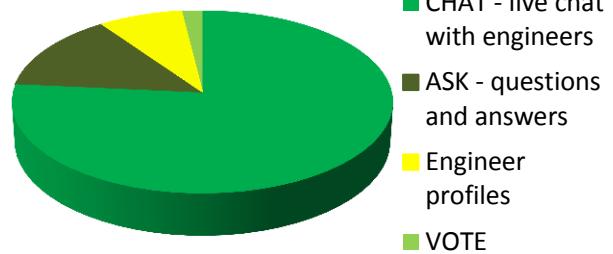
"I think that the event was very good, and a great opportunity that we got in maths (we had just finished a project and needed something fun to do!)"

Student

The vast majority of students (76%) said the live CHATs were their favourite activity on the site. Other students liked the ASK section (14%) and the engineer profiles (8%), and one liked VOTE the best.

This is very similar to *I'm a Scientist* where, where 73% of students preferred CHATs, 18% ASK, 6% scientist profiles and 3% VOTE.

Which parts of the site were the students favourite



Awareness outcome: Learn about the wide range of opportunities in engineering, and that engineering is a suitable career for them. Learn about the social impact of engineering.

94% of the students reported learning new things about engineering that they didn't know before, and also felt that they better understand what engineers do now. 98% of the students consider themselves now more aware of careers in engineering, and the remaining student wasn't sure.

"i liked the fact that i could ask an engineering question and it would be answered straight away this is because i am interested in engineering, so the advice helped"

Over 80% of the students are now more aware of how what they learn in Maths, D&T and Science is used in engineering, although 10% disagreed with this statement and the remaining students weren't sure.

"I enjoyed taking it I think this a good way to teach students what school helps you achieve"

Student

Awareness outcome: Realise that engineers are human.

Students commented on how they got to speak with real engineers, and were very grateful that the engineers took the time to speak with them.

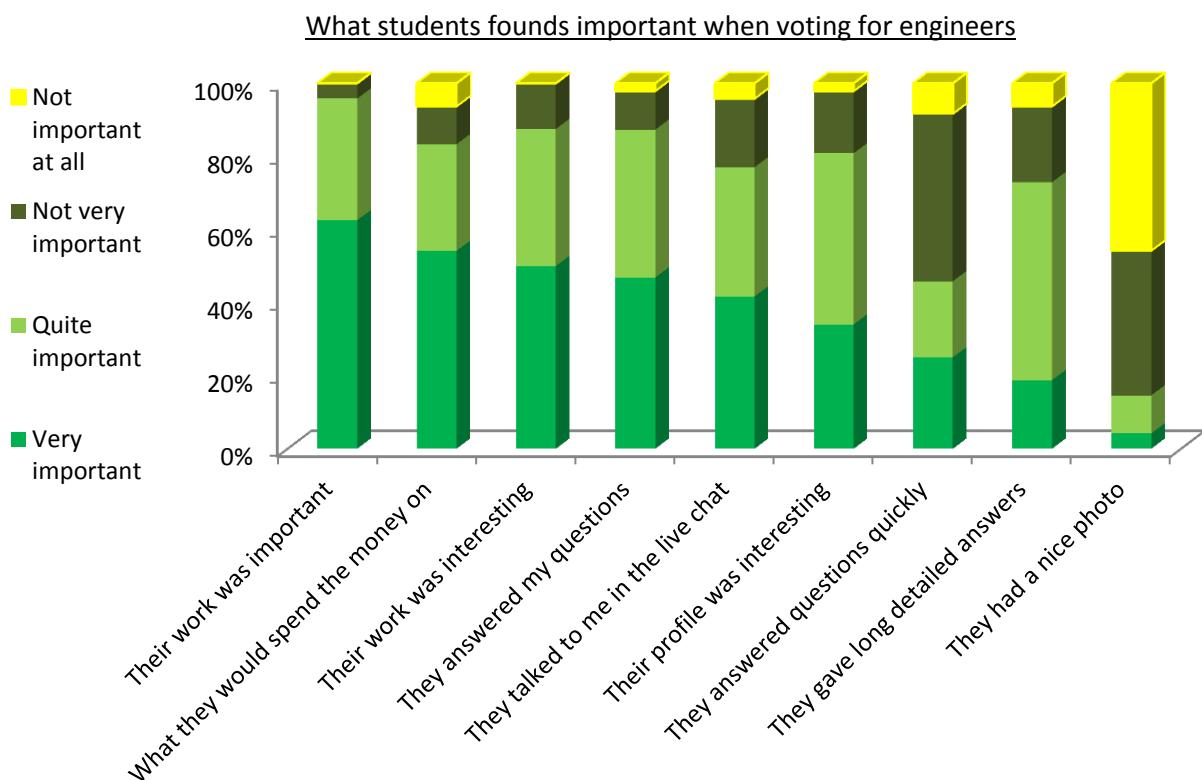
"I really liked how friendly the engineers were! They were so nice on Chat and they answered all of my questions!"

"I liked the fact that all the engineers were willing to get involved. Even on the live chat, they were answering questions that had nothing to do with engineering!!!"

"We got to ask the engineers anything and they had to answer truly"

The students were asked what they thought was important when they voted for the engineer they wanted to win the £500. The results below show that students considered that the engineers' work needed to be important and interesting, and felt that approving of what they would spend the winning money on was much more important than having a nice photo. These results demonstrate that students were engaging with what the engineers were doing rather than using superficial judgements to decide who won.

The students were also more influenced by having their question answered per se, and being talked to in a live chat, than by how quickly the engineers' answered their question. Giving long detailed answers wasn't deemed 'very important' by many students, but the majority (54%) considered it as 'quite important', so it was certainly a contributing factor.



Evaluation question: Has the event changed students' perceptions of engineering?

Teachers, engineers and students thought that *I'm an Engineer* changed the students' perceptions of engineers and engineering. This ranged from students realising engineering isn't just about "repairing cars" and seeing how it relates to their studies, to considering engineering as a future career.

"i loved this event as now im more aware of what engineers doi now want to be an engineer when i grow upi also enjoyed asking questions as the answers made me more aware of engineering...the moderator did a brilliant jobi loved this and would like to do this again"

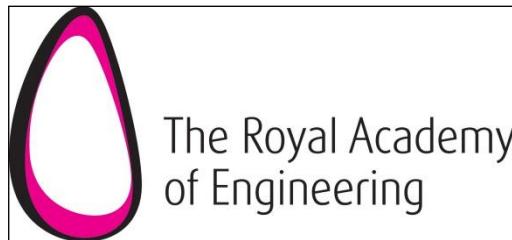
"I loved being able to ask questions and thoroughly enjoyed taking part in 'I'm a engineer'. I would have loved to ask questions to engineers in other zones though as I read a few profiles and some of them had very interesting jobs that I would have loved to have learnt more about"

"I found this extremely interesting, and i hope it has inspired some young people to become engineers, because it has certainly made me think about maybe becoming one"

Student

Appendix 1: Evaluation Planning Template

The Royal Academy of Engineering hold a very useful evaluation surgery day for all grant recipients. As part of this all projects complete an Evaluation Planning Template, identifying key objectives and outcomes, evaluation questions and the methodology to use. Here's ours.



Ingenious evaluation surgery

Evaluation planning template

Principal Applicant: Shane McCrackenError! Not a valid bookmark self-reference.

Organisation: Gallomanor Shane McCrackenError! Not a valid bookmark self-reference.

Project Title: Error! Not a valid bookmark self-reference. I'm an Engineer, Get me out of here!

Grant Ref: MCC01Ing11 Shane McCrackenError! Not a valid bookmark self-reference.

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Ingenious objectives & key outcomes

As well as setting objectives, the Academy requires each *Ingenious* grant holder to identify **key outcomes** related to the delivery and impact of projects. Consideration of the **key outcomes** are especially important for the engineers that will be involved in activities, but we also ask about the anticipated outcomes for publics and specialist audience groups. Think of the key outcomes as a subset of your project objectives.

Key outcomes are split into three types: **metrics**, **experiences** and **impacts**.

- All projects should report **metrics** in terms of the activities, events and/or resources to be delivered and the target number of participating engineers and public audiences.
- For the **experience** outcomes choose at least one item from the list that reflects the experience/s you aim the participating engineers and public audiences to have.
- For **impacts**, please choose at least one key outcome for each of the audiences (eg engineers, publics) that your project targets.

You will be asked to feedback results and comment on success by completing a Final Report Form. There will be space in this report to feedback on outcomes and impacts not included in the list overleaf.

Project objectives

The objectives as set out in your project proposal	<ul style="list-style-type: none"> • To produce a high quality online event including teacher packs; • To run 5 zones. Each zone consists of 5 engineers and 20 classes. 5 classes equates to 25 engineers, 100 classes and 2,000 students. We could attempt more zones but at present we have no information regarding just how many teachers or engineers would participate. In our experience 5 zones will be achievable; • To evaluate the project throughout, to measure if your aims and objectives are being met; • To disseminate the findings of the project, promote and seek funding for running beyond 2012.
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Key outcomes

Metrics	
Number of activities, events and/or resources you aim to deliver	<p>5 zones 25 Engineers 100 classes 2,000 students Teacher pack resources</p>

For engineers	
Metrics	
Target number of participating engineers	25
Engineers to have the following experiences:	
Enjoyable	<input checked="" type="checkbox"/>
Interesting	<input checked="" type="checkbox"/>

Informative	<input checked="" type="checkbox"/>
Interactive	<input checked="" type="checkbox"/>
Well-organised	<input checked="" type="checkbox"/>

Expected impacts on the engineers:

Awareness	Learn that young people are interested in their work, that they want to engage with engineers, and that online methods are available that are useful and efficient.
Attitudes	Public Engagement is enjoyable, worthwhile and useful to them as engineers. To feel that online engagement is as useful and enjoyable as offline methods.
Skills	Improved communication skills particularly but not solely in terms of online and young people

For public and specialist audiences

Metrics

	Publics	Specialist Group/s
Audience type	Students	Teachers
Target number	2000	75

Audiences to have the following experiences:

	Publics	Specialist Group/s
Enjoyable	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Interesting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Informative	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Interactive	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Well-organised	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Expected impacts on the audiences:

	Publics	Specialist group/s
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Awareness	<p>Learn about the wide range of opportunities in engineering. That engineering is a suitable career for them.</p> <p>Learn about the social impact of engineering.</p>	Alternative ways of involving engineers in school. Learn that students can be trusted to debate and question responsibly.
Attitudes	Engineers are human	Introduce engineering into lessons

***Ingenious* evaluation questions**

Evaluation questions are the broad questions that you'd like your evaluation to answer. Think of four or five near the start of your project to help focus your work. Page 8 of the *Ingenious* evaluation guide gives more details about this.

Evaluation questions

The questions you want your evaluation to address

1. Do the engineers view their participation as a positive experience?
2. Have they / do they think they have improved their communication skills?
3. Has the event changed students' perceptions of engineering?

Ingenious evaluation methodology

Think about the approach and methods that you will use to answer your evaluation questions. Refer to the evaluation guide for ideas and tips, and feel free to use the resources in the online evaluation toolkit.

Evaluation methodology

The approach and tools you will use to answer your evaluation questions

Pre / post event online surveys – engineers / teachers / students

Sampled telephone interviews – engineers / teachers

5 engineers / 5 teachers

Personal Meaning Mapping

Students and engineers to complete as part of event

Flesch-Kincaid – reading age analysis

By analysing the engineers' answers over the two weeks of the event we will measure how their language changes. Winners can be compared with less successful participants.

Class observation

We will visit schools to see in person how the students interact with the event

Web stats analysis

Basic statistics on site usage for benchmarking against sister events, against future events and to compare zones.

Attendance Analysis

Analysing which schools and teachers turn up

School analysis

Analysing school academic record and geographical location to ensure that we are reaching under-performing schools.

Engineer analysis

Checking that we have a broad range of engineers in terms of age, discipline, career stage, place of employment and ethnicity.

Ingenious sampling / analysis / reporting

Think about the final steps in your evaluation process and use the space below to make any notes.

Sampling / analysis / reporting

Who will be included in your evaluation sample and when will you collect feedback from them?

Is there any special way in which you plan to analyse your data?

Who are the audiences for your evaluation report?

Sampling

Online – everyone is asked to complete the relevant post-event survey straight after the event (engineers / teachers / students). Completion is incentivised with I'm an Engineer mugs.

Telephone – 5 engineers / 5 teachers

- Post event
- Random sample, aiming for 1 per zone

Class visits – 2 during event, chosen due to proximity to project team.

Data analysis

See previous Evaluation methodology section

Reporting

The report will be disseminated to the RAEng. It will be available for the participating engineers and members of the SciComm sector.

Appendix 2: Teacher pre event survey

Teacher Survey: Pre event

We'd really appreciate you answering the following questions. They will help us measure what teachers gain from the event and help us improve I'm an Engineer in the future.

Don't feel you have to write loads! Brief answers are fine.

1) How did you hear about I'm an Engineer? (tick all that apply)

- From another teacher
- From my local area science co-ordinator
- Found the site in an internet search
- Twitter
- Email from I'm a Scientist
- Email, newsletter or online article from an engineering organisation
- Paper publication from an engineering organisation
- Heard via the Royal Academy of Engineering
- Heard via the Design and Technology Association
- Heard via the National Centre for the Excellence in Teaching of Mathematics
- Other (please explain)

2) What appeals to you most about I'm an Engineer?

3) Please rank the following outcomes in terms of importance for you as a teacher (the most important at the top to least important at the bottom).

- _____ Students are more informed about the range of STEM careers
- _____ Students are more aware of how their studies relate to the real world
- _____ I am more confident in using online tools in lessons
- _____ Students have a more positive view of STEM subjects
- _____ I am more aware of cutting edge STEM research
- _____ I am more aware of the insights my students have into STEM subjects
- _____ I will gain ideas for teaching in the future

4) Please briefly explain your reasons for your rankings in Question 3.

5) Is there anything else not mentioned in Question 3 that you're expecting as an important outcome?

6) How are you planning to run I'm an Engineer? (Tick all that apply)

- In lessons as part of the scheme of work
- In lessons as enrichment
- Outside lessons as part of a themed day/week
- Outside lessons in a STEM club
- Other - tell us how

7) What students are you planning to run the event with? (Tick all that apply)

	Maths	D&T	Science	Engineering	STEM club	Other
Year 7	<input type="checkbox"/>					
Year 8	<input type="checkbox"/>					
Year 9	<input type="checkbox"/>					
Year 10	<input type="checkbox"/>					
Year 11	<input type="checkbox"/>					
Year 12	<input type="checkbox"/>					
Year 13	<input type="checkbox"/>					
STEM Club	<input type="checkbox"/>					
Other	<input type="checkbox"/>					

8) How many lessons with each class do you plan to spend on this project?

- () 1
- () 2
- () 3
- () 4
- () 5 and over

9) Have you taken part in any of the following STEM enrichment projects?

- CREST Awards
- Visit from a STEM Ambassador
- Researchers in Residence
- I'm a Scientist, Get me out of here! previously
- Visit to a local science centre/museum

Visit to a science festival

Other - tell us what

10) Have the class(es) you're running I'm an Engineer with taken part in any of the following STEM enrichment projects in the last 2 years?

CREST Awards

Visit from a STEM Ambassador

Researchers in Residence

I'm a Scientist, Get me out of here! previously

Visit to a local science centre/museum

Visit to a science festival

Other - tell us what

11) Are you planning on also running other major STEM enrichment activities over the next few months? If yes, tell us what

No

Yes - tell us what: _____

12) Are there any other comments you'd like to add?

Appendix 3: Engineer pre event survey

Engineer survey: pre event

We'd really appreciate you answering the following questions. They will help us measure what engineers gain from the event and help us improve I'm an Engineer in the future.

Don't feel you have to write lots! Brief answers are fine.

1) How did you hear about I'm an Engineer?

- From a friend or colleague
- Through the company I work for
- From a university/research institute
- From an engineering Institution
- From a STEM outreach organisation
- Twitter
- Found the site in an internet search
- From the Royal Academy of Engineering
- From the STFC
- Other (please explain)

2) What appeals to you most about I'm an Engineer?

3) Please rank the following outcomes in terms of importance for you (the most important at the top to least important at the bottom).

- _____ Becoming more confident in communicating my work
- _____ Having a better understanding of how students view engineering
- _____ Becoming re-energised about my work
- _____ Developing links with other engineers
- _____ Becoming more confident in using online tools
- _____ Being more aware of what other engineers do
- _____ Students becoming more aware of careers in engineering
- _____ Winning £500 for a STEM engagement project
- _____ Students becoming more engaged with engineering

4) How confident do you feel about communicating with young people?

- () Very
- () Reasonably
- () A bit

() Not at all

5) How confident do you feel about discussing social, ethical and environmental implications of your work with members of the public/people outside your field?

- () Very
- () Reasonably
- () A bit
- () Not at all
- () Don't know

6) Have you previously taken part in any STEM engagement projects? (Tick all that apply)

- [] STEM Ambassadors
- [] Researchers in Residence
- [] Visit to a local school
- [] Science festival
- [] University/institute organised events
- [] Other - tell us what

7) If you have previously taken part in the STEM Ambassadors scheme, to what extent do you agree with the following statements?

	Strongly agree	Agree	Disagree	Strongly disagree
It didn't take too much of my time to prepare for	()	()	()	()
I was able to engage and communicate with the audience effectively	()	()	()	()
I improved my communication skills	()	()	()	()
The audience seemed to enjoy the experience	()	()	()	()
Overall I was satisfied with the experience	()	()	()	()

8) Are there any other comments you would like to add?

Appendix 4: Teacher post event survey

Teacher Feedback: post event

We'd really appreciate you answering the following questions. They will help us measure what you and your students gain from the event and help us improve I'm an Engineer in the future. Don't feel you have to write lots! Brief answers are fine.

1) To what extent do you agree with the following outcomes from taking part?

	Strongly agree	Agree	Disagree	Strongly disagree	Don't know
My students enjoyed the event	()	()	()	()	()
Students are more informed about the range of STEM careers	()	()	()	()	()
Students are more aware of how their studies relate to the real world	()	()	()	()	()
I am more confident in using online tools in lessons	()	()	()	()	()
Students have a more positive view of STEM subjects	()	()	()	()	()
I am more aware of cutting edge STEM research	()	()	()	()	()
I am more aware of the insights my students have into	()	()	()	()	()

STEM subjects					
I've gained ideas for teaching in the future	()	()	()	()	()
I found the event easy to implement	()	()	()	()	()
Overall I was satisfied with the event	()	()	()	()	()

2) What was the single most important outcome for you as a teacher?

3) Would you participate again?

- () Yes
- () No

4) Would you recommend taking part to a colleague?

- () Yes
- () No

5) How did you run I'm an Engineer?

- [] In lessons as part of the scheme of work
- [] In lessons as enrichment
- [] Outside lessons as part of a themed day/week
- [] Outside lessons in a STEM club
- [] Other - tell us how

6) How many lessons did you spend on I'm an Engineer?

- () 1
- () 2
- () 3
- () 4
- () 5+

7) From a technical viewpoint, how did you find using the site?

- () Difficult throughout
() Quite difficult to start but easy once I was used to it
() Quite simple and straightforward
() Very easy
() I didn't use the site

8) As a teacher, what would you do differently next time (if anything)?

**9) We had a zone sponsor in addition to our main funder, the Royal Academy of Engineering.
Can you name them?**

10) How useful did you and your students find the following parts of the site?

	Very useful	Quite useful	Not that useful	Not at all useful	We didn't use it
ASK - students asking questions	()	()	()	()	()
CHAT - live chat	()	()	()	()	()
VOTE - students voting	()	()	()	()	()
Live chat booking form	()	()	()	()	()
Staffroom	()	()	()	()	()
/Teachers (the teachers' area)	()	()	()	()	()
Teacher FAQ	()	()	()	()	()

11) Which parts of the teacher pack did you use, or plan to use in future teaching?

	Used in full	Picked bits out	Did not use	Plan to use later
Lesson 1: You're the Judges!	()	()	()	()
Lesson 2:	()	()	()	()

Meet the Engineers				
Lesson 3: Live chat	()	()	()	()
Lesson 4: Project analysis	()	()	()	()

12) How did you find the teacher briefing notes?

- () Very useful - they told me everything I needed to know
- () Quite useful - they covered most points but had some gaps
- () Not very useful - I had lots of questions after reading them
- () Not at all useful - a waste of paper
- () I didn't read the briefing notes
- () I didn't receive any briefing notes

13) If you used the CHAT 'live chat' facility, how do you feel it can be improved?

14) If you didn't book a live chat, can you tell us why?

15) What do you think about the number of emails you received in the run up to and during the event?

- () Just right
- () Not enough - I would have liked more regular emails
- () Too many - the emails were too regular

16) How useful was the content of emails you received?

- () Very useful - contained everything I needed
- () Quite useful - contained some useful information
- () Not particularly useful - didn't contain much useful information
- () Not useful - I didn't use any information in them

17) Can you suggest any information you feel was missing from emails about the event?

18) Is there anything else you would like to add, such as things you particularly liked or disliked about the event, or what you would change about the event?

Appendix 5: Engineer post event survey

Engineer Feedback: post event

**Thanks for agreeing to fill in our feedback survey. Your answers will help us measure what you gain from the event and help us improve I'm an Engineer in the future.
Don't feel you have to write lots! Brief answers are fine.**

1) Overall, did you enjoy taking part in the event?

- Yes, it was fantastic
- Yes, it was OK
- Not really, it was a bit of a chore
- No, it was a waste of time

2) To what extent do you agree with the following outcomes from taking part?

	Strongly agree	Agree	Disagree	Strongly disagree
I am more confident in communicating my work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I have a better understanding of how students view engineering	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am re-energised about my work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I have developed links with other engineers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am more confident in using online tools	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I want to do more public engagement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am more aware of what other engineers do	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3) To what extent do you agree with the following statements about I'm an Engineer?

	Strongly agree	Agree	Disagree	Strongly disagree
It didn't take too much of	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

my time to prepare for				
I was able to engage and communicate with the students effectively	()	()	()	()
It improved my communication skills	()	()	()	()
The students seemed to enjoy the experience	()	()	()	()
Overall I was satisfied with the experience	()	()	()	()

4) How do you think it compared to other forms of STEM engagement or dialogue you may have been involved with?

5) Would you participate again?

- () Yes
 () No

6) Would you recommend it to a colleague?

- () Yes
 () No

7) How useful did you find the following parts of the site for communicating with students??

	Very useful	Quite useful	Not that useful	Not at all useful
CHAT - live chat with students	()	()	()	()
ASK - Q+A with students	()	()	()	()
My engineer profile	()	()	()	()

8) How did you find the engineer briefing notes?

- () Very useful - they told me everything I needed to know
- () Quite useful - they covered most points but had some gaps
- () Not very useful - I had lots of questions after reading them
- () Not at all useful - a waste of paper
- () I didn't read the briefing notes
- () I didn't receive any briefing notes

9) From a technical viewpoint, how did you find using the site?

- () Difficult throughout
- () Quite difficult to start but easy once I was used to it
- () Quite simple and straightforward
- () Very easy
- () I didn't use the site

10) How do you think the CHAT facility could be improved?

11) Approximately how long did you spend per day, on average, participating in the event?

- () Up to 1 hour a day
- () 1-2 hours a day
- () 2-3 hours a day
- () 3-4 hours a day
- () More than 4 hours a day (please specify): _____

12) What do you think about the number of emails you received in the run up to and during the event?

- () Just right
- () Too many - the emails were too regular
- () Not enough - I would have liked more regular emails

13) How useful was the content of emails you received?

- () Very useful - contained everything I needed
- () Quite useful - contained some useful information
- () Not particularly useful - didn't contain much useful information
- () Not useful - I didn't use any information in them

14) Can you suggest any information you feel was missing from emails about the event?

15) If you used twitter during the event, how useful did you find it for the following?

	Very useful	Quite useful	Not very useful	Not at all useful	I didn't use it
Interacting with fellow engineers	()	()	()	()	()
Keeping up to date with how the event's going overall	()	()	()	()	()
Sharing questions with engineers in different zones	()	()	()	()	()
Reporting and hearing about problems	()	()	()	()	()
Letting colleagues and friends know about the event	()	()	()	()	()

16) Is there anything else you would like to add, such as things you particularly liked or disliked about the event, or what you would change about the event?

Appendix 6: Student post event survey

Tell us what you think! Student survey: post event

Thanks for agreeing to fill in our feedback survey. This will help us to understand what young people want from the event and help us improve I'm an Engineer in the future.

To say thank you, everyone who fills it in will get entered into a prize draw for £20 WH Smiths vouchers.

Don't feel you have to write lots! Brief answers are fine.

1) What year are you in at school? (The equivalent Scottish and Northern Irish years are in brackets).

- Year 7 (P7/Year 8)
- Year 8 (S1/Year 9)
- Year 9 (S2/Year 10)
- Year 10 (S3/Year 11)
- Year 11 (S4/Year 12)
- Year 12 (S5/Year 13)
- Year 13 (S6/Year 14)
- Other (tell us which): _____

2) Where did you use the I'm an Engineer website?

- At school
- At home
- Both

3) To what extent do you agree with the following statements about taking part in I'm an Engineer?

	Strongly agree	Agree	Disagree	Strongly disagree	Don't know
It was interesting	<input type="checkbox"/>				
I enjoyed taking part in I'm an Engineer	<input type="checkbox"/>				
I learnt new things about engineering I didn't know	<input type="checkbox"/>				

before					
I now understand what engineers do better	()	()	()	()	()
The website was easy to use	()	()	()	()	()
I'm now more aware of careers in engineering	()	()	()	()	()
I'm now more aware of how what I learn in Maths, D&T and Science is used in engineering	()	()	()	()	()

4) Was the website easy to use?

() Yes

() No

5) What features did you use on the website?

	Used frequently	Used once	Never used	Didn't know it existed
Ask	()	()	()	()
Chat	()	()	()	()
Vote	()	()	()	()
FAQ	()	()	()	()

6) Which activity was your favourite?

() CHAT - live chat with engineers

() ASK - questions and answers

() VOTE

() Engineer profiles

() Other (tell us what): _____

7) How important were the following when you were deciding which engineer to vote for?

	Very important	Quite important	Not very important	Not important at all	I didn't vote
Their work was interesting	()	()	()	()	()
Their work was important	()	()	()	()	()
They answered my questions	()	()	()	()	()
They talked to me in the live chat	()	()	()	()	()
They answered questions quickly	()	()	()	()	()
They gave long detailed answers	()	()	()	()	()
Their profile was interesting	()	()	()	()	()
They had a nice photo	()	()	()	()	()
What they said they would spend the money on	()	()	()	()	()

8) Would you recommend taking part to your friends?

() Yes

() No

9) Is there anything else you wanted to say? What did you particularly like or dislike about the event, or what you would change about the event?

10) To qualify for the free draw to win £20 of WH Smiths vouchers please let us know your email address and which school you're at. Please check your email address carefully as an incorrect address will rule you out of the draw.

Email Address: _____

Appendix 7: Credits

We'd like to thank you to everyone involved in making *I'm an Engineer* a success.

Mike Little – Lead Developer. Mike built the *I'm a Scientist* website, making Wordpress do things it's never done before. His job was to build an equivalent site for *I'm an Engineer*.

@mikelittlezed1 | <http://zed1.com/about/about-mike-little>

Gareth Coxon – Designer. Gareth designed the overall look and feel for the project, including logos and teacher and engineer materials.

@garethdotdesign

Andrew Beeken – Developer. Andrew took our graphic designs and requirements and turned them into CSS stylesheets. He made the site look right.

@abeeken

Hywel Vaughan – Engineer. Hywel deserves the credit for sowing the seed of *I'm an Engineer*. He took part in *I'm a Scientist* and encouraged us to run a version just for engineers, and gave us motivation to apply for funding and to make the idea a reality.

Lesley Paterson – Royal Academy of Engineering. As Head of Communications and Engagement at the academy Lesley advised us through the application process for the Ingenious Award which funded the event.

Manisha Laloo – Royal Academy of Engineering. Manisha runs the Ingenious Awards and was our point of call for many questions throughout the funding process and the event.

Dave Rowley – Bloodhound SSC. Dave is Education Programme Director at Bloodhound and gave us invaluable advice when *I'm an Engineer* was in the planning stages.

Dawn Fitt – Bloodhound SSC. As Education Delivery Director Dawn helped spread the word to teachers.

Gareth James – Institute of Engineering and Technology. As Head of Education at the IET Gareth helped spread the word to teachers.

Colin Matthews – National Centre for Excellence in the Teaching of Mathematics. Colin spread word of *I'm an Engineer* to Maths teachers.

Richard Green – Design and Technology Association. Richard spread word of *I'm an Engineer* to D&T teachers.

Chris Harvey – Teacher. Chris was kind enough to let us visit Melksham Oak School to talk to her and her colleagues about running *I'm an Engineer*. Their advice helped us shape the project.

Ian Francis – Teaching Consultant. Ian Francis reworked lesson plans to appeal to Maths, D&T and Science teachers and students and advised on the educational side of running *I'm an Engineer*.

Declan Fleming – Teaching Consultant. Declan helped us adapt what we know about running *I'm a Scientist* to running *I'm an Engineer*, including advising on teacher resources and giving feedback on the site.

@declanfleming | <http://declanfleming.com/>

Karen Bultitude – Evaluator. Karen has given invaluable advice and direction on evaluating *I'm an Engineer*, and unleashed the team's inner data geekiness.

Shane McCracken – Project Director. Shane articulated the vision for the project and helped all the project members do their jobs.

@shanemcc

Rosie Schultz – Project Wrangler. Rosie's job was to liaise with teachers, engineers and the rest of the project team to make sure *I'm an Engineer* happened!

@rosieschultz