



I'm a Scientist, Get me out of here

March 2012 – March 2015 Report


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Scientists
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Sakshi Sharda


Me and my Work: I work on understanding why we get fat and why some of us suffer from diseases such as diabetes.

Status: I am loving this!!!

[Read more about me](#)

Latest Question:
[will the sun eventually burn out?](#)

Latest Comment:
[When you hear the word 'scientist', what is the first word that comes into your head? \(1 comments\)](#)



Naomi Osborne

WINNER!


Me and my Work: I make agar (kind of like jelly!) that allows the detection of hospital superbugs and bacteria that cause food poisoning

Status: Over the moon to have won - thanks to everyone who voted!

[Read more about me](#)

Latest Question:
[What is your favourite part about your job :\)](#)

Latest Comment:
[How do you think advances in microbiology will be made? \(1 comments\)](#)




Mathew Piasecki

Me and my Work: I study motor unit characteristics and their association with muscle function

[Read more about me](#)

Latest Question:
[Are tattoos bad for you?](#)

Latest Comment:
No comments to display



Ian Stephenson


Me and my Work: I figure out how to do computer graphics for movies.

Status: Happy to make the final 2

[Read more about me](#)

Latest Question:
[what is representation theory and what is it used for?](#)

Latest Comment:
[Are you vegetarian ? \(1 comments\)](#)



Edward Hughes

Me and my Work: I work out what happens when you smash particles together really hard, using some weird and wonderful new maths

Status: So many great questions - amazing fun!

[Read more about me](#)

Latest Question:
[what does the Riemann zeta function shows when its in complex numbers?](#)

Latest Comment:
No comments to display

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Foreword

This report is all about our learnings in these last three years. Evaluation is embedded in our processes. Every activity we run is measured and core metrics are recorded. However during the project we have stopped to look more deeply at various aspects such as widening participation or the technology used in schools. When we do that we have written up our findings so we can take a step back and reflect on our progress and potential future directions. This report is a combination of both approaches and therefore throughout you will see we refer to different time periods and sample sizes. The funding for the activity we have run is also non-uniform. The Wellcome Trust has been by far and away the biggest funder with a society award from March 2012 to June 2014, followed by an extension for November 2014 to June 2015. We've tried to include as much as possible in this report as we continue to innovate and improve the project. The downside is that it creates some inconsistency. That is a cost we incur in sharing as much as we can with the sector.

We've divided our learning in 8 different points – plus summary, introduction and recommendations.

We hope you enjoy reading this report as much as we did the three years that lead us to it.

A handwritten signature in black ink, appearing to read 'Shane', followed by a long, horizontal, slightly wavy line that extends to the right.

Shane McCracken

Director

May 2015

Introduction

I'm a Scientist is an online public engagement event that gets scientists talking to school students all over the country.

Scientists create a profile on the website and engage directly with students in live text-based chats. The students ask questions about whatever they want - the scientists' research, their careers, their wider interests, the universe and beyond! The event helps students to realise that science is something they can relate to and discuss. Students have the power to decide where the £500 prize money goes, giving them ownership over the event.



The site is split into zones – some are themed like the Animal Behaviour Zone (featuring experts in this field) and some are general such as the Samarium Zone (featuring a wide mix of scientists). Each zone has five scientists and a target of 330 students.



I'm a Scientist runs three events every year – in March, June and November – which makes a total of ten events between March 2012 until March 2015. The project has had 22 funders (about.imascientist.org.uk/funders/) since early 2012. The Wellcome Trust has been the largest funder without whom the project could not have developed as it has. The STFC and Institute of Physics have been long term funding partners providing stability and opportunities for more non-biomedical researchers to get involved. More recently the Royal Society of Chemistry have committed as a major funder of nine zones per year. This diversity allows us to bring a wider range of subjects to a wider range of teachers.

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Executive Summary

- 1. *I'm a Scientist* has gone from 30 zones per year in 2012, to 54 zones scheduled in the 2014/2015 school year.** Between March 2012 and March 2015, over 600 scientists engaged with over 39,000 students from all around the UK at imascientist.org.uk
- 2. Expanding zones to different audiences.** We have shown that the format is also effective for primary school students, for whom we ran specific zones for the first time in March 2014. Zones also open to the general public show promise, although are dependent on much wider and dedicated promotion.
- 3. *I'm a Scientist* is a public engagement boost for scientists.** 90% of scientists want to do more public engagement after taking part, and a large number of these go on to do so. In particular, those who did very little public engagement before *I'm a Scientist* increase their number of engagement activities from an average of 1.6 outreach activities per year before, to 3.7 activities per year after the event.
- 4. *I'm a Scientist* gets students enthused about science.** Taking part has a positive impact on students' attitudes to science. There is even a correlation between students' activity on the site and their positive change in attitude: the more activity on the site, the more positive the change in attitude observed.
- 5. *I'm a Scientist* reaches a diverse set of students.** The schools are geographically widespread. Within schools it gives an equal voice to all students, benefiting those who lack the confidence to speak up in class.
- 6. Teachers come back, but tricky to track:** the events work best for all concerned if the number of places offered is less than the number of teachers interested. From our end it increases efficiencies and reduces dropout rates, and for the teachers it enhances their perceived value for the activity.
- 7. Students ASK about cancer, animals, and life and CHAT about science, scientists and work,** yet in chats scientists are frequently asked about their favourite things and conversation is dominated by questions about scientists as people. Closer inspection shows that topical subjects do appear. In March 2015 the eclipse and ebola were on the list of frequently mentioned science terms.
- 8. Mobile devices are increasingly popular for accessing the site.** Moving forwards, further adaptation to new technologies (such as tablets and smartphones) is important.

Meeting our objectives.

We were awarded a **Society Award** to run *I'm a Scientist* from March 2012 until June 2014. We later received a grant extension for November 2014 to June 2015. **The objectives and data in the table below are for the period from March 2012 to June 2014.**

Our main aim was to create more two-way dialogue between scientists and school students, in which we have been very successful. We also set a number of specific objectives to be achieved during that period, let's review them closely.

Society Award Objectives	Result
Run 60 Wellcome Trust funded zones.	60 Wellcome Trust funded zones run
Run 120 zones in total.	105 zones run.
Expand the project to 50 zones per year by 2014.	<p>We ran:</p> <ul style="list-style-type: none"> • 36 <i>I'm a Scientist</i> zones (plus 6 <i>I'm an Engineer</i> zones) in 2012 • 38 <i>I'm a Scientist</i> zones (plus 2 <i>I'm an Engineer</i> zones) in 2013 • 31 <i>I'm a Scientist</i> zones (plus 5 <i>I'm an Engineer</i> zones) until June 2014 — another 10 zones were run in November 2014, adding up to 41 zones in 2014 <p>Limiting factors:</p> <ul style="list-style-type: none"> • Other funders were slower to come online than expected • Lack of buy in from industry, and not being able to charge fee-paying schools or universities to take part. • Lower than expected applications from teachers until the 3rd year of the grant. (possibly as we diversified with sister events like <i>I'm an Engineer</i>, teachers might have joined these new events instead <i>I'm a Scientist</i>.)
To engage 40,000 students over the 3 years	<p>We've engaged 31,127 students March 2012- June 2014. This represents an overall average of 296 students per zone against a target of 333. There are two main factors:</p> <ol style="list-style-type: none"> 1. The teacher dropout rate was higher than expected. Particularly June 2012. We were also growing the event and giving teachers as many classes as they requested. In recent years we have increased the number of teacher packs from 22 to 25 packs per zone and limited the number of classes that teachers were allocated to deal with the excess of applications. As a result we saw the average number of students in March 2015 rise to 383 per zone. 2. Starting <i>I'm an Engineer</i> will have slightly depressed numbers. That event targeted Maths, D&T and Science teachers. Inevitably some science teachers who otherwise might have taken part in <i>I'm a Scientist</i> choose <i>I'm an Engineer</i>.
At least 75% of students are active in the event ¹	83% of students were active in the events.
50% of students express a desire to study science at higher level	79% of students who filled in the post-event survey are planning to choose a science subject at the next stage of their education, compared to 52% before <i>I'm a Scientist</i>.
75% of students have a more positive view of science after the event.	<p>46% of students reported an improvement in their attitude to science after taking part in <i>I'm a Scientist</i>.</p> <p>The majority (62%) of students started the event with a positive attitude to science. 90% reported a positive attitude after taking part in <i>I'm a Scientist</i>.</p> <p>It is unrealistic to expect to measure that 75% of students saw an improvement in attitude considering the starting point of the majority is already positive. Read more on how <i>I'm a Scientist</i> improves students attitudes to science in point 5.</p>
To get 1,000 teachers from 500 schools using the event	<p>Around 700 teachers from 400 schools took part 2012-2014.</p> <p>See school distribution in point 1.2.</p>

¹ Active students are those who ask a question, take part in a live chat, or vote.

To have 600 scientists taking part in the event in the three years.	522 scientists took part March 2012 - June 2014. See scientists distribution in point 1.1.
50% of scientists being enthused to do more public engagement.	An average of 61% of the scientists who take part in the events, answer our post event survey. Of these, 90% said they now want to do more public engagement . This enthusiasm translates into scientists actually doing more public engagement after taking part (see point 3.1).
To continue to receive at least 75% positive feedback from scientists, teachers and stakeholders	97% of teachers say they are overall satisfied with the event. 99% of scientists said they enjoyed the event. Read how <i>I'm a Scientist</i> encourages scientists to do more public engagement in point 3.
Involving other funding partners to raise £140,000 additional funding	We've secured £143,200 of funding for <i>I'm a Scientist</i> zones, from partners including the Institute of Physics, Royal Society of Chemistry, The Genome Analysis Centre, and the Science and Technology Facilities Council.
Develop revenue generation	Despite extensive efforts, we have not succeeded in developing revenue from corporate sponsors or international or fee-paying schools. We are just now, after three years, in the position to start charging schools as we're oversubscribed with schools wanting to take part and we can be more selective when assigning places to teachers.

1) *I'm a Scientist* has gone from 30 zones per year in 2012, to 54 zones scheduled in the 2014/2015 school year

- Between March 2012 and March 2015, we have run 131 zones, with 642 scientists and 39,506 students.
- Most of the zones we run are still biomed themed, but we are gradually including other science topics, like chemistry or physics.
- The competitive element of *I'm a Scientist* begins before the event starts. Part of the selection process involves students and teachers rating the scientists based on a one sentence description of their work.
- We ensure that the scientists taking part are from different academic levels and they are spread throughout the UK, 50:50 female:male, and 10% BME background (black, minority, or ethnic).
- Building a closer relationship with centres for Doctoral Training will be key to ensuring a steady and sustainable flow of scientists applying, and approach private companies and government research agencies and centres to get non-academic scientists involved.
- The schools that take part are also spread nation-wide.

I'm a Scientist runs three times a year: in March, June and November. Since March 2012 we've run 10 events, counting the last one in March 2015. We've also run additional one-off events like the GM Food Zone, *I'm a Scientist Live*, or the RI CHRISTMAS LECTURES Zone (point 2). Here we aim to offer an overview of the last three years, but we've also published evaluation reports for each of the zones run in each event: about.imascientist.org.uk/category/zone-reports/

<i>I'm a Scientist</i> in numbers	March 2012 - March 2015
Number of zones	131
Number of scientists	642
Number of students	39,506
% of active students ¹	84%
Average number of students per zone	301
Number of questions ²	34,502
Number of votes	31,040
Number of live chat sessions	1,766

Table 1. Overview key figures for *I'm a Scientist* events from March 2012 to March 2015

We ran 36 zones in 2012, 36 in 2013 and 45 in 2014 and 14 in 2015 so far. This adds up to **131 zones between March 2012 and March 2015** in which a total of **642 scientists have taken part**.

We are gradually including more science topics in our events. Most of the zones we run are still biomed themed, but we have increased the funding we received from organisations like the STFC or the Royal Society of Chemistry, which has allowed us to increase the variety of science themes available in our events (figure 1).

¹ % of students who asked, chatted, commented or voted

² Number of approved questions — Moderators take out duplicate questions, questions which the scientists have already answered on their profile pages, and inappropriate questions.

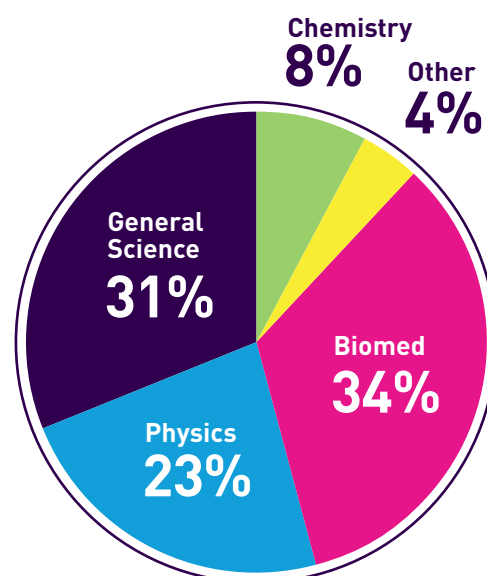


Figure 1. Percentage of zones run according to their theme. General Science zones have a mix of five scientists from different fields. The 4% of zones with "other" themes, are those themed after disciplines that lay between different fields (ie. Big Data: maths, biology, computer science).

In these past three years, **scientists have answered 34,502 questions**, which brings the total number of questions answered on the site to over 53,258 questions. In April 2015 alone this archive drew over 110,000 visitors to our site presumably having typed a science question into a search engine.

1.1. Scientists

We need a steady flow of scientist applying to take part as, unlike teachers, scientists only take part in *I'm a Scientist* once. The project is an excellent training experience for scientists and by giving a preference to first time participants we are building more capacity for public engagement. We need to be oversubscribed with scientists to be able to select those who make an effort in their application form, and are presumably the keenest scientist to take part and engage with the students. Also, as we run more and more themed zones it is important to have a large pool from which to select. We're currently averaging 28 new scientists registrations per month.

Due to the central focus of *I'm a Scientist* on student (and teacher) needs, a major part of our selection process is based on asking students and teachers to rate scientists based on the one-sentence descriptions of their work that they provide as part of the application process.

Our intention is to provide students the opportunity to engage with the widest range of scientists possible. Whilst emphasising the diversity of scientific careers and backgrounds, this also allows students to identify themselves in the scientists and see them as role models. The scientists who have taken part in the events are **spread throughout the UK**. From Aberdeen to Plymouth and from Swansea to Suffolk (figure 2).

A significant proportion of them are PhD students (43.6%), as they are generally closest to the school students in terms of age, language etc., but also we believe they will benefit most from taking part through improving their communication abilities. However **postdoctoral researchers, lecturers and professors have also participated** and benefit from a reinvigorating experience and seeing their research from a different perspective. We also make an effort to get **scientists from outside academia** involved in our events, so that

students see that there are multiple ways to pursue a scientific career (figure 3).

Gender and ethnic balance is of great importance to us, and we work hard to ensure that there are **50% women scientists** (figure 4) and at least **10% scientists from a BME background** taking part in *I'm a Scientist*.

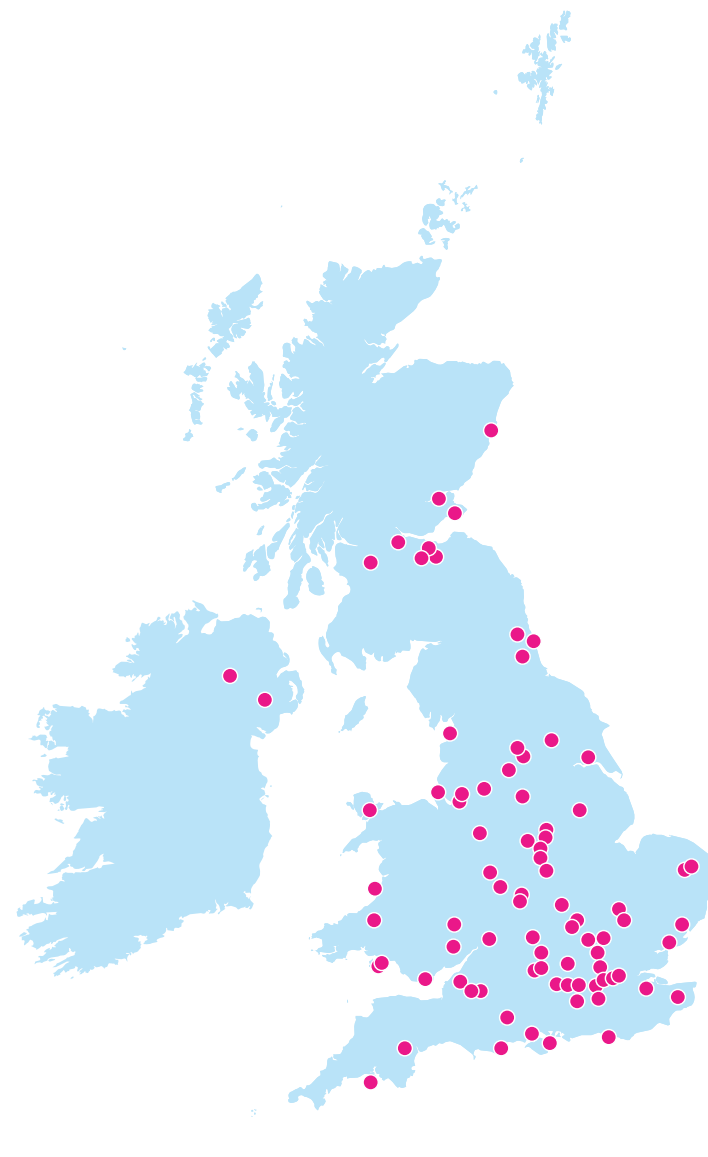


Figure 2. Geographic distribution of scientists who took part in *I'm a Scientist* between March 2012 and March 2015. Scientists working in nearby institutions are depicted as a single dot, the map gives an overall idea of the scientists distribution nationwide. A minority of scientists came from abroad and are not depicted in this picture, but there is an interactive map available at: imascientist.org.uk/scientist-distribution

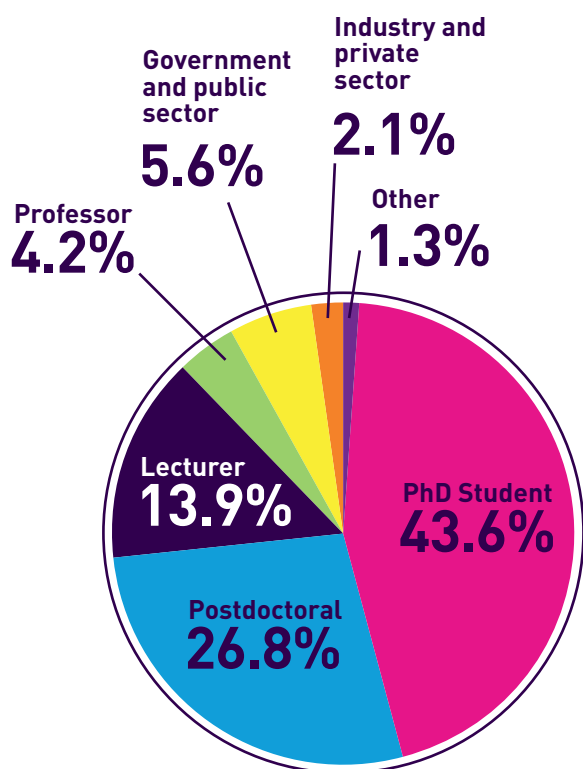


Figure 3. Percentage of scientists by academic stage and job sector. 85% of the scientists who took part in *I'm a Scientist* come from academia, and roughly half of these are PhD students. We continue to work to recruit scientists from the public and private sectors.

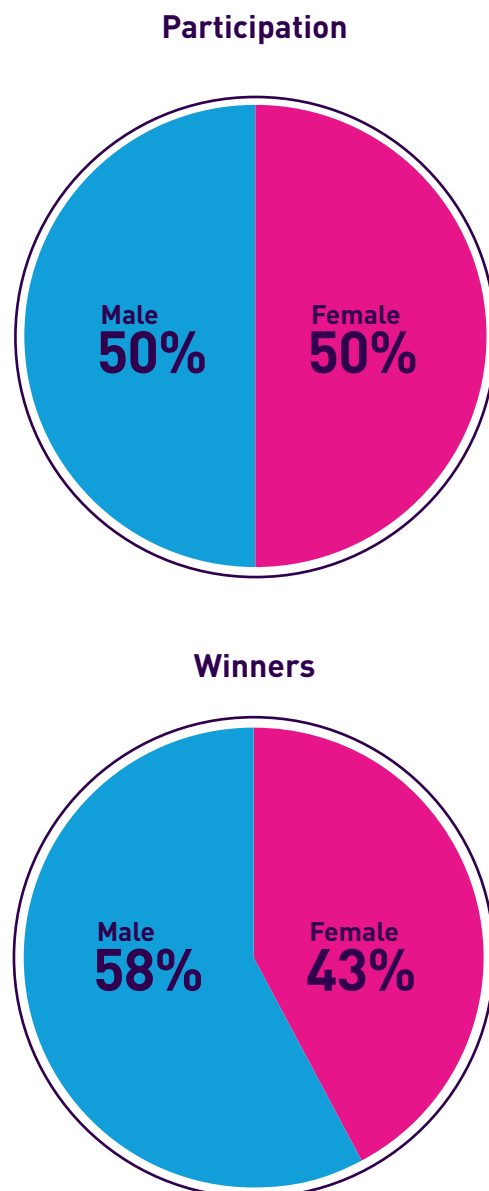


Figure 4. Gender distribution of scientists in the events celebrated between March 2012 and March 2015: for all the scientists who have taken part (top), and for winner scientists (bottom). We deliberately ensure a (roughly) even gender representation for each event and zone.

1.2. Schools

Between March 2012 and March 2015, we engaged with **39,506 students from about 400 schools all around the UK**; from The Shetland Islands to Jersey, and from North Wales to Norwich (figure 5). An average of 84% of the students asked questions, commented on them, or participated in a chat, or voted for their favourite scientist.

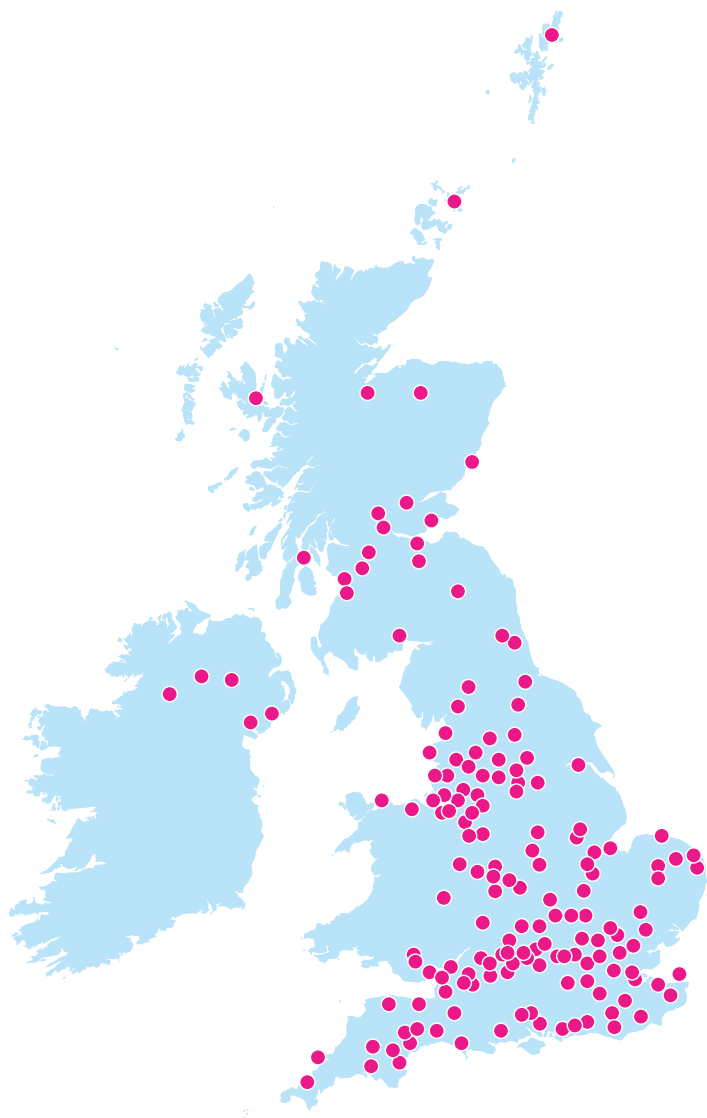


Figure 5. Geographic distribution of the schools who took part in *I'm a Scientist* between March 2012 and March 2015. An interactive version of this map is available at: imascientist.org.uk/school-distribution

Recommendations:

- Include a poll asking unknown users why they've visited imascientist.org.uk, and a feature to rate the answer they've found. .
- Invite scientists to provide contact details on their profile post-event, so that visitors getting an answer to the questions they have googled can get access to the scientist behind it.
- As shown in figure 3, most of the scientists taking part in *I'm a Scientist* come from academia. We need to diversify our recruitment process so we get more scientists from the private and public sector on board. This is important if we want to show students the wide range of science careers available.

2) Expanding zones to different audiences.

- Running primary school only zones for the first time was a success.
- Running zones open to the public was a success overall, but highlights the importance of timing and topicality.

We have expanded our target audience over the last three years; with zones solely for primary school students as well as zones open to anyone with an interest in the topic.

2.1. Primary school students also enjoy taking part in *I'm a Scientist*

We've always had primary schools taking part in *I'm a Scientist* zones, nestled in among secondary schools. Primary schools are also looking for science enrichment activities, and talking with real scientists is as exciting for primary school students as it is for secondary ones.

In March 2014 we ran our two first primary school only zones, for Year 5 & 6 students.

These were developed in part to avoid possible situations of primary students reading questions on non-primary-friendly topics asked by secondary students in their zone. More importantly however, we were led to this step as a result of the [ASPIRES](#) project about young people's science and career aspirations, which concluded that STEM education projects need to begin earlier, at primary school.

The general primary zones are not very different from the general science zone for secondary schools: the only changes are that we avoid any non-primary appropriate topics (like IVF), we mention to the scientists that they are in a primary zone, and we are clearer about how secure the site is and give more advice, such as students not using their first and last names in their username. In March 2015 we ran our first themed zone for primary schools with funding from the Royal Society of Chemistry, and have another planned for June 2015. From our first two primary zones in March 2014 we learnt that **there is a demand for primary zones**. We had too many teachers wanting places and had to turn some

away. Due to this enthusiasm within the primary community we have run primary zones in every event since. These zones, however, represent a low proportion of the event activity. In June 2014 and March 2015 we've only run 5 primary zones, compared to 36 secondary ones (figure 6). We currently have at least 160 primary teachers signed up to our lists, which represents 12% of the total number of teachers who tell us the type of school they are at upon registration. 60 (38%) of these 160 primary school teachers have taken part in our events since 2012.

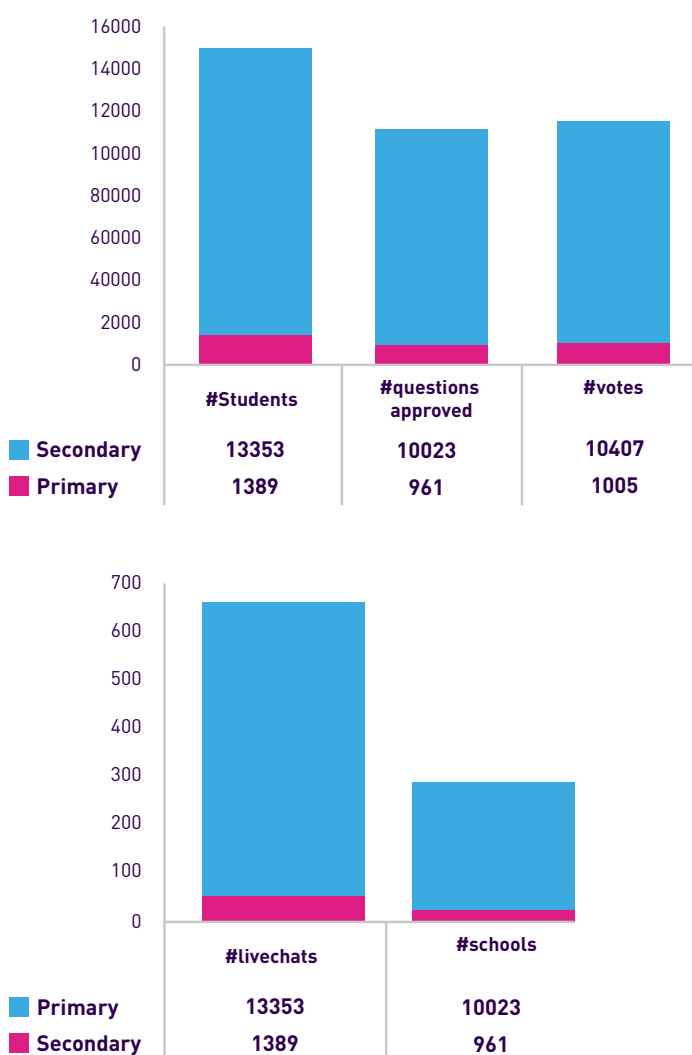


Figure 6. Comparison of the number of students, questions approved, votes, live chats and schools taking part in the 36 secondary (blue) and 5 primary (pink) zones run between March 2014 and March 2015. Only scientists' and students' (not teachers') activity is shown.

Generally speaking, being in a primary zone doesn't affect the scientists' experience of taking part. However some primary school students

are not proficient at typing: they might ask fewer questions, or do the live chat using only one user account (with the teacher asking all the questions), which can make the chat go much slower.

2.2. We want everyone to get involved, not just school students

We've always believed that the *I'm a Scientist* format had potential outside of schools. Our first foray, a zone about genetically modified food, demonstrated that there was potential. We were able to discuss the subject in a civilised and informative way. There was more light than heat. A separate evaluation of that was published here: about.imascientist.org.uk/2012/gm-food-zone-evaluation/

We have also experimented with the format to see if that could help us engage with new and broader audiences.

Success has been mixed.

I'm a Scientist Live

I'm a Scientist Live puts five scientists on stage to compete for audience votes by answering the public's burning science questions. Based on the successful online format, the live format takes advantage of the public's curiosity, allowing them not only to engage with the scientists but to decide for themselves the best science communicator. We've run six live events. For each of them we've found five suitable and passionate scientists to take part, and Helen Arney helped us brief the scientists and warm up the audience. She lead the show, ensuring the audience have both an entertaining and informative experience.



In **March and April 2013** we organised the heats and final of *I'm a NeuroScientist Live* at the Barbican as part of Wonder season: Art and science on the brain. We delivered two weekend heats and a final in Barbican Cinema One with a paying audience. A separate evaluation of that was published here: about.imascientist.org.uk/2013/im-a-neuroscientist-live-project-report

These events were a great success, with **each heat attracting around 150 people and the final selling out of 260 £5 tickets** (approximately 218 of those who bought a ticket showed up on the night). The weekend heats appealed to all, with those from 1 to 80 years taking part, and no gender bias. While there were no young families at the final, due to it being a ticketed evening event with a lower age limit of 12, there was still a broad range of ages in the audience. 35% of the audience who came to the final were scientists themselves, while the rest were members of the public with an interest in science.

We kept the format simple, in the heats handing out coloured voting cards to match each scientist for the audience to use to vote. During the final we took advantage of the availability of electronic voting cards to enable even greater audience participation and to gather some quick audience feedback. **89% of the audience enjoyed the event:** 63% of the audience thought the final was “fabulous” and 26% thought it was “good”. **98% of the audience said they had learnt something:** 32% said “My brain is buzzing”, 40% said “I learnt a lot”, 25% “learnt a bit” and only 2% said they didn’t learn anything. The budget for the project did not include a formal evaluation, but anecdotally the scientists also enjoyed the experience.



Pascal Durrenberger
@1BrainScientist

The final is over, not won, but what an experience and an eye opener and what a fantastic public. Would do this again without hesitation.

Tweet from one of the contestants.



Audience voting at one of the weekend heat events (above), and Helen Arney with the five scientists in the final (below).





I'm a Scientist: Live at Burlington House.

Another *I'm a Scientist Live* happened in November 2013, on **European Antibiotic Awareness Day**. We joined the Royal Society of Chemistry (RSC) at Burlington House in London, Piccadilly for a foray into antimicrobial research. We took five scientists whose research looks at the uses of antibiotics and antimicrobials, put them in a room in-front of around 100 sixth-formers, and had them answer questions on everything from Typhoid Mary, to zombie apocalypses.

Full evaluation available at: about.imascientist.org.uk/2013/ias-live-antibiotic-awareness-day

The room was filled, with around 100 students in their seats, votes being counted using the electronic voting system were all around the 90 mark. The audience was made up predominantly of school students, with about 12% being teachers. **A majority of the audience who provided feedback said they had learnt something** with 49% saying they had “learnt a lot”, and 37% learning “a bit”; only 8 respondents (14%) said they had not learnt anything. We got a whole lot of positive comments from students and teachers:

“Really informative; loved the bit when the scientists talked about their specialties; really interactive — the pads were great; great venue and they liked the refreshments (felt very adult!)” — student

CHRISTMAS LECTURES Zone

We opened the first CHRISTMAS LECTURES Zone to the general public, from December 2013 to January 2014. The CHRISTMAS LECTURES are a series of science talks, which have been held at the Royal Institution since 1825. Currently the CHRISTMAS LECTURES are broadcast on BBC Four. In December 2013, the Royal Institution teamed up with us to extend the discussion around the CHRISTMAS LECTURES, and give everyone the opportunity to ask questions to scientists online. Differing from the standard *I'm a Scientist* events, in the CHRISTMAS LECTURES Zone there was no voting. The CHRISTMAS LECTURES Zone ran from mid December 2013 until the end of January 2014.

Our key findings:

- Almost **600 people participated** in the CHRISTMAS LECTURES Zone, of whom 78% were students who took part through their schools, 8% were teachers, and 14% were other members of the public.
- All of the **teachers** who answered our feedback survey **agreed that we should run the CHRISTMAS LECTURES Zone the following year.**
- **26 scientists** took part in the CHRISTMAS LECTURES Zone. The two scientists who we interviewed after the event said that they now feel **much more confident in science communication** and they would recommend taking part in *I'm a Scientist* to their colleagues.
- There is room for improvement, particularly regarding the **participation of the general public, which we would like to see increase in future events.**

In 2014 the Royal Institution invited us to run another CHRISTMAS LECTURES ZONE this time in *I'm an Engineer, Get me out of here!* alongside the *Sparks will Fly: How to hack your home* theme.

Recommendations:

- We want to keep running primary school zones to diversify our audiences and to enthuse students about science at a younger age.
- Live events work well to reach new audiences, but they are expensive. For some organisations they can be worthwhile additions to an existing programme of events. However we will focus on attracting new sectors of the public to online events.

3) *I'm a Scientist* is a public engagement boost for scientists

- Scientists did on average 39% more outreach activities in the year after taking part in *I'm a Scientist*, than the year before.
- *I'm a Scientist* remains the “best crash course in science communication” (Ben Still, QMUL).
- Of the scientists who've reported how they spent their winning £500, 59% spent it communicating with school students, and 79% in the UK.

3.1. How does *I'm a Scientist* act as a public engagement booster?

I'm a Scientist has an impact on all scientists who take part, not just those who win their zones. Data from surveys emailed to all participating scientists after each event show that **90% of scientists want to do more public engagement after taking part**. On top of this, *I'm a Scientist* seems to be a good public engagement training activity: 86% of scientists agree that they feel more confident doing public engagement after taking part.

Of course actions speak much more loudly than words, so, following this up with a long term survey, sent to all scientists at least one year after they took part, we found out that their good intentions do materialise after the post-event excitement (figure 7).

Responses from 113 scientists show:

- **Scientists who had done very little public engagement (0-3 activities per year) increased their activity dramatically**, from an average of 1.6 activities per year to an average of 3.7 outreach activities per year after the event. An increase of 130% (figure 7).
- For 60% of scientists, *I'm a Scientist* represented their **first online public engagement activity**.
- ***I'm a Scientist* is a good way to start doing public engagement in schools**. We saw a significant increase in school public engagement activities, especially among scientists who were new to this form of outreach.
- Scientists who had already done 4-15 public engagement activities per year did **more specific**

online outreach (blogs, podcasts, websites) after participating in *I'm a Scientist*, at the expense of other activities.

- Unsurprisingly, scientists who were already highly engaged in public engagement did not greatly change their behaviour.

	Year before	Year after
Least experienced	1.6	3.7
2nd	5.4	9.9
3rd	11.1	14.7
4th	18.5	19.7
Most experienced	35.6	33.9

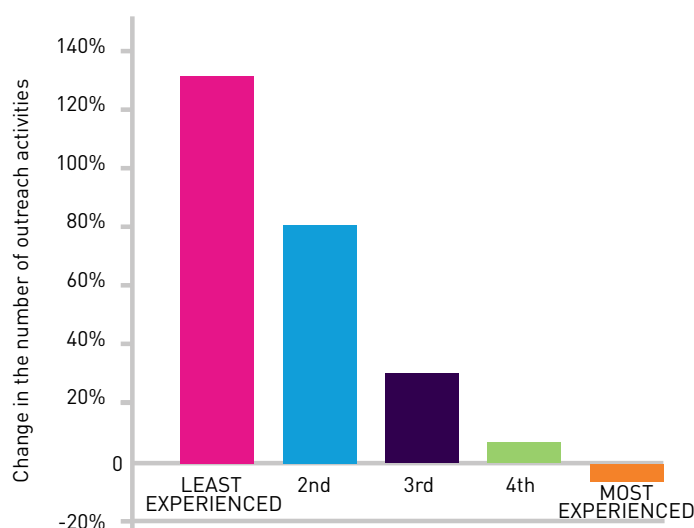


Figure 7. We placed the respondents into quintiles based on public engagement activity prior to taking part in *I'm a Scientist*. The table shows the actual average before and after levels of activity and the graph the percentage change.

Those with minimal prior experience saw the greatest percentage increase, and those in the second quintile with a little experience saw the largest mean increase of 4.5 more activities in the year after *I'm a Scientist*.

3.2. How do winners spend their £500?

I'm a Scientist is the project that keeps on giving; the winning scientist in each zone receives £500 to spend on a science communication project of their choice. We ask winners to write a short report after they've spent their winnings (usually one year after winning) and post these on the site for other scientists to read:

about.imascientist.org.uk/category/prize-winner/.

From March 2012 to March 2014, we distributed £38,500 of prize money to 77 winners.

55 out of the 77 prize winners between March 2012 and March 2014 have spent their money and written a report for the site. We're in contact with the remaining 22, to remind them about spending their winnings and reporting back to us.

Scientists have spent their winnings in very different ways, each project however, engages more students or members of the public with science, and scientists often involve their colleagues too, spreading the reach of the *I'm a Scientist* funding even further. The most common are workshops (figure 8): from measuring the speed of light with chocolate, to buying a quadcopter with a camera to take aerial photos of the land around volcanoes after they erupt to show local residents. If scientists were struggling to find the time to spend the money or develop a project, we suggested they donate to projects such as The African Science Truck Experience. And some scientists spend their prize to buy equipment such as cameras or microphones to record videos or online radio podcasts

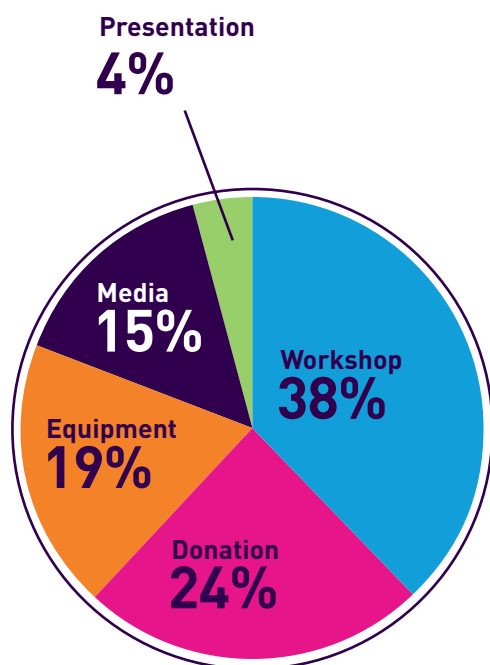


Figure 8. Distribution of prize spendings of the prizes received between March 2012 and March 2014.

In terms of who the scientists engaged with these activities, the **majority (59%) of the scientists spent their prize money communicating with**

school students – either developing new projects or designing resources for science lessons. A third of the scientists (28%) communicated with the broader public; through science fairs, podcasts or videos. 13% of the scientists used their prize money to communicate with both school students and other sectors of the public (figure 9).

85% of scientists spent their money in the UK. When spent abroad, it was usually working with school children in developing countries, or buying school resources for them (figure 10).

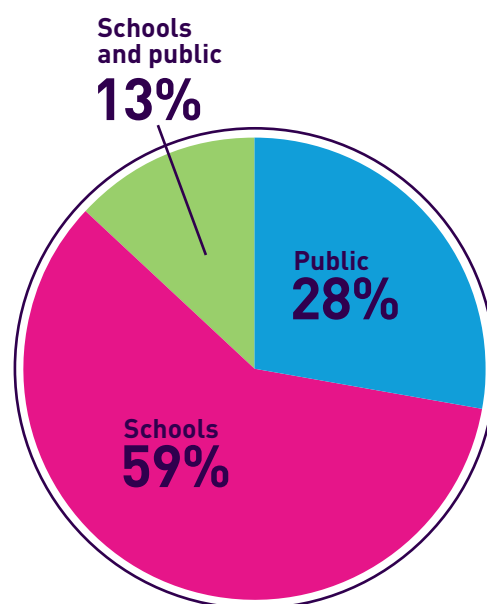


Figure 9. Target audiences for the prize winners' efforts.

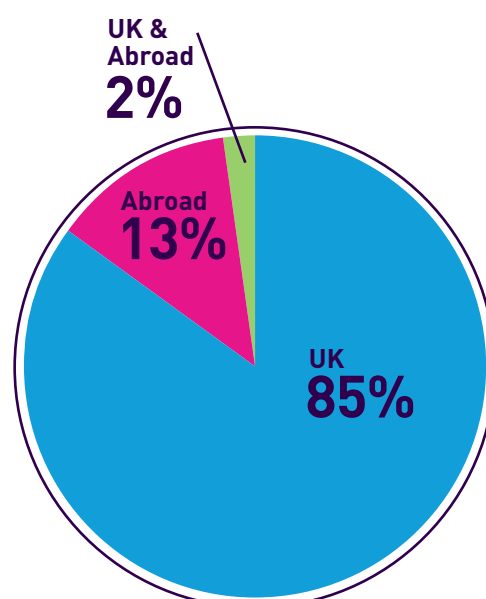


Figure 10. Geographic location of prize winners' efforts

Recommendations:

- We should repeat our long-term alumni surveys regularly to see if the effect is sustained.
- The *I'm a Scientist* alumni network is currently informal and operates on twitter and in university cafes and bars around the country. We should improve on that to give scientists more support in their post *I'm a Scientist* public engagement activities.
- We plan to distribute nearly £200,000 in prize money over the next 5 years of the project. We need to improve the reporting methods for how this is spent by making it more methodical and accountable.

4) *I'm a Scientist* gets students enthused about science

- Students have a more positive attitude to science after taking part in *I'm a Scientist*
- The more a student takes part in *I'm a Scientist*, the more positive their change in attitude towards science.

4.1. Measuring students' changing attitudes

We know that participating in *I'm a Scientist* has an overall positive effect on students' attitudes to science. All teachers who've filled in our post-event surveys said their students enjoyed the event, and **91% said their students were more excited about science after taking part**. To explore this further we asked students themselves, through four attitudinal questions when they registered on the site, and again at the end of the event:

Questions

1. How does school make you feel about science?
2. Are you planning to choose a science subject at the next stage of your education?
3. Do you think jobs involving science are interesting?
4. When you finish your education, how likely are you to look for a job that uses your science knowledge and skills?

Each question has a five point answer scale, to which we assign a numerical value: 2 for the most positive answer, -2 for the most negative. We match each student's answers on registration to their answers after they've taken part. Then subtract the "before event" value from the "after event" value to give us a value for change in attitude for each question for each student (horizontal axis in figure 11). As with all non compulsory surveys, the data collected post event will suffer from some self-selection bias.

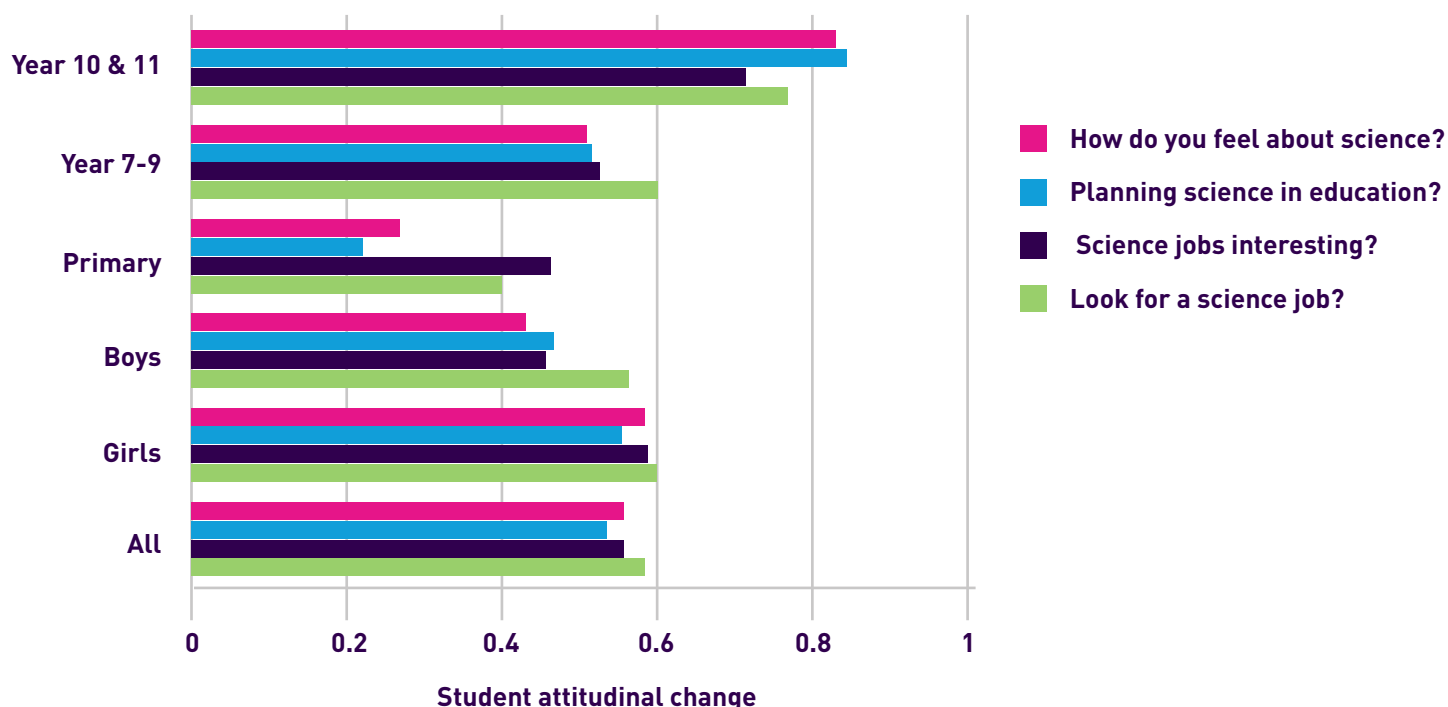


Figure 11. Change of attitude towards science divided by gender and year group. Each question has a five point answer scale, to which we assign a numerical value: 2 for the most positive, -2 for the most negative. We match each student's answers and then subtract the "before event" value from the "after event" value to give us a value for change in attitude for each question for each student (horizontal axis). N= 853. Access the interactive graph at: about.imascientist.org.uk/2014/how-does-im-a-scientist-affect-students-attitudes-to-science/

The data from 853 valid responses from students across three events from June 2013 to March 2014 in the UK confirms anecdotal evidence and teacher feedback that taking part in *I'm a Scientist* increases students' attitudes to science (figure 11).

Not only that but also that **the greatest improvement is seen in Year 10 & 11 students and in female students.**

4.2. Attitude change by activity level

There is also a large quantity of data generated through our site, which we can use to measure the amount and type of activity of a particular student during the event. We looked at the three main types of activity: ASK, CHAT, VOTE and scored each student in rough quartiles between 0 and 3 depending on how active they were. Adding up the individual scores gave each student a total score between 0 and 9 (horizontal axis in figure 12). If we put these data together with the survey results we get a very nice picture: the overall trend is that the more activity on the site the more positive the change in attitude towards science (figure 12).

Change of attitude towards science by level of activity on site

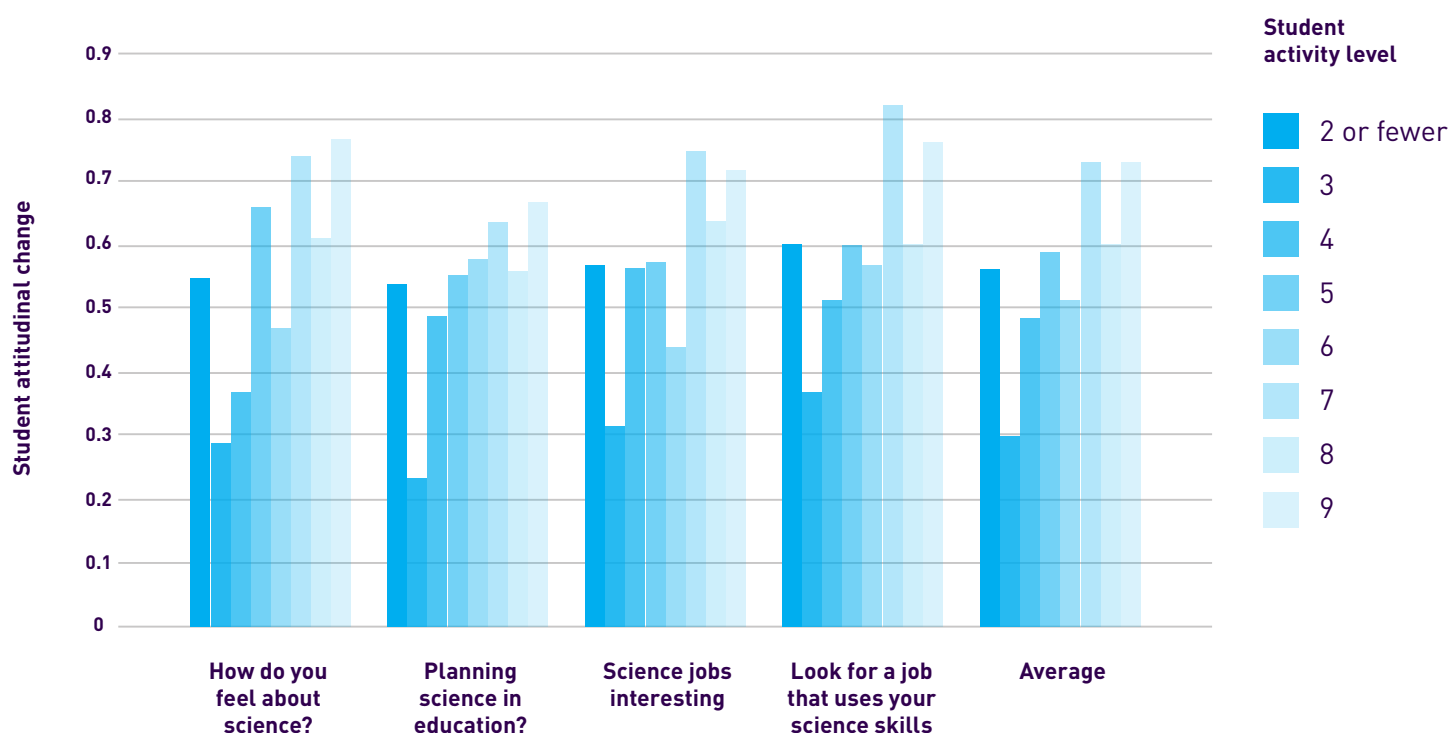


Figure 12. Change of students' attitude by activity level. Each individual column represents a group of students, divided by activity: from 2 or fewer site interactions (dark blue) to 9 site interactions (pale blue). Each group of columns represents the change in attitude to one of the questions asked in the survey: How does school make you feel about science?, Are you planning to choose a science subject at the next stage of your education?, Do you think jobs involving science are interesting?, When you finish your education, how likely are you to look for a job that uses your science knowledge and skills. The last group of columns represents the average change in attitude (average response). The vertical axis represents the change in attitude for each question for each student. You can access the interactive graph at: about.imascientist.org.uk/2014/how-does-im-a-scientist-affect-students-attitudes-to-science

5) *I'm a Scientist* reaches the (diverse) parts other science engagement doesn't.

- *I'm a Scientist* gives an equal voice to all students; the quietest student in class can be heard just as well online as the loudest
- More girls than boys have participated in *I'm a Scientist*, and taking part seems to have a greater positive impact on girls' attitudes to science, than boys.
- Schools signing up for *I'm a Scientist* are slightly skewed to those in less deprived areas, but it's not as skewed as we expected.
- Students from Widening Participation schools are more likely to be excited by science, they're less likely to study it in future or consider it as a future career than non-Widening Participation students.

5.1. *I'm a Scientist* gives an equal voice to all students Teachers have told us that *I'm a Scientist* is particularly good at giving a voice to students who often lack confidence to speak up in class.

*"When a scientist visits the school about a third of the class will put their hands up to ask a question. With *I'm a Scientist* everyone asks a question. And one of the unexpected benefits is that the confident pupils see what the quiet ones ask and go: 'Wow. I never knew she had that in her.' Their perceptions of the their quiet classmates are transformed."*

— Humphrey Jones, Columbia College, Dublin

"Wow, I am really pleased that Lilly won [a £20 voucher for the most engaged student voted by scientists and zone moderators], she is a student in year 9 who needs her confidence boosting in science so it will help!"

— teacher, March 2012

"A student who normally struggles in science and school in general coming to school one day and smilingly handing me a printout of her question and the answer she received, saying, 'this is your copy' while she walked away with her own to put it in her folder."

— teacher, November 2012

5.2. *I'm a Scientist* is popular in schools from deprived areas

Children from wealthy areas with high science capital have a great advantage in being involved in science as a career or as part of culture. It's inherently unfair. Anecdotally we are told schools in wealthy areas tend to do plenty of science engagement. We believe it is very important to see if we are reaching not only these schools, but also schools in more deprived or literally hard to reach areas, who don't normally participate in outreach activities. While we hear anecdotally that schools in the most deprived areas struggle to take part in enrichment and outreach activities, our data suggest that those schools are slightly less likely to sign up but it's not as extreme as we expected. Overall we believe we are well represented across the range of schools in the UK.

Using four measures (Polar, IDACI, GCSE 5+, and FSM) and data from the Department for Education, we plotted the ranking of schools who participate in *I'm a Scientist* and compared the profile against that for all schools (Figure 13).

In the most deprived quintile of areas *I'm a Scientist* follows the national profile, but it is overrepresented in the least deprived areas. To a certain degree, this result was expected; schools in the least deprived areas are more likely to find time to seek out and run STEM engagement and enrichment projects.

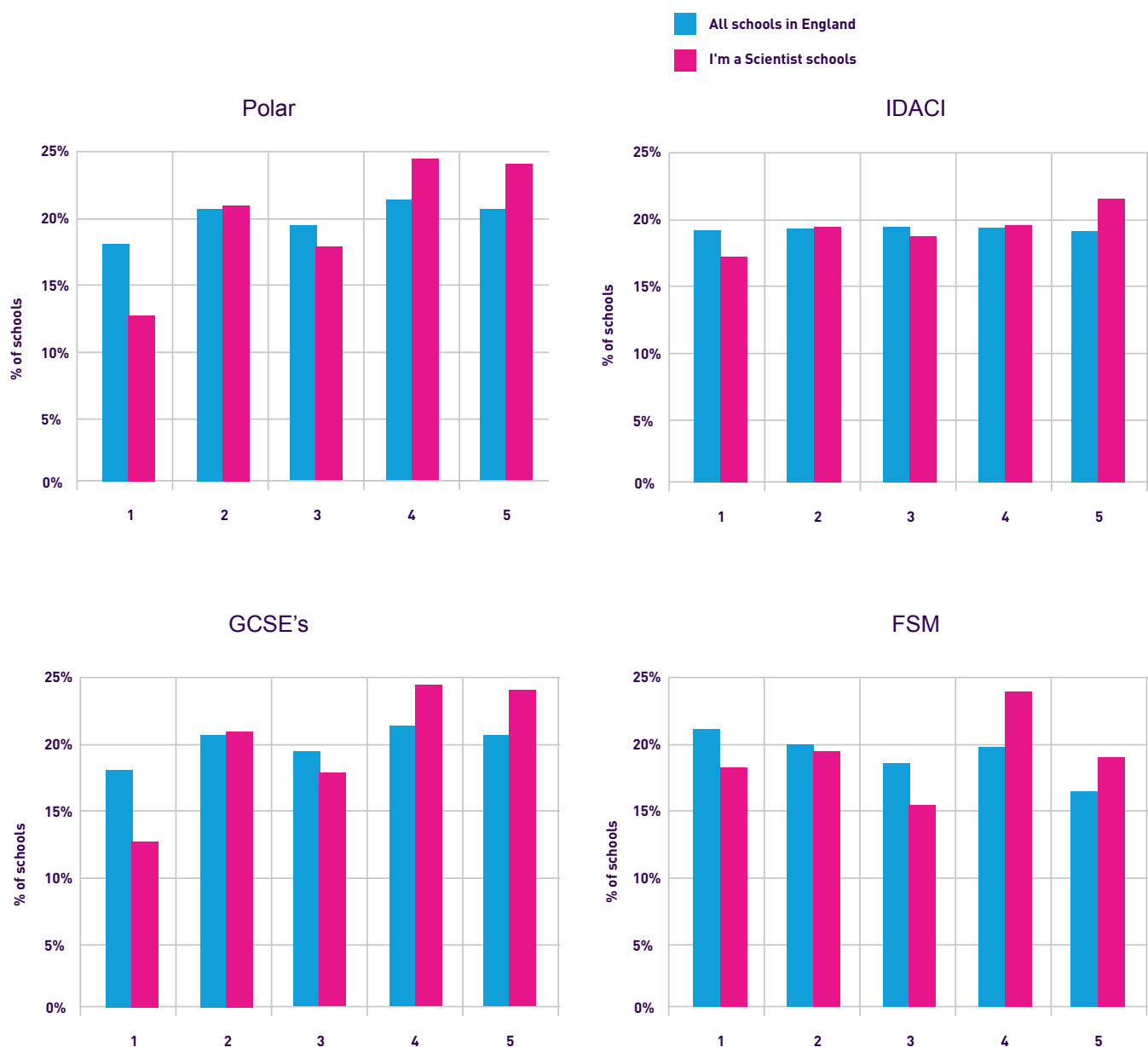


Figure 13. Polar, IDACI, GCSE5+, FSM rankings for schools who participate in *I'm a Scientist* (pink) against all schools in England (blue). The quintiles of deprivation go from lowest socioeconomic background/most deprived (1) to highest socio-economic background/least deprived (5).

³ Read more on the measures of Widening Participation at: about.imascientist.org.uk/measures-wp/

Moreover, when we've targeted Widening Participation schools in the past, and given their teachers extra support during the event, the school dropout rate decreased, and student activity at Widening Participation schools increased. Our data also shows that while students from Widening Participation schools (from the lower quintiles in our study) are more likely to be excited by science, they're less likely to intend to study it in future or consider it as a future career than non-Widening Participation students. This indicates that *I'm a Scientist* is a successful way for schools in more deprived areas to run enrichment activities, and a little extra attention and support can boost their participation.

5.3. Gender

Registration data from over 15,000 students who have taken part June 2012- March 2014 shows that **more girls than boys participated in *I'm a Scientist***. The difference is most obvious in years 9 and 10, in which significantly more girls take part (figure 14).

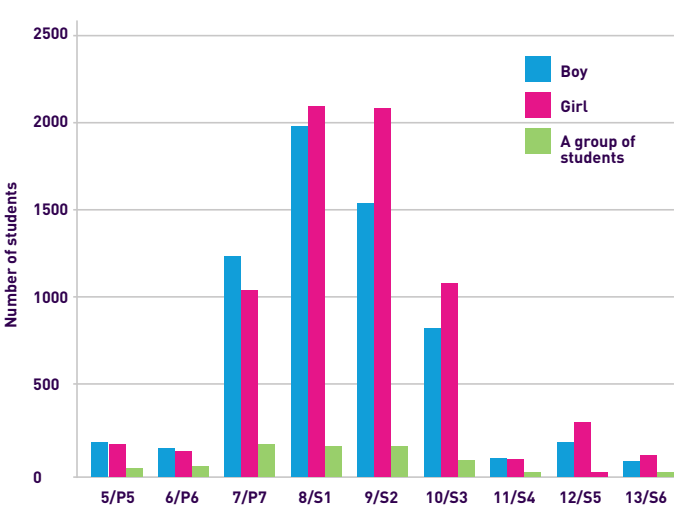


Figure 14. Gender representation of students who have taken part in *I'm a Scientist* according to their year group. Note that in some schools multiple students participate by sharing a single computer; it is not possible to delineate individual genders in these cases so these have been labelled “a group of students” (green).

If we take a closer look at the attitudinal change data (see previous section) according to gender we see that ***I'm a Scientist* has a greater effect on girls than boys** (figure 15):

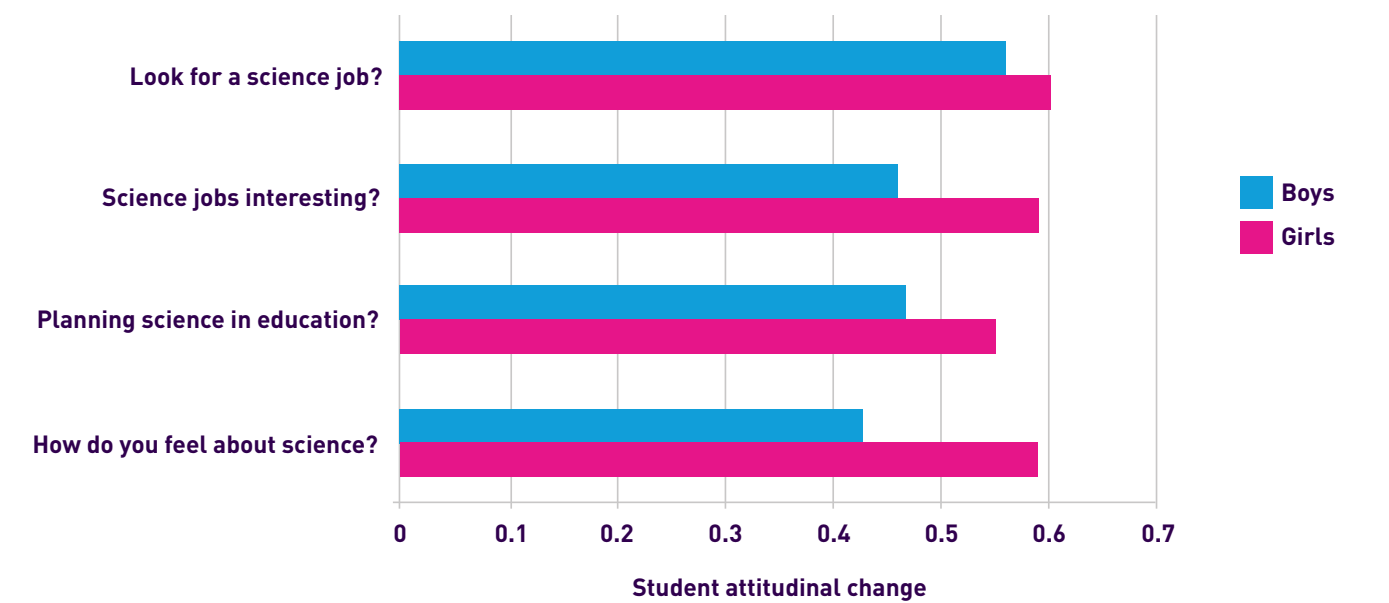


Figure 15. Positive change of attitude towards science by gender: boys (blue), girls (pink).

In March 2015 we worked with the Institute of Physics Improving Gender Balance project to investigate the differences in how girls interacted with the event in single sex environments compared with co-educational schools. That work is still being analysed.

Recommendation: We believe we are reaching schools that are not well served for science engagement but there is no available national data about which schools engage or not. We intend to work with STEMNet and the BSA to build a better understanding of which schools are well served or not.

6) Teachers come back, but tricky to track

- In the early years of the award we grew the event in line with the number of teachers applying to take part. The results was that we gave them all the classes they requested. With some drop out it meant some zones were not as busy as expected.
- In 2014/15 we have increased the number of teachers applying beyond our capacity. This has meant restricting the number of classes per teacher. This has resulted in a lower drop out rate and more student accounts being used as the teacher value the opportunity more.

Over 800 teachers have taken part in *I'm a Scientist*, of whom around 640 from 450 schools took part between March 2012 and March 2015. The number of teachers registering to participate in *I'm a Scientist* is steadily growing; we're currently averaging 40 new teacher registrations per month

and we were 37% oversubscribed with teachers wanting to take part in our March 2015 event. Being oversubscribed allows us to limit the number of classes per school, so that teachers realise there are more people waiting to take part, and value the places they are given. This will potentially reduce the number of teachers who register to take part, but do not use the spaces they are allocated.

We have two ways of increasing the number of teachers applying to take part. Firstly, to encourage more teachers to return to the event, and take part more than once. Secondly to recruit new teachers to the programme. We aim for a mix. We want to broaden the base particularly among schools that do not currently do much science enrichment activity, but we also know that teachers taking part repeatedly (with different classes) are more likely to prepare their students well so that they get more out of the activity. We have looked at the participation behaviour of the teachers involved:

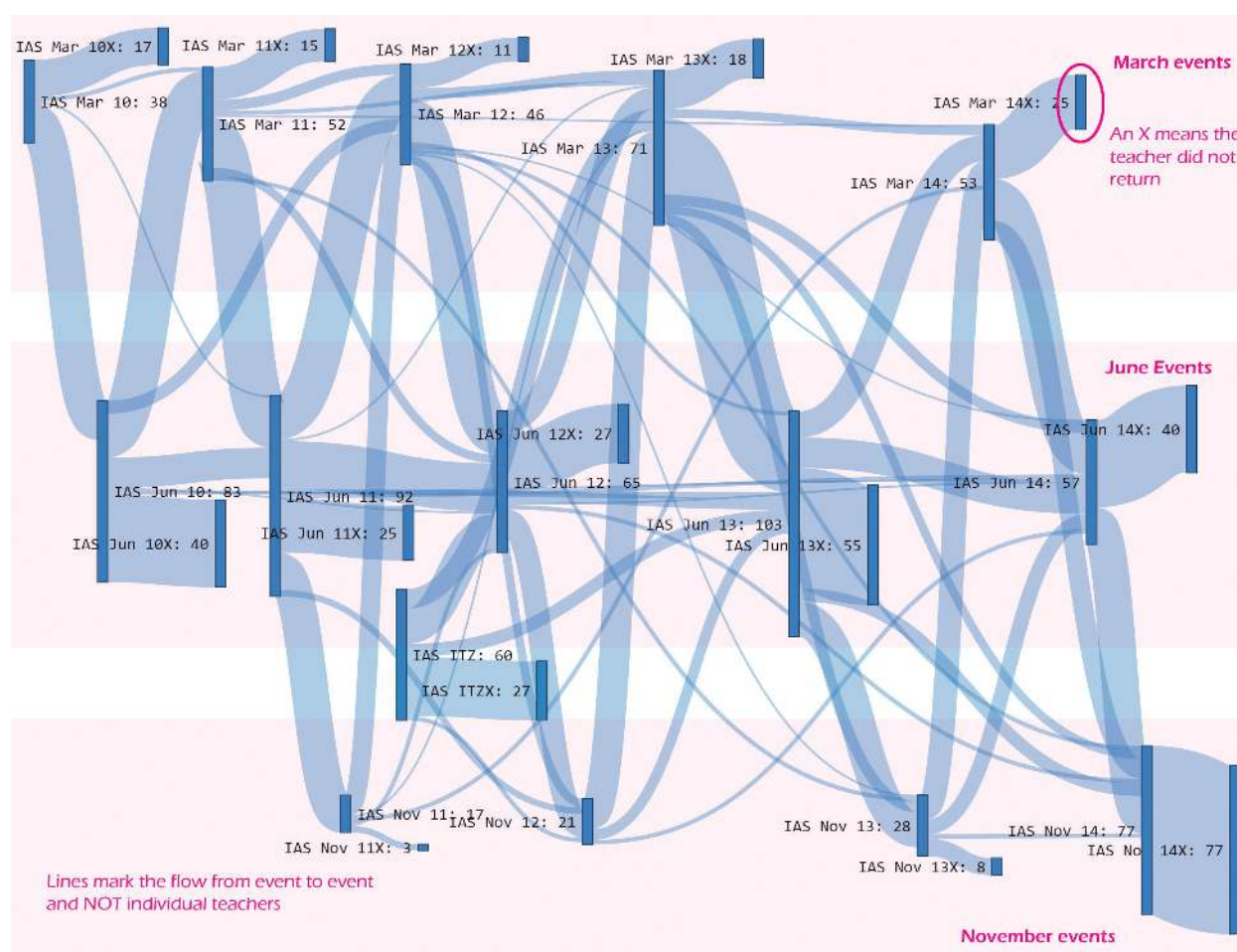


Figure 16. Sankey diagram illustrating the flow of teacher involvement between events.

In 2013 we emailed three clusters of teachers to try to ascertain why they hadn't returned.

- 442 teachers who had signed up but never taken part — 44 took part in the next event. 23 took part in a later event. A very small proportion responded to explain why they hadn't.
- 35 teachers who had taken part in a 2008 event but not returned — 4 responded 2 had left teaching, 2 were taking part again and since then 4 have taken part again.
- 36 teachers who had taken part at least 3 times but hadn't registered for the latest event — 20 responded. 10 asked to take part, 7 had resourcing issues, 3 had timetable clashes.

The takeaway message is that whilst satisfaction levels are high (97% of teachers are overall satisfied with the event) some teachers are unable to take part as often as they, and us, would like. However suitable reminders mean that many do come back when they can.

June events see the biggest drop off in teachers. Teachers taking part in March and November tend to come back for more. About 50% of teachers take part only once. This is probably misleading though as this figure is based on using a teacher email address as the unique identifier. A teacher will frequently pass on responsibility for organising the event to another teacher, they will sometimes move school and frequently over the past five years they have changed email address as their schools have converted to academy status. We recognise that we need to improve our teacher database to use the school as the unique identifier.

We have found that we can get more teachers on board in *I'm a Scientist* through:

- **Word of mouth:** previous participants' word of mouth has been our best marketing tool. 100% of the teachers who filled in the post-event survey said they would recommend taking part to a colleague, so we include flyers in the teacher packs that go out to every teacher, to pass onto colleagues.
- **Keeping in contact:** through twitter, our blog and mailing campaigns. We've recently connected with more teachers and schools on twitter, and encourage them to share their experience of taking part. We update our blog with our latest findings,

including asking teachers for advice such as what zones to run.

- **Working with partners and funders** like the Institute of Physics, who promote their zones to their member teachers.
- Building a relationship with **STEM contract holders**.
- Promotion through **teacher newsletters and organisations** such as the Association of Science Education.
- Attending **teacher conferences and teach meets**, like the ASE conferences.

As a result we've limited the number of classes per school, to allow students at as many schools as possible to take part, and also increase the perceived value of taking part.

Recommendations:

- Improve our teacher database to use the school as the unique record identifier.
- Allocate classes preferentially to schools in more deprived areas, reducing the skew we've had in past events to schools in less deprived areas. Work with others to identify more effective techniques.

7) Students ASK about cancer, animals, and life and CHAT about science, scientists and work.

- Analysis of the text of all the questions asked since 2010, shows a clear emphasis on Biomedical Science.
- Topical science stories emerged in common topics the students talked about during the live chats in March 2015. We are working to analyse this in further detail.

We've looked at the text of the all the questions asked since the first *I'm a Scientist* event in 2010 and used the basic word frequency Wordle tool to illustrate what topics students have been asking about (figure 17). Common words are automatically stripped and we have further removed anything that couldn't be called a science topic, like "favourite" or "job". There are imperfections in our methodology. Some single words such as "black" and "hole" should appear together, some stem words (human, humans) appear twice. We need to improve on this in future iterations. The words demonstrate a clear emphasis on Biomedical Science. Out of

43 words 24 are biomedical in nature, 13 are astrophysical, 1 chemistry related and 5 are about How Science Works. It is clear that students want to know about cancer, animals, brains and the world. We also looked at live chat transcripts for our March 2015 event and split the student and scientist content. This time we stripped out the common stop words and those words used to punctuate conversation such as I “think”, “love”, “like”. Students seemed to be asking about science and scientists and their work (figure 18).

We are currently working with Rob Appleyard, a data scientist and *I'm a Scientist* alumni from the STFC to analyse the question data in more depth to see if topical science stories emerge in the questions asked by students.

Recommendation:

The project would benefit from some more robust text analysis of what students and scientists are writing. Does engagement differ by zone, gender or age group? Although such analyses are outside the remit of a standard evaluation process, we have been exploring options to enable deeper academic reflection on such topics (for example with Dr Karen Bultitude at UCL).



Figure 17. Word cloud showing the popular topics in the questions asked by students since 2010.

8) Mobile devices are increasingly popular for accessing the site

- Visits from tablets and mobile devices have increased from about 8% to nearly 50% since we built the site in 2010.

Two thirds of teachers indicated in our post-event surveys that they found the website either “very easy” or “quite simple” to use. A further 31% of teachers found it “difficult to start with”, though after the initial period of getting familiar with the site they found it OK. Only 2% of teachers reported that the website was “difficult throughout” their involvement. (figure 19).

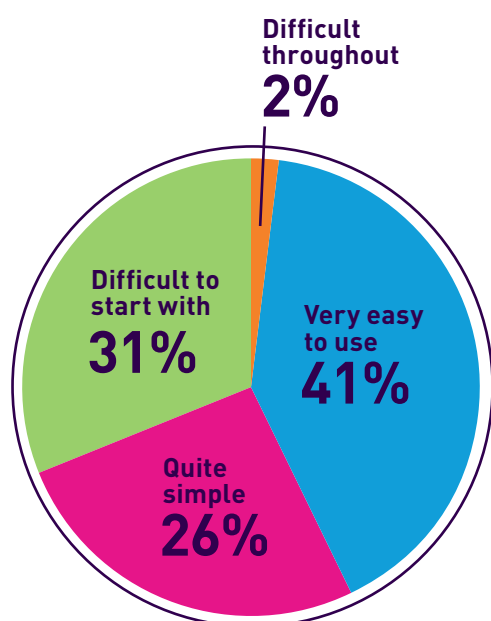


Figure 19. Teachers’ perceptions of how difficult the *I’m a Scientist* site is to use. Percentage of teachers who found the website very easy to use, quite simple, difficult to start with, and difficult throughout. N= 42. Data from post-event surveys March 2012 - November 2012. This question was later taken out of the teacher post event survey, in order to make it shorter to improve our teacher response rate, and therefore we can only include data from this period.

We have also looked at how visitors access the site and how that has changed year by year, as well as at how the behaviour of visitors registered as students differ from all visitors.

Taking a closer look at the site usage patterns, we found that visits from **mobile phones and tablets have increased: nearly 40% of visits were from mobile devices in 2015** (figure 20). However the majority of mobile users were unknown members of the public, whilst the proportion of registered school students using mobile devices remained relatively low. It seems that it is mostly questions that unknown mobile users visit, indicating that the *I’m a Scientist* site is used as a knowledge resource by members of the public. The use of tablets to access the site keeps being low for both registered students and the broad public, total use around 10% (figure 20). There is also little difference in the content visited by students using tablet and the ones using desktop.

A significant proportion of site visitors are using mobile devices and landing on question pages through organic search. In addition Google’s latest algorithms penalise websites without a mobile friendly design. Currently our design is non-responsive and whilst viewable it is not designed for use on phones and tablets.

Non-registered users are responsible for 95% of visits to our site and 68% of page views.

Recommendation: Adapt the site design so mobile users get a better experience.

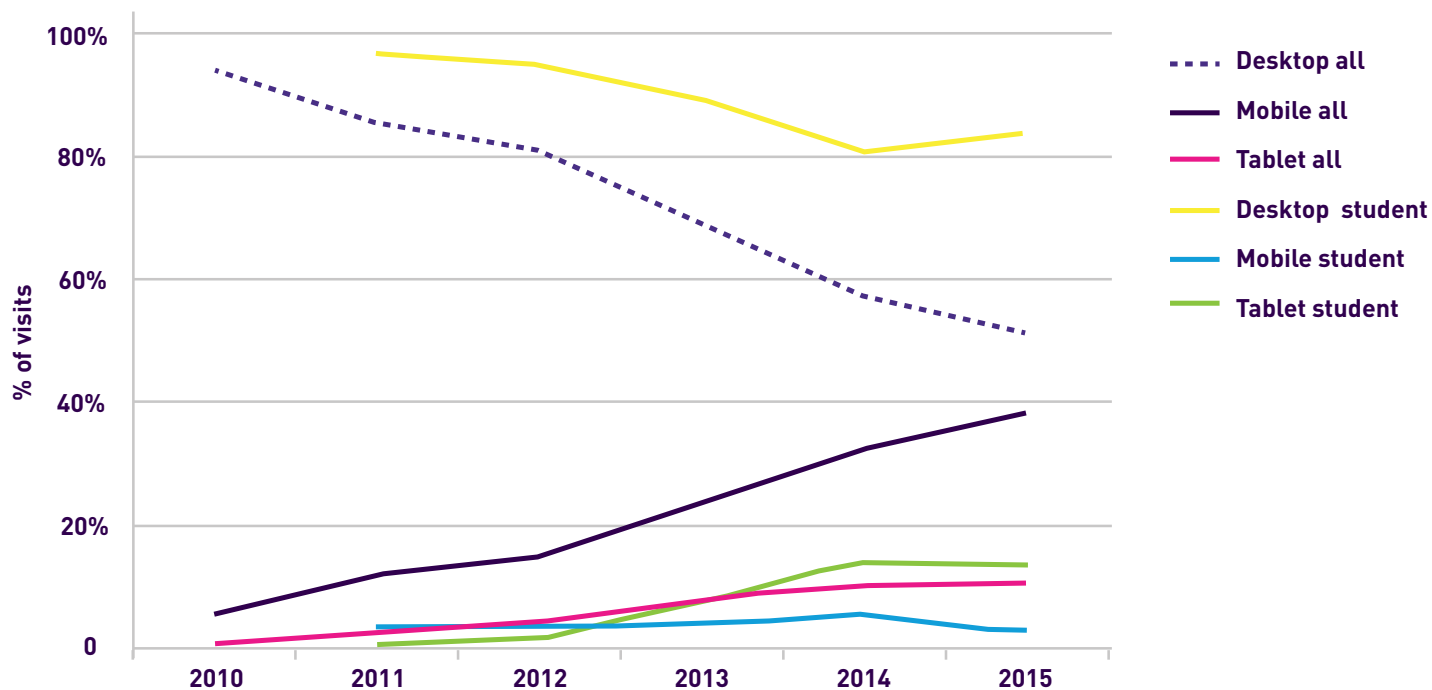


Figure 20. Visits to imascientist.org.uk from January 2010 to May 2015 by device type: desktop (blue), mobile (red), and tablet (green). Continuous lines represent all users, dashed lines represent students.

Recommendations

1) Reach schools in more deprived and hard to reach areas. We believe we are reaching many schools that are not well served for science engagement but there is no available national data about which schools engage or not. We intend to work with STEMNet and the BSA to build a better understanding of which schools are well served or not.

2) Get scientists from the private and public sector involved.

As shown in figure 3, most of the scientists taking part in *I'm a Scientist* come from academia. We need to diversify our recruitment process so we get more scientists from the private and public sector on board. This is important if we want to show students the wide range of science careers available.

3) Adapt the site design so mobile users get a better experience. Visits from tablets and mobile devices have increased from about 8% to nearly 50% since we built the site in 2010. A significant proportion of site visitors are using mobile devices and landing on question pages through organic search. In addition, Google's latest algorithms penalise websites without a mobile friendly design.

4) Improve our teacher database.

A teacher will frequently pass on responsibility for organising the event to another teacher, they will sometimes move school and frequently over the past five years they have changed email address as their schools have converted to academy status. We recognise that we need to improve our teacher database to use the school as the unique identifier.

5) Diversify our audience.

- We want to keep running primary school zones to diversify our audiences and to enthuse students about science at a younger age.
- Live events work well to reach new audiences, but they are expensive. For some organisations they can be worthwhile additions to an existing programme of events. However we will focus on attracting new sectors of the public to online events.

6) Actively support the *I'm a Scientist* alumni network.

- We should repeat our long-term alumni surveys regularly to see if *I'm a Scientist* keeps acting as a public engagement booster for scientists.
- The *I'm a Scientist* alumni network is currently informal and operates on twitter and in university cafes and bars around the country. We should improve on that to give scientists more support in their post *I'm a Scientist* public engagement activities.
- We plan to distribute nearly £200,000 in prize money over the next 5 years of the project. We need to improve the reporting methods for how this is spent by making it more methodical and accountable.

7) Make imascientist.org.uk more user friendly for unknown visitors.

- Include a poll asking unknown users why they've visited imascientist.org.uk, and a feature to rate the answer they've found.
- Invite scientists to provide contact details on their profile post-event, so that visitors getting an answer to the questions they have googled can get access to the scientist behind it.

8) Develop a robust text analysis of what students and scientists are writing.

The project would benefit from some more robust text analysis of what students and scientists are writing. Does engagement differ by zone, gender or age group? Although such analyses are outside the remit of a standard evaluation process, we have been exploring options to enable deeper academic reflection on such topics (for example with Dr Karen Bultitude at UCL).