

Pilot Evaluation

I'm a Scientist USA - May 2015

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I'm a Scientist, USA Pilot Evaluation Report

Tristan MacLean May 2015

Student

"I am so glad I am actually talking to real scientists! Thanks for the great experience!" - Hamilton school student

Scientist

"I wanted to thank you so much for the opportunity to interact with so many amazing schools and students! I never expected to make it as far as I did, but I am very grateful. This was a really transformative experience for me." -Lindsay Hunter, Rising Star Expedition

Teacher

"Every time a scientist would answer a question one of them would turn to me and raise their hand or yell "They answered my question!" and they've just never experienced something like that before in a traditional classroom setting."-Lesli Horowitz, Kearney High School



CONTENTS

Summary	
1. Introduction and background	5
2. Evaluation	7
3. Methodology	9
4. Scientists	
5. Schools	13
6. Results	15
7. Case Studies	50
8. Discussion	73
9. Conclusions	87
APPENDICES	88

Evaluation conducted by Tristan MacLean.



Summary

I'm a Scientist creates opportunities for scientists to answer questions from students via the internet, opening dialogue, while developing skills and understanding of the scientific process. It also gives students an idea of what it is like to be a scientist and the types of careers available.

This evaluation report provides a detailed analysis of the first *I'm a Scientist USA* event held in May 2015. Evaluation data was collected from scientists, teachers and students. Web analytics and site usage statistics are combined with questionnaires, interviews, school performance data and classroom observation to provide a formative evaluation report. **Data suggested that the pilot event was very successful, exceeding teachers' expectations and inspiring students.**

It shows that:

- **Scientists** became more confident in communicating their science and developed techniques to provide informative yet short explanations. The excitement and interest of the students reaffirmed the importance of their work, re-invigorating and inspiring them. The opportunity to learn more about their own subject from a broader perspective revived their enthusiasm for their work and made them more knowledgeable about their subject.
- **Students** enjoyed the event and were far more interested in science jobs and careers. Students of all ages, abilities and backgrounds engaged well with the scientists and found the event to be a rewarding experience.
- **Teachers** were all very pleased with the experience their students had and the positive impressions the scientists made. They developed a better understanding of their students' interests and 86% gained new ideas for teaching. Given the opportunity, they would all enroll classes in future events.
- The logistical and technical delivery of the event went very smoothly and was praised by teachers and scientists.

Enhancements and recommendations:

- Providing easier 'one-click' navigation in chats, to reply quickly to students, and in the ASK questions to reduce the time taken to answer questions and navigate to student profiles.
- Display the time on chat bookings in an AM/PM format rather than use a 24 hour clock.
- Providing teachers more explicit guidance on navigating and interacting with the website.
- Developing better systems for teachers to access saved chat transcripts.
- Provide video upload option on scientists' profiles.
- Have a reserve list of scientists available for zones.
- Provide teachers with an advance highlight of potential discussion and debating topics in the featured scientists' field of study.
- Provide future engagement opportunities with the same scientists so students can develop longer term relationships.



Key figures for 2015

- One event 11th to 22nd May
- One zone General science
- 13 schools
- 19,699 visits to the site
- 262 students took part
- 2,120 scientist profile views
- 402 questions asked



1. Introduction and background

I'm a Scientist is an award-winning event, originating in the UK, that as the website states:

Get(s) your students talking to real scientists online!

It is in the form of an American Idol style competition between scientists, where school students are the judges. It is designed to enable teachers to connect their students with scientists. By connecting students with practicing scientists they can learn more about the practices that scientists carry out in their work and bring real science to life. The program supports the Next Generation Science Standards (NGSS)¹ and is supplemented by carefully developed classroom resources. It:

- develops discussion and critical thinking skills
- supports the Practices part of the National Framework
- gets students engaged with science
- provides lesson plans, information sheets, and resources for different ages and ability levels, between 9 – 18 years old (see <u>www.imascientist.us</u>)

I'm a Scientist is an innovative approach to STEM education and public engagement that cleverly utilizes familiar and commonplace browser software to create inspiring and exciting lessons that are capable of reducing equity gaps. The event overcomes geographical barriers and provides access to expertise and learning opportunities for all students that enables them to personalize their learning. *I'm a Scientist* supports the aims of the National Education Technology Plan 2010 and has the same ethos to "enable, motivate and inspire all students to achieve, regardless of background, languages or disabilities" by "ensuring that our professional educators are well connected to the content and resources, data and information, and peers and experts they need to be highly effective"².

I'm a Scientist events consist of three main student focused activities; ASK, CHAT and VOTE. In the ASK section students are able to submit questions to the competing scientists whenever they like. CHAT involves 30 minute live chat sessions with the scientists and groups, or classes, of students that are moderated. Students choose the most deserving scientist to win the competition by casting votes in VOTE. Students get a new opportunity to votes with each round of eliminations.

The value of scientists work is no longer judged solely on its intellectual merit or the scientific discoveries made, but also on the benefits to society. Public engagement and science communication are increasingly important in STEM careers as recognised by the National Science Foundation (NSF) in the Broader Impacts Review Criterion³. *I'm a Scientist* provides a platform for scientists to share their knowledge and expertise while learning about public attitudes to their work and further developing their communication skills.

¹ Next Generation Science Standards <u>http://www.nextgenscience.org/next-generation-science-standards</u> Accessed April 2015.

 ² The Secretary of Education, November 2010, Department of Education, Office of Educational Technology, National Educational Technology Plan <u>http://tech.ed.gov/netp/</u> Accessed April 2015.
³ National Science Foundation, Broader Impacts Review Criterion

http://www.nsf.gov/pubs/2007/nsf07046/nsf07046.jsp Accessed March 2015.



I'm a Scientist has been running in the UK since 2008 where it is funded by the Wellcome Trust and a number of other research organizations and learned societies. Evaluations are undertaken of each event and large scale evaluations of the programme have been undertaken a number of times. In addition to this a number of research surveys have been conducted on the impact, including cost-benefit ratios and case studies of participants. The data has been shared with the science communication and education communities at a number of conferences. Attendance at the 2015 International Public Science Events Conference (IPSEC) conference in Cambridge, MA enabled preliminary reaction to the event to be shared with delegates and a workshop for scientists will be held at the 2016 AAAS annual conference – *Outreach that boosts your career; competing to communicate*. A proposal has also been submitted to share the findings of the pilot *I'm a Scientist USA* event at the NSTA annual conferences in 2016.

Evaluations

http://imascientist.org.uk/about/evaluation

http://about.imascientist.org.uk/category/evaluation/evaluation-reports/

Zone reports

http://imascientist.us/zone-reports

Research

http://about.imascientist.org.uk/2014/does-im-a-scientist-enhance-the-participation-of-scientists-in-public-engagement/

http://about.imascientist.org.uk/2013/how-does-im-a-scientist-change-studentsperceptions-of-science/

Case studies

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

Conferences

Evolving Science Communication, April 2014 - http://about.imascientist.org.uk/2014/evolving-science-communication-conference/

Science Communication Conference 2011 – https://prezi.com/fe7n4nhdwjaq/im-a-scientist-get-me-out-of-here-sciencecommunication-conference-2011/

International Public Science Events Conference (IPSEC), Cambridge, MA, May 2015. <u>http://sciencefestivals.org/event/the-2015-international-public-science-events-</u> <u>conference-ipsec-and-inaugural-science-live-workshop-2/</u>

AAAS Annual conference, Washington, DC February 11th – 15th, 2016. *Outreach that boosts your career; competing to communicate.*

NSTA Annual conference, Nashville, Tennessee: March 31–April 3, 2016. *Submitted proposal: Overcoming geographical barriers to engaging with scientists - I'm a Scientist USA*



2. Evaluation

This is a report on the evaluation of the pilot I'm a Scientist USA event that ran May 11th-22nd 2015. The report does not assess any longitudinal impact.

The aim of *I'm a Scientist USA* is to enhance science education and public engagement by promoting *more two-way dialogue between scientists and the public*.

The pilot objectives were:

- To run the event pilot (website, competition and supporting materials).
- To run a general "zone" featuring competition of five scientists talking to 20 classes of students. This equates to approximately 400 students.
- To evaluate the project at the beginning and the end to see if the desired outcomes have been achieved.
- To collect evidence of the impact of *I'm a Scientist USA* that can be used to support funding applications for future events.

Evaluation Objectives were developed using the pilot aim and objectives listed above.

Formative Evaluation Objectives:

- What worked well and not so well?
- What aspects of the program administration and website could be improved?
- The impact on students' education and their attitudes to science.
- The value to scientists and their organizations.
- The benefits to teachers and any challenges.

Evaluation Objectives for delivery:

- The means of communication between *I'm a Scientist USA*, teachers and scientists.
- The clarity of information provided.
- The materials provided.
- The ease of use of the website.
- The timing of chats and voting.

Evaluation Objectives for scientists:

- The extent of change new skills, confidence, changing views on public engagement, young people, science etc.
- How successful was the recruitment of scientists and are there barriers to recruitment?
- The identification of most appropriate ways to attract scientists.
- Were scientists' expectations met?
- Was there a different impact depending on type of scientist etc.
- Are they more likely to do public engagement activities again?
- What help do they need for future events?

Evaluation Objectives for teachers:

- The extent students have changed attitudes, empowered, more discussion in class, etc.
- Is *I'm a Scientist USA* valued by teachers?
- Whether teachers have changed their practice?
- Have teachers developed any new skills?
- Were they supported enough?
- Is the content in a useful format?



- Are the debate kits useful?
- Are their expectations met?
- Does *I'm a Scientist* support or enhance their curriculum?

Evaluation Objectives for students:

- Have their attitudes to science changed?
- Do they have a better understanding of the practices of scientists?
- Do they feel more empowered to make decisions relating to science?
- Are they more confident in asking questions and contributing to discussions?
- What is the biggest impact of I'm a Scientist USA?
- Were they inspired by scientists?
- Did some types of classes, etc benefit more?



3. Methodology

The evaluation methodology draws upon strategies and approaches that are commonly employed to assess STEM education and public engagement initiatives in the UK and USA. One of the frameworks that was used to guide the design of the evaluation is the National Science Foundation (NSF) framework for evaluating impact of informal science education in America⁴. This suggests a range of important key factors to evaluate including:

- knowledge or understanding of STEM concepts
- processes or careers
- engagement or interest
- improved or changed attitude towards STEM related topics
- developed skills and a change in behaviour

The information collected in the evaluation included both quantitative and qualitative data. The particularly rich degree of quantitative data available through surveys and online activity is able to more conclusively confirm the findings from qualitative data and determine the degree of impact achieved. The availability of this data is one of the defining strengths of this program over other STEM outreach and engagement initiatives.

The evaluation will encompass the user experience and technical aspects of the website but an in-depth assessment of the technology employed will not be undertaken in this report.

Overview of summative evaluation approaches:

- Summary data relating to the event was collated e.g. geographical location of schools.
- Analysis of web traffic and online event activity.
- Live chat interaction recording and analysis.
- Pre and post-event questionnaires for scientists, teachers and students.
- Classroom observation.
- Interviews of teachers by Skype and in-person.
- Interviews of scientists, in-person and by Skype or Google Hangout.
- Case studies of scientists and schools.
- Collation of general feedback comments.

3.1. Summary data

The key statistics from the event were compiled to provide an overview of the output and impact that the event produced.

3.2. Web traffic

The website traffic data was collated by Emily Paget (Gallomanor Communications) using Google analytics.

⁴ The National Science Foundation: *Framework for evaluating impacts of informal science education projects* – report from a national science foundation workshop, The National Science Foundation <u>www.informalscience.org/documents/Eval_Framework.pdf</u>



3.3. Live chat interactions

The live chat data was archived on the website. Quantitative data statistics were calculated and keywords were analysed using <u>OpenRefine</u>. The lines of live chat engaged in were analysed by school and by scientist. Keywords occurring in the chats were ranked by frequency. The data was presented in the <u>Hydrogen zone report</u>. In addition to this, while live chats took place, snippets of conversation that reflected the interactions between the students and the scientists were copied to a text document. Quotes from students who may be below the age of 13 are reported anonymously either as '*student'* or using their log-in user ID known only to their teacher, in accordance with the Children's Online Privacy Protection Act (COPPA).

3.4. Questionnaires

Questionnaires were carried out with students, scientists and teachers, prior to and after the event. The questionnaires were adapted from the general survey, used for all *I'm a Scientist* events (for teachers, scientists and students), and delivered through survey gizmo (<u>www.surveygizmo.com</u>). The survey questions are listed in appendix 1.

Students accessed their questionnaires through the *I'm a Scientist USA* website. The student questionnaires were on the students profile page and could be accessed once students had logged onto the site. The pre-event questionnaire was posted before the students received their log-ins and the post-event questionnaire was uploaded to their profiles towards the end of the second week of the event. Teachers were emailed notification of the survey update and students were encouraged to complete it during live chats. Teachers and scientists were emailed a link to their pre and post-event questionnaires.

3.5. Classroom observation

One classroom observation was undertaken with Vestal Middle School. Tristan MacLean arranged a visit to the school with the class teacher, Jaimie Hurlbut, which took place on the Monday of the second week of the event. Tristan arrived prior to the lesson and was able to discuss with Ms. Hurlbut what the students had done in relation to the event and how it had been received up to that point. The lesson observations were recorded using a template form (appendix 2) and video and camera footage were collected to supplement the written observations. It was hoped to have observed more lessons in more schools, but due to the geographical distance to schools this was not logistically possible.

3.6. Interviews

Interviews were conducted in-person and via Skype and Google hangouts. Interviews were recorded either with a GoPro (in-person) or using screen recording software (BB Flashback express <u>http://www.bbsoftware.co.uk</u>). The guideline questions are listed in appendix 3. The interviews questions were adjusted in-motion to account for the responses from the interviewees.

3.7. Case studies



Case studies of participating scientists and schools were carried out by combining background information, event activities, follow up interviews and where possible classroom observation to provide in-depth look at the participants and the impact of the event on them.

3.8. General feedback

From the start of the event preparations, through to the conclusion and evaluation, all feedback provided from participants was recorded and collated. This included thank you letters written by students to the scientists, tweets by teachers and scientists, email comments, verbal feedback, interview responses, suggestions by the *I'm a Scientist* UK team and a range of other input. Quotes from this feedback are displayed on the *I'm a Scientist USA* home page and are listed in appendix 4.



4. Scientists

The initial call for participating scientists was put out a couple of months prior to the event. Existing contacts were informed of the event, a variety of social media announcements were made on Twitter, Facebook and LinkedIn and outreach groups at universities were contacted. To begin with sign-ups were slow but by the closing date for applications (April 13th) five scientists had applied, who demonstrated through their one sentence description of their work they had suitable communication skills to take part. However, all the applicants were male and it was decided that as this was not representative of the scientific community the application deadline would be extended and a renewed round of appeals for applicants would be made aimed specifically at recruiting female scientists. This proved very successful and the number of applicants quickly rose to 30, including both new female and male applicants.

With a far larger pool of potential competitors to choose from we were able to select a more diverse panel of scientists to engage the students. The primary criteria for this selection was the one sentence description of their work. Irrespective of any other factor the ability to communicate in a clear and compelling way is essential for student enjoyment and the success of the event. Based on this criteria we were able to narrow the applicants down to a shortlist of ten very appealing scientists. Our aim then was to provide a diverse selection of scientists working in industry, academia and non-governmental organisations across a range of scientific fields to increase the scope of scientific topics and career advice the students could receive expert feedback about.



The final five scientists chosen to participate included three academic scientists, one working in industry and one working for a non-governmental organization. They were located in New York State, California, Minnesota, Michigan and South Africa. Their areas of expertise included entomology, archaeology, paleoanthropology, microbiology, food science, ecology, evolutionary biology, mathematics, computer science and neuroscience. Ideally scientists working in the chemical or physical sciences would have been included, however, there was a significant majority of applicants with biological science specializations and the final five applicants chosen was representative of the applications received.

The scientists profiles and CVs can be accessed at this link http://hydrogenm15.imascientist.us/scientists/



5. Schools

Thirteen schools took part in the event. Publicly available data about the schools and their students was collected from school websites and school district reports.

The schools ranged from Elementary schools to High schools. They included state schools, charter schools and private schools.



The smallest school has 99 students while the largest has over 2,000. Class sizes varied from over 30 students to classes of six to eight students.



The students taking part varied, from schools with indicators of very economically deprived student intakes e.g. Hamilton Middle School to those with very few deprived students e.g. Vestal Middle School.

The ability levels of the students were equally varied. Some schools focusing on highability students and accelerated learners e.g. the Acera school ⁵ whereas other schools such as the Kindezi school aim to overcome student disadvantages "Despite having a Title I population with 70% qualifying for free and reduced lunch, Kindezi outperforms 75% of Georgia's schools on the Criterion-Referenced Competency Tests (CRCT)" ⁶.



One school identified itself as a religiously guided school – St. Mary's School, a private Catholic Kindergarten to 8th grade school.

Further school data and links can be found in appendix 5.

⁵ "Acera enables high-ability students to learn based upon ability and motivation in a supportive, energetic environment, to help them become the best version of themselves." <u>http://aceraschool.org/</u> accessed May 2015

⁶ <u>http://kindezi.org/results</u> accessed May 2015

⁷ <u>http://www.sandi.net/domain/10280</u> accessed May 2015

⁸ <u>http://www.vestal.stier.org/Downloads/DistReportCard_20132.pdf</u> accessed May 2015



6. Results

6.1. Summary data

Number of zones - One (Hydrogen).

Number of teachers - 14 (with some working with a number of classes).

Number of schools - 13 schools registered, all schools took part and only 1 school did not engage in a live chat.

Geographical range of schools – 2 countries (USA and Canada), 11 states/provinces.

Number of classes - 18 classes registered to take part. Only one of the registered classes was unable to take part due to an exam clash.

Number of students - 262 students.

Student activity - 80% of student log-ins recorded activity in ASK, CHAT or VOTE.

Number of scientists – 30 scientists applied for 5 places. Five scientists completed their profiles, four scientists engaged in live chats and answered questions in ASK.

Number of live chats - 17 live chats in the Hydrogen Zone. Maximum number of live chats undertaken by a school = 3. All but one school took part in live chats.

Number of responses from scientists – 385 answers to 402 questions. The first and second placed scientists provided approximately 129 answers each.

The quantitative results are listed in more detail in the Zone report (<u>http://imascientist.us/zone-reports</u>)

6.2. Web traffic

The overall traffic to the website during May coincided closely with the live chat bookings (see below), with more visits to the site at the start of each week during the event. There was relatively little activity in the run up to the event and only six questions were submitted to the scientists through ASK before the first live chats on the 11th of May. This suggests that either there wasn't much pre-event interaction with the website by students or that teachers visited the site and provided their students with print-outs from the site, such as the scientists' profiles.





PAGE VIEWS	HYDROGEN ZONE
Total zone	19,699
ASK page	1,542
CHAT page	2,721
VOTE page	2,175
Scientist profiles	6,426

Summary of page views

The ASK question which received the most page views was What is love? with 62 hits.

The scientist who received the most profile views was K. Lindsay Hunter. Profile views did not reflect the results of the scientists; second placed Lindsay received more views than the winner Jeff and fourth placed Zoe received more than Kenzi in third place.



6.3. Live chat interactions

Keywords occurring in the chats were ranked by frequency. The data was presented in the <u>Hydrogen zone report</u>. In addition to this, while live chats took place, snippets of conversation that reflected the interactions between the students and the scientists were copied to a text document.



There were 3,324 lines of live chat with an average of 190 lines across 17 chat sessions. The contributions to live chats graphed by school are shown below.



The contributions of the scientists to the live chats are shown in the pie chart below.



The live chat archives were processed to remove non-keywords such as, 'that', 'for' etc. They were then analysed and displayed in a word cloud (<u>www.wordle.net</u>) with frequency represented by keyword size (see below).





Popular topics in the zone were bats, insects, caves and food – showing the students picked up on the research interests of the scientists. Lots of the students wanted to know about superheroes and batman due to Jeff's research and profile description. During chats there were also lots of questions about caves, fossils evolution and sometimes eating insects. Chats predominantly featured biology and often topics overlapped, with Lindsay, Zoe, Kenzi and Jeff co-operating to answer the students' questions.

Many students asked the scientists how they got interested in their subjects, what they liked at school and how they ended up doing the work that they do. Areas of potential controversy arose, such as animals being hurt in research, the ethics of dissection, evolution, GMOs and artificial ingredients in food, and the scientists responded excellently providing clear and well-reasoned explanations that were invariably well received.

Examples of good engagement during live chats were saved. A common question from students was why the scientists chose to have a career in science e.g.

"268hyda23 : why did you choose to become a scientist ?

Zoe : @268hyda23-I became a scientist because I love asking questions and learning interesting facts about nature. As a scientist I get paid to keep asking questions and discovering new things.

Lindsay : @268hyda23 I don't think anyone can really put a date on how long they've been a scientist since it's really all about a way of approaching the world. I've always been curious about the world and tried testing my observations."

School of the Future

There were also many questions about what day to day work is like as a scientist e.g.

"Student : how long do you work a day

Zoe : @ *Student - good question. Some days I work allIll day, but usually i work the usual 8 hours. You have to pull some late nights in science but things are very flexible. I can sleep in really late as long as i dont mind working late.*"

Hamilton middle school

and

"Student : @Lindsay @Kenzi what kind of tech do you use for experiments?

Lindsay : @Student I've used 3D contact digitizers, 3D laser scanners, GPS, plum bobs, porcupine quills, spoons, toothpicks, calipers, pipettes, etc. Soon, I hope to learn to use radio collars for monkeys!

Kenzi : @Student - on a regular basis I use a microscope, petri plates, pipettes, and other technologies to study really small organisms [smiley]"

St Mary's School

Students were keen to find out about career paths and were inspired by the scientists work e.g.

Page | 18



"Student : I want to be a paleontologist. What should my next steps be?

Zoe : @Student -First you need to graduate from high school and apply to a college with a good paleontology department. Read about what its like, and what the big discoveries are. IF you can, find some summer camps or clubs you can join that will teach you paleontology skills.

Jeff : @Student I'm sure @Lindsay can handle this, but I work with a lot of paleontologists and I think they got involved with helping out on digs and research in museums in high school."

Hamilton middle school

and

"Student : @everyone, what are some tips to become a scietntis

Kenzi : @Student: Curiosity is key for being a scientist! Sometimes you have to spend a lot of time to solve a problem, but in the end, getting to answer your question is worth it!

Zoe : @Student -You want to be a scientist? go find some experiences! there are lots of summer camps and clubs that help you learn skills for being a scientist. Get your parents to send you to those. It helps you figure out what you are interested in and what you like, plus it makes it easier to get into a good college.

Jeff : @Student it's hard work, but never forget to keep asking questions!"

Kindezi School

and

"374hyda39 : are there any internship programs for students interested in researching and learning more about bats?

Jeff : @374hyda39: depends where you are! there are definitely places all around the world to help you learn more. Bat Conservation International is a great place to start learning more"

Kearney High School of International Business

Many of the conversations were related to the scientists work e.g.

"635hyda24 : do insects hibernates during winter

Jeff : @635hyda24 some insects hibernate, but the way they hibernate is pretty different than mammals or other larger animals. a lot of butterflies/moth s either hibernate or migrate to escape the cold!"

School of the Future

and

"352hyda32 : Jeff, what is the most common disease found in bats? Why is it?

Jeff : @352hyda32 that's a good question. it really depends on the type of bat, however, many relatives of flu are often found in bats. it's a mystery to a lot of scientists, but we think it's because they have very great immune



systems that hold off diseases from doing lots of harm, but live in huge colonies so they still spread rapidly"

Hamilton middle school

and

"Student : @zoe do inscets have a brain

Zoe : @Student -They do have a brain. Most of them have 1 big brain in their heads and a few little brains in their bodies that handle all the moving. 6 legs are hard to coordinate.

Student : @zoe do insects have dream

Zoe : @Student -Wow. do insects dream? what a cool question! I have no idea! i don't think anyone knows. we barely know what insects experience. That would be a really cool thing to try to test though."

Kindezi School

and

"julian : @Zoe Have you ever worked with applying beetle adaptations to solve human problems? (biomimicry)

Zoe : @julian-Great question. I try to make stink bug smells myself to use in pest management. Does that count?"

Garth Webb Secondary School

and

"Student : @zoe, do insects communicate like us?

Zoe : @Student - great question! Insects talk all the time, but they do it by smells and tastes rather than talking"

St Mary's School

There were also general science questions about topics outside the specialties of the contestants e.g.

"573hyda23 : @zoe what is in a black hole

Zoe : @573hyda23-I have nooooo idea. I would love to know though. you should become an astrophysicist and find out for me."

School of the Future

and

"573hyda23 : @zoe what is at the bottom of the ocean?

Zoe : 573hyda23-Sand. Fish. Coral. deep sea hydrothermal vents. Weird creepy molluscs. old ships. treasure. lots of cool things."

School of the Future

There were conversations about what the students were studying in class e.g.

Page | 20



"242hyda23 : What do you think the new elements will be made of and how long until they are found?

Jeff : @242hyda23 physicists and chemist make new elements by decomposing other ones or combining them. it's almost impossible to guess but they're trying it all the time!

Lindsay : @242hyda23 Did you guys just study the periodic table or are you all just really in love with the elements? [smiley]

242hyda23 : We have been learning about the periodic table@lindsay"

School of the Future

Many interactions between the scientists and the students in live chats led to scientists expressing their views on the importance of school, learning and hard work to the students:

"Student : everyone from chris what lesson from school benefited you the least from school now

Jeff : @Student honestly chris, when i was younger it seemed like a lot of stuff wasn't going to be relevant but you'd be really surprised. so many random things come up in different topics that i'm glad i had such a diverse education

Lindsay : @Student Chris, I hate to break it to you, but they ALL benefited me to some extent. [smiley]"

Kindezi School

In some cases students asked questions that the scientists hadn't previously considered e.g.

"635hyda24 : Is that why insects seem bigger in the beginning of summer middle of spring?

Jeff : @635hyda24 my guess would be that a lot of those are fattening up to mate, but i'll let @Zoe confirm that!

Zoe : @635hyda24-I never noticed that. In part, there are different insects out at different times, so maybe the bigger ones come out during the summer. I think Jeff has a point. Lots of good food around, and they want to look big and strong to attract a sexy mate."

School of the Future

Topics that can be controversial and difficult for some scientists to discuss arose in live chats such as evolution and religion, GMOs and climate change. Furthermore these topics sometimes led to personal enquiries by the students. For example:

"552hyda23 : can you believe in evolution and god at the same time?

Zoe : @552hyda23. I dont, but many people do.



Jeff : @522hyda23 i know plenty of people who do just that

Zoe : @552hyda23-some people see god as the designer of all of the forces and changes we see as scientists.

Lindsay : @552hyda23 I actually converted from Roman Catholicism to Judaism during my PhD studying evolution. They explain different parts of the world and how humans think.

Zoe : Charles Darwin struggled with his discoveries and his religion.

Lindsay : @552hyda23 Humans are absolutely amazing in their ability to hold two seemingly contradictory positions at the same time.

Jeff : @Lindsay I think a lot of people would say they don't contradict each other at all, though!

Zoe : Evolution and religion don't always mix, but religion and a belief in god are not always the same thing."

School of the Future

and

"Student : @kenzi do you make food with natural ingredients

Kenzi : @Student: Yes! Some of General Mills products are all organic and non-GMO, specifically our Annie's, Muir Glen, and Cascadian Farms brands [smiley]

Student : @kenzi do you protest or want to stop people for making artifical ingredients

Kenzi : @Student: No, I personally don't think artificial ingredients are bad. Sometimes you need to add chemicals to make the food safer to eat or last longer on the shelves."

Kindezi School

The scientist honesty and open responses were really appreciated by the students, as one student reported in a letter they wrote to K. Lindsay Hunter:

"I voted for you because you stood out to me. We are also very much alike. We both travel and I like seeing fossils and learnig about them. You also give very truthful responses even if they don't make you look perfect. This is why I voted for you. I learned that you should pay attention in all classes because you don't know what will benefit you in the future."

Student, Kindezi School

The enthusiasm of the students was most readily observed during live chats and there was much mutual respect between scientists and students and evidence of learning taking place e.g.

Student : @Lindsay hey I'm sooooooo excited to talk to you

Lindsay : @Student OMG, I'm excited to talk to you!

Student : @everyone thank you for teaching us so many interesting fact!



Kenzi : @ Student: glad you had fun! We had a great time talking to all of you too!!

Kindezi School

6.4. Questionnaires

Response rates for the questionnaires ranged from 100% for the participating scientists (the 4 scientists who undertook live chats and answered questions) to 3.8% for the student post-event questionnaire.

Response rates are listed in the table below.

	Pre-event	Post-event
Scientist	100%	100%
Teacher	54%	54%
Student	80%	3.8%

Teachers were repeatedly informed prior to, throughout and after the event about the questionnaires. In future increased communication to students about the post-event survey and the gift card, such as during live chats, should increase the post-event response rate.

Where the questions are related the responses to both pre and post-event surveys are reported together.

6.4.1 Scientist questionnaire

1. How did you hear about I'm a Scientist USA?

One scientist heard about the event through twitter, two others through their university or research institute, while Kenzi was invited to apply by myself, knowing her interest in engagement and education. It was not too surprising, being the first US event, that none of the scientists had heard about the event directly from a previous participant. Jeff did report in the interview that he heard about it from a



friend of a friend who had participated previously. Neither STEM outreach organizations or professional associations or learned societies were the source of *I'm a Scientist USA* information and this is an area that should receive more focus in the run-up to future events.

This question was included in the survey gizmo questionnaire rather than the google survey sign up on the webpage. In future in order to find out the most effective means of reaching scientists this question will be included in the web based sign-up form.

2. What appeals to you most about I'm a Scientist?

It is important to establish the appeal of *I'm a Scientist* to US scientists as they are essential for delivery of the event and their continued recruitment will rely on effectively



communicating the benefits to scientists. The questionnaire responses of each scientist are listed below:

"Broad and varied communication with multiple young students nationwide."

"Outreach to students interested in Science!"

"The opportunity to interact online with students and other scientists through a well-respected forum."

"I want more experience doing outreach and science communication. I believe that scientific discoveries are useless if they can't be communicated to others."

3. Please rank the following outcomes in terms of importance for you.

	Overall Rank
Students becoming more engaged with science	1
Students becoming more aware of careers in science	2
Having a better understanding of how students view science	3
Developing links with other scientists	4
Becoming more confident in communicating my work	5
Boosting my science communication career	6
Increasing my science communication profile	7
Winning \$500 to spend on outreach	8
Being able to report on the Broader Impacts of my work	9
Becoming re-energised about my work	10
Being more aware of what other scientists do	11
Being recognised by my employer for my volunteering activities	12
Becoming more confident in using online tools	13

The primary motivation for the scientists was the students. Both student engagement with science and student knowledge of the careers available in science were the main reasons for scientists' participation in the event. Ranked third was developing a better understanding of how students view science, evidence that public perceptions are important to scientists. The lowest ranked motivation was becoming familiar with online tools and it may well be that 'early adopters' of *I'm a Scientist USA* are already quite familiar with online engagement. Also ranked at the bottom in terms of motivation was recognition by their employer. This will be worth considering in terms of future appeals for scientist participation. The prize money itself was ranked midway on the list of motivations and was not a driving factor in scientist sign-up.



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

Before the event started the scientists were already very or reasonably confident in communicating with young people. This did not change post-event. Due to the high baseline confidence it would be difficult to demonstrate a significant improvement, thankfully the event did not decrease the scientists' confidence in communicating with young people.



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?

Discussing topics and research that can elicit negative responses from members of the public can be intimidating to researchers. This question was included in the evaluation to ascertain the impact on the confidence of scientists' ability to communicate potentially challenging topics. Prior to the event there wasn't a significant lack of confidence amongst the scientists but there was still an increase in confidence following participation in the event.





6. Have you previously taken part in any science engagement projects? *and from the post-event questionnaire* 6. How do you think it compared to other forms of science engagement or dialogue you may have been involved with?

The scientists taking part in the first *I'm a Scientist USA* event were experienced in outreach having all taken part in events at local schools as well as science festivals and events organized by their university or research institute.



The other activity described by one scientist was:

"Live-Skype from the Rising Star Expedition for Nat Geo and U. of the Witwatersrand"

Being able to draw up on the scientists other outreach experiences enabled the postevent questionnaire to examine how *I'm a Scientist USA* compared to those other activities.

"Face to face is always better, but I liked the real-time aspect of the online chat forum."

"It was considerably more informal, but that went a long way towards the stated goals of the program."

"The chats were extremely fast-paced and somewhat undirected and confusing. They questions were often repetitive (within the chat). I didn't find the free-for-all format very comfortable or easy to communicate at all, much less explain science. I much preferred the Ask format, bc you were able to give the thought to each question that they deserved, and could form a connection, where the Chats were a bit like noisy maelstroms."

Post-event questionnaire results

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

All the scientists enjoyed the event, choosing 'Yes, it was fantastic' as the most apt description.

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

The outcomes included in the questionnaire were based on the aims and objectives of the pilot project. All of the scientist strongly agreed, or agreed that taking part had enabled them to report the 'Broader Impacts' of their work and increased their science communication profile. The other two highest rated outcomes for the scientists were reenergising them about their work and encouraging them to do more public engagement.



	Strongly	Agree	Disagree	Strongly
	agree %	%	%	disagree %
I am more confident in communicating my work	25	75	0	0
I have a better understanding of how students view science	25	75	0	0
I am re-energised about my work	50	50	0	0
I have developed links with other scientists	25	50	25	0
I am more confident in using online tools	0	75	25	0
I want to do more public engagement	50	50	0	0
I am more aware of what other scientists do	25	25	50	0
I increased my science communication profile	75	25	0	0
I can report the 'Broader Impacts' of my work due to taking part	75	25	0	0
I have been recognized by my employer for my participation	50	25	25	0
It has improved my prospects of having a science communication career	50	25	25	0

3. How confident do you feel communicating to young people following the event?

(See discussion of pre-event questionnaire)

4. Now you have taken part in the event how confident do you feel about discussing social, ethical and environmental implications of your work with members of the public/people outside your field?

(See discussion of pre-event questionnaire)

5. To what extent do you agree with the following statements about *I'm a Scientist*?

Preparation time for the event varied and it will be worth investigating in more detail what the scientists spent their time on in the run up to the event. All the scientists found



that the event enabled them to engage with the students and they seemed quite confident that the students enjoyed the experience. The scientists enjoyed the experience and it improved their communication skills.

	Strongly agree %	Agree %	Disagree %	Strongly disagree %
It didn't take too much of my time to prepare for	50	25	0	25
I was able to engage and communicate with the students	50	50	0	0
It improved my communication skills	25	75	0	0
The students seemed to enjoy the experience	75	25	0	0
Overall I was satisfied with the experience	75	25	0	0

6. How do you think it compared to other forms of science engagement or dialogue you may have been involved with?

(see discussion of pre-event questionnaire)

7. Would you participate again? *and* 8. Would you recommend it to a colleague?

All of the scientists would take part in the competition again and recommend it to colleagues.

9. How useful did you find the following parts of the site for communicating with students?

Three of the scientists found the live chats were the most useful part of the site for communicating with the students, however one of the scientists did not find live chat that useful. All the scientists found the ASK section useful. The usefulness of the scientist profile was variable, but none of the scientists found it not at all useful.

	Very	Quite	Not that	Not at all
	useful	useful	useful	useful
CHAT - live chat with students	75.0 %	0.0 %	25.0 %	0.0 %
ASK - Q&A with students	25.0 %	75.0 %	0.0 %	0.0 %
My scientist profile	25.0 %	50.0 %	25.0 %	0.0 %



10. How did you find the scientist briefing notes?

The briefing notes were well received with all the scientists reading them and finding them useful. Discussion of potential improvements to the notes were explored in more detail in the scientist interviews.



11. From a technical viewpoint, how did you find using the site?

All the scientist found the site easy to use once they had got used to it. One reported it being difficult to begin with and it will be worthwhile improving the familiarization period for scientists.



12. How do you think the CHAT facility could be improved?

Three out of the four scientists found the chat facility very useful but one found it 'not that useful' (question 9). Whether scientists found it useful or not there is always room for technological and user experience improvements to the site. The experiences and suggestions of users is therefore very important in continually enhancing the event experience and ability to achieve impact. The following suggestions revolved primarily around the ease of interacting with students and the incorporation of more single click interactivity. Only one scientist made a suggestion about radically changing the chat format.

"It would be nice if scientists could easily click on the student's profiles."

"The ability to click on a username to respond instead of typing them out would be ideal."



"I wish there were emoji options :) I also wish there was an easier way to reply to the correct student. The copy/paste of their chat name or typing it took quite a bit of time. It would be nice if you could just click on the student/question you wanted to answer, and it would automatically pop up a message box or their name would show up in your reply box."

"I would consider a format that allowed one scientist at a time to engage with a few students at a time, so that they could have more of a conversation. The hectic atmosphere at present made this a bit difficult."

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

The amount of time that scientists spend taking part in live chats and answering questions on the site is entirely up to the competitors. There were up to 3 live chats of 30 minutes scheduled each day. On average scientists spent 2.3 hours a day and none reported spending more than 3 hours a day on the event.



14. What do you think about the number of emails you received in the run up to and during the event? *and* 15. How useful was the content of emails you received?

All the scientists thought that the number of emails they received and the content of those emails through the event was just right, neither too many nor too few and full of useful information.

17. If you used Twitter during the event, how useful did you find it for the following?

Twitter has been very helpful in recruiting scientists and teachers for events in the UK and for the first US event. This question aimed to find out the extent to which scientists used twitter and how it was useful. The scientists who used twitter reported finding it most helpful with keeping up to date with the progress of the event. It was also useful for interacting with fellow scientists and letting colleagues and friends know about the event.



Interacting with fellow scientists	50.0 % 2	25.0 % 1	0.0 % 0	0.0 % 0	25.0 % 1	4
Keeping up to date with how the event's going overall	75.0 % 3	0.0 % 0	0.0 % 0	0.0 % 0	25.0 % 1	4
Sharing questions with scientists in different zones	25.0 % 1	0.0 % 0	0.0 % 0	0.0 % 0	75.0 % 3	4
Reporting and hearing about problems	0.0 % 0	0.0 % 0	0.0 % 0	0.0 % 0	100.0 % 4	4
Letting colleagues and friends know about the event	50.0 % 2	25.0 % 1	0.0 % 0	0.0 % 0	25.0 % 1	4



6.4.2 Teacher questionnaire

1. What appeals to you most about I'm a Scientist?

Like with the scientists it is important to establish the appeal of *I'm a Scientist* to US teachers as they are essential stakeholders and gatekeepers to communicating with students. Without school recruitment, reaching young people and improving their learning experiences is considerably more difficult. It is therefore imperative to assess the appeal of the event to this stakeholder group.

The following were the questionnaire responses from the teachers.

"exposure to real Scientists which shows students what potential jobs they could have in the future"

"A personal connection with real scientists. Students can watch the conversation or join in if they want. Voting on the favorite scientist is a great way to get the students engaged in a more personal way."

"Online interaction and learning more about what scientist actually do. I teach Career Tech and want students to be more aware of the broad range of careers available as a scientist."

"I like that it's "organized"- with Lesson plans. I like that it involves current research. I like that it is a low risk activity for students and teacher- any student could do it no matter their knowledge of science."

"My kids always have a lot of random science questions and I don't always have the time to address them fully because other students often see this as something outside of what we're working on and quickly get off task. So being able to give them an opportunity to get their questions fully answered is attractive."

"I believe that scientists and the scientific community are a mystery to my students. In spite of my efforts to facilitate their understanding of the nature of science, they have a very difficult time identifying with the scientific community. Due to logistical and budgetary limitations, it is impossible to get my students out of the classroom and into the scientific community, and I am hoping that programs such as this one can bring the scientific community into my classroom."

2. Please rank the following outcomes in terms of importance for you as a teacher. *and* 3. Is there anything else not mentioned in Question 2 that you're expecting as an important outcome?

There are a large number of potential outcomes teachers and students may gain from taking part in *I'm a Scientist*. In the pre-event questionnaire the teachers were asked to rank the outcomes provided. The most important outcome for teachers was to get their students more excited about science. The other outcome reported by the teachers that we hadn't included in the survey was "*talking about science topics with their friends outside of class!"*



	Score*	Overall Rank
Students are more excited about science	62	1
Students have a more positive view of science	57	2
Students are more aware of careers in science	51	3
Students are more confident in asking questions about science	37	4
I am more aware of the insights my students have into science	35	5
Students have a more nuanced view of science	32	6
I am more confident in using online tools in lessons	28	7
Students are more confident in debating science issues	28	8
I am more aware of cutting edge science	25	9
I will gain ideas for teaching in the future	21	10
I am more confident in teaching science practices	20	11

and from the post-event questionnaire

3. To what extent do you agree with the following outcomes from taking part? *and* **4.** What was the single most important outcome for you as a teacher?

In the post-event questionnaire the question was changed to enable likert scale responses by teachers to provide a finer level of feedback. Overall teachers were satisfied with the event, found it easy to implement and 85.7% reported that it gave them new ideas for teaching (one of the least anticipated outcomes in the pre-event questionnaire). Teachers agreed that students seemed to enjoy the event and were more confident in asking questions about science. Teachers also became more aware of their students interests. None of the teachers strongly disagreed with the outcomes included in the questionnaire but there were a range of opinions about some outcomes. Full results below:



	Strongly agree %	Agree %	Disagree %	Strongly disagree %	Don't know %
My students enjoyed the event	71.4	28.6	0.0	0.0	0.0
My students are more excited about science	28.6	28.6	0.0	0.0	42.9
My students are more aware of careers in science	57.1	28.6	0.0	0.0	14.3
My students have a better understanding of the practices of scientists	42.9	28.6	14.3	0.0	14.3
My students are more confident in debating science issues	14.3	28.6	28.6	0.0	28.6
My students have a more positive view of science	28.6	57.1	0.0	0.0	14.3
My students are more confident in asking questions about science	14.3	85.7	0.0	0.0	0.0
My students have a more nuanced view of science	16.7	16.7	16.7	0.0	50.0
I have gained new ideas for teaching	0.0	85.7	0.0	0.0	14.3
I am more confident in using online tools in lessons	14.3	57.1	28.6	0.0	0.0
I am more confident in teaching Science	0.0	42.9	42.9	0.0	14.3
I am more aware of cutting edge science	0.0	71.4	28.6	0.0	0.0
I am more aware of my students interests	28.6	71.4	0.0	0.0	0.0
I am more aware of my students' attitudes to	14.3	71.4	14.3	0.0	0.0
I found the event easy to implement	71.4	28.6	0.0	0.0	0.0
Overall I was satisfied with the event	71.4	28.6	0.0	0.0	0.0



To enable teachers to report on their own outcomes from taking part in the event a free text question was provided. The teacher responses are listed below:

"Students discovering careers related to science and what they do in their field."

"Students gain awareness of interesting careers in STEM field."

"That students would get experiences talking with scientists in the field."

"getting the students engaged with the scientists"

"The students were able to meet real scientists on a personal level. The kids were very interested in what the person was like as well as what they were interested in studying. I was amazed at all the questions that my students asked and I was very impressed with the thoughtful and engaging answers. My students had even more questions after the discussion which is great!!"

"They were totally engaged and we could have easily gone on longer than 30 minutes. They simply had a wonderful time talking to people they would otherwise never have the opportunity to talk to."

"Students being able to interact with "real scientists" which gave them an idea of some careers out there that are not medicine or veterinary"

4. How are you planning to run *I'm a Scientist? and from the post-event questionnaire* 11. How did you run *I'm a Scientist?*

Teachers planned to incorporate *I'm a Scientist* into their teaching in a variety of ways and given more time would include it in their planning and embed it in their curriculum.



Pre-event

The one 'other' response was described in more detail as follows:

"I'm not really sure as this will be my first experience. Ideally, I would be able to coincide the scientist's research with what I am covering in class, but obviously this is difficult. Provided this is a positive experience, I will likely design a formal, ongoing "nature of science" theme for next year and these chats can be an integral part of that theme. In addition, I will likely develop curriculum to coincide with the chats that support NGSS and Common Core."


Teachers actually incorporated the event into their teaching in a variety of ways but primarily in lessons as an enrichment. Factors that may have influenced the way they were able to combine it with their curriculum included it being the first event, the proximity to the end of the academic year, their role as a teacher and the age of the students.



Post-event



5. What grade(s) of students are you planning to run *I'm a Scientist* with? *and from the post-event questionnaire* 2. What grade(s) of students did you run *I'm a Scientist* with?

Based on the questionnaire responses teachers planned to run the event with the key target audience of grade 6 to 12. The students who actually took part included grade 4 and 5 students. This matched the age range of students reported by teachers when they signed up to the event through the google form. Based on the survey results the greatest number of students taking part were 7th graders.



Pre-event

Post-event

6. Have the class(es) you're running *I'm a Scientist* with taken part in any of the following science enrichment projects?

There were only three responses to this question. None of the teachers who completed the questionnaire had previously taken part in *I'm a Scientist*, however, we know one of the teachers who registered their school had previously taken part in *I'm a Scientist UK*. None of the teachers reported a visit to their school by a scientist or a trip to a science festival. Of the three other enrichment activities, one was a visit to a science museum and another was a visit to Siemens Healthcare. One of the 'other' responses was a similar online live chat with a scientist:

"Earlier in the school year I conducted a live chat using Skype with a scientist from the Salk Institute. I was hoping to schedule more chats with them, however, it has been difficult securing scientists committed to the program."

7. Have you taken part in any of the following science enrichment projects?

This question was designed to ascertain the sorts of enrichment activities teachers carry out, or have carried out with their students, not specifically the classes they decided would be suitable for taking part in *I'm a Scientist*. Based on one of the 'other' responses it would be worthwhile rephrasing this question in any future questionnaires.

"Are you asking about me personally? If so then most of my own personal science professional development has mostly occurred via a few teacher interships in which I have participated over a few summers."

There were five responses to this question, three were visits a science museum, one was to a science festival and one was the 'other' response quoted above. Whether these enrichment activities were with students or for personal interest cannot be determined based on the phrasing of the question.



8. How many lessons do you plan to spend on this project? *and from the postevent questionnaire* 12. How many lessons did you spend on I'm a Scientist?

Teachers planned to spend up to 4 lessons on the event, though most planned to deliver just one lesson on it (40%).



After the event teachers reported actually spending, on average, 2.4 lessons on *I'm a Scientist USA*. None of the teachers who completed the survey reported spending more than 4 lessons on the event with their students. None of the schools took part in more than 3 live chats and both the questionnaire data and interviews indicate that teachers spent time in other lessons preparing for or engaging in the event in other ways. Noticeably the majority of teachers ended up spending two lessons (43%) on the event and the number who spent just one lesson fell to 14%.

9. Are you planning on also running other major science enrichment activities over the next few months? If yes, tell us what

None of the teachers who responded to the questionnaire recorded any other science enrichment activities. It is likely that holding the first event in May meant that there wasn't time for teachers to involve their students in other events and it is quite possible they did not report any activities planned for the following academic year.

Post-event questionnaire results

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

(See pre-event discussion)

4. What was the single most important outcome for you as a teacher?

(See pre-event discussion)

5. Does I'm a Scientist align with the curriculum?

Delivering learning experiences that enable teachers to cover parts of the curriculum provides a number of advantages to teachers who are often hard pressed to cover a large amount of material in a short amount of time. Therefore it is important to establish



if *I'm a Scientist* aligns with the curriculum in US schools and the greater US educational landscape. All the teachers reported that the event aligned with the curriculum they work to, though not necessarily when the event was run.

	Yes %	No %	Yes, but not during this event %	N/A %
School curriculum	71.4	0.0	14.3	14.3
State curriculum	71.4	0.0	14.3	14.3
Next Generation Science Standards	57.1	0.0	14.3	28.6

6. Is *I'm a Scientist* an effective way to overcome potential barriers to STEM education?

	Yes %	No %
Geography e.g. enabling students to engage with scientists in the classroom	100	0.0
Gender e.g. connecting female students with good role models	100	0.0
Poverty e.g. establishing a level playing field for student interactions with scientists	100	0.0
Ethnicity e.g. reflecting the diversity of the STEM workforce	71.4	28.6
Stereotypes e.g. dispelling the image of the mad scientist	100	0.0

7. Would you participate again? *and* 8. If you would participate again, would you sign you students up for a general science zone OR a topic specific zone e.g. astronomy?

All the teachers who responded to the questionnaire would take part in I'm a Scientist in future.





9. Was it clear the Hydrogen zone was a general science zone featuring scientists from a range of disciplines?



Prior to the event the naming of general zones was discussed, with planets, endangered animals and famous scientists, as well as the elements of the periodic table being proposed. It was decided that for the pilot the general zones would be named after elements of the periodic table, as they are in the UK event. Early in the event some teachers asked if the event was focused around the topic of Hydrogen. Choosing a suitable naming convention for the general zones is therefore important for teacher understanding.

10. Would you recommend taking part to a colleague?

All the teachers would recommend I'm a Scientist USA to their colleagues.

11. and 12.

(See pre-event discussion)

13. From a technical viewpoint, how did you find using the site?



14. How useful did you and your students find the following parts of the site?



In order to build upon and improve the event for teachers and students it is important to identify the aspects of the website that they found the most useful.

	Very useful	Quite useful	Not that useful	Not at all useful	We didn't use it
ASK - students asking questions	0.0 %	85.7 %	0.0 %	0.0 %	14.3 %
CHAT - live	71.4 %	14.3 %	0.0 %	0.0 %	14.3 %
VOTE -	57.1 %	42.9 %	0.0 %	0.0 %	0.0 %
Pupil profiles	42.9 %	28.6 %	28.6 %	0.0 %	0.0 %
Live chat	57.1 %	28.6 %	14.3 %	0.0 %	0.0 %
Staffroom	0.0 %	57.1 %	14.3 %	0.0 %	28.6 %
Teachers	14.3 %	42.9 %	14.3 %	0.0 %	28.6 %

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

Teacher packs were sent out to the participating schools in the weeks preceding the event. Each pack contained an introductory letter, student log-in cards, teacher briefing notes and a vaccination debate kit. The teacher briefing notes included three classroom lessons that have been designed by UK educators and trialled in UK schools.

	Used in full	Picked bits out	Did not use	Plan to use later
Lesson 1 - You're the judges	0.0 %	71.4 %	14.3 %	14.3 %
Lesson 2 - Meet the Scientists	14.3 %	71.4 %	0.0 %	14.3 %
Lesson 3 - Live chat	71.4 %	14.3 %	14.3 %	0.0 %
Vaccination debate kit	0.0 %	0.0 %	42.9 %	57.1 %

16. How would you rate the teacher briefing notes?

Teacher briefing notes were provided as hard copies in the teacher packs sent out to schools and placed on the website at <u>http://imascientist.us/resources-for-teachers</u>.



Teachers were informed of these resources by email and the classroom activities in them were advocated for the students.



17. If you used the CHAT (live chat) facility, what worked well about it? How do you feel it can be improved?

The following feedback was provided by teachers on the live chat facility:

"Had difficulty registering."

"My students enjoyed reading each other's messages and the replies they were getting"

"overall went well"

"It worked well, but it was hard for only 4 scientists to respond to all 25 students. Maybe having more scientists in the live chat would help."

"I thought it worked well. Initially students were a little confused by having 3 scientists in the same window, but they adjusted quickly."

"maybe more scientists so that all the questions could be answered. Some students didn't get their questions answered."

"It was simple and very user friendly. I wished I had a chance to review the chat since it went really fast. Also a chance to have saved the chat for future reference."

18. If you didn't book a live chat, can you tell us why?

There was only one teacher who didn't book a live chat. They explained why:

"Couldn't register and didn't have time at end of year to make connection. Great communication from Tristan, just not enough time on my end. It was suggested I complete in the Fall next year when more time available."



19. Was the VOTE part of the competition clear? Did your students vote more than once? Please tell us about ways it could be improved or how it worked well with your students.

Voting is an essential component of the event in its current format. Therefore it has to be clear and simple to engage with. Generally the voting was straightforward but reminders are required.

"It worked well and was very clear."

"Voting went well. Students had no difficulties."

"yes. They really liked it and felt an attachment to certain scientists."

"It was good that the moderator reminded us to vote, otherwise I think we might have forgotten. They only voted once."

"I needed to be more "on them" about this but it was difficult based on where we were in the semester"

20. What do you think about the number of emails you received in the run up to and

during the event? and 21. How useful was the content of emails you received? and

22. Can you suggest any information you feel was missing from emails about the

event?

The teachers were all happy with the number of emails they received, neither too many nor too few. The information provided was useful and the questionnaire didn't reveal any additional information that teachers would like to receive but one teacher did mention some confusion over the Hydrogen Zone.



"I really didn't understand the Hydrogen Zone at first. I understand first year in USA because UK site has much more available."

23. 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?

Many of the teachers commented on how much they liked the scientists and how well they engaged with their students. Though this cannot be controlled for in logistical planning of the event or technical adjustments to the website it reinforces the importance of careful selection of the participants in order to deliver an event that teachers and student value.



"I liked how friendly each scientists were to the students. I wish there was a possibility that students were able to video chat with the scientists were they write their questions and the scientists answer on the video."

Requests for a video component have been made by both teachers and scientists in other feedback. The technical challenges and potential impact on the event need to be considered before embarking on any upgrades to the site or alterations to the format of the event.

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

The answers to this question will help advise teachers in future to get the most out of the event.

"Have students modify their username right away."

"Make the voting more of a "thing" with my students by tracking the results more frequently"

"Yes, I would start sooner and involve a science class vs just Career Technology."

"I would have my students write questions for the live chat ahead of time and check them for a homework grade. I would give my students feedback for their questions in order to help them learn good questioning techniques."

"I would have the students spend more time learning about the scientists and their research first. I would then have them research questions before the live chat. They liked the live chat better than the ASK section."

"I did this pretty last minute, but next time I would probably build more prechat curriculum like assigning research topics regarding the work of the scientists. This would allow the students to have a much more in depth discussion than last time."

"I would like to develop some post chat curriculum that encourages my students to have ongoing conversation (emails) with the scientists. I would think that building deeper relationships would have a greater chance of influencing the students' thoughts about a career in science."

25. What was the best thing about I'm a Scientist?

Identifying the best aspects of the event will help to keep delivering what works well and maximize what teachers like. Teachers liked the key elements of the event – student scientist interactions.

"It was great because students were able to ask questions to real scientists in the field."

Other things that teachers really liked were the students learning about the scientists' jobs and research they carry out e.g.

"I teach at a Title 1 school. Most of my students' parents have not graduated college, so they really have no contact with the scientific community other than people like myself. I especially like the fact that these were field scientists (I have done a few live chats with the Salk Institute, but bats & bugs are much more fun than mitochondria."



Ultimately having engaged students was the best thing about the event -

"The live chat and the kids getting excited about the interactions. It was a whirlwind and the kids really enjoyed the personal attention. Even the kids who are shy were asking questions and getting excited."



6.4.3. Student questionnaire

A large number of students completed the pre-event survey (210) but only 10 students completed the post-event survey. Conclusions drawn from the post-event survey results should be considered in light of this low response rate.

2. What grade are you in at school?

The age of students responding to the survey ranged from 4th to 12th grade, reflecting the range of ages that teachers reported delivering the activity to. Almost half of the students who responded to the survey (46%) were grades 9 or 10, the key age range for the event. Noticeably there were a significant number of 4th grade students 23%.



3. Are you a...

There was an even mix of girls and boys with few student reporting to be working together from one log-in.





4. How does school make you feel about science?

Despite the differences in reporting rates there are surprisingly similar results to this question. It could be concluded that students who are bored or not excited by science are less likely to complete the post event survey, accounting for the differences in the results.



5. Are you planning to choose a science subject at the next stage of your education?

Like question 4 the results of the post-event survey are surprisingly similar to the preevent survey and show little change.





6. Do you think jobs involving science are interesting?

There was a noticeable difference in the students perceptions of science jobs following the event with those who found it very interesting increasing from 34% to 60%, and the proportion of students who didn't know if they were exciting decreased.



7. When you finish your education, how likely are you to look for a job that uses your science knowledge and skills?

As with questions 4 and 5, once again the pre and post-event responses are very similar and the possibility that the event has engendered a change in the career paths of students cannot be inferred from the data collected.





6.5. Classroom observation

The classroom observation results are documented in case study 7.1 – Vestal Middle School. The approach adopted for the observation involved recording teacher instruction and events in the classroom including the reactions of the students along with more focused observations on one student chosen randomly at the beginning of the lesson. The observation checklist employed was based on an instrument used in classroom observations conducted as part of previous *I'm a Scientist, Get Me Out of Here!* evaluations. Evidence of learning was recorded based on Generic Learning Outcomes (GLOs) developed from the Inspiring Learning Framework

(<u>www.inspiringlearningforall.gov.uk</u>). These GLOs align closely with the NSF informal learning framework measurements of impact and were chosen to allow the results to be compared with the findings of previous *I'm a Scientist* evaluations.

Generic Learning Outcome	Evidence
Knowledge and	Scientific facts and information, broad concepts.
Understanding	
Activity, behaviour and	Interactions with the website, asking for another chat
progression	session, enquiring about science careers.
Enjoyment, inspiration,	Observation showed enjoyment, excited students full
creativity	of energy.
Attitudes and values	Opinions or attitudes towards scientists e.g. pleased to talk to them, find out about what they do, what
	their favourite superhero is etc. Attitudes towards
	science and science careers. Positive or negative
	attitudes in relation to the event.
Skills	Communication, intellectual or information
	management skills e.g. preparing questions.

When interpreting the results of observations it is important to recognise that these are subjective measures that do not directly assess learning.

6.6. Interviews

Interviews were conducted with three scientists and three teachers. Two interviews were conducted in-person and recorded with a video camera the other interviews were conducted via Skype or google hangout and recorded with screen capture software. The scientist interviews were conducted towards the end or shortly after the event, whereas the teacher interviews took longer to organize, in part due to the end of the school year. The feedback provided in the interviews is documented in the corresponding case studies (section 7).



7. Case Studies

7.1. Vestal Middle School, Vestal, NY

School: Mixed state middle school serving 863 students from grade 6 to 8.

Teacher: Jaime Hurlbut

Class: Grade 7, Science, 22 students (10 girls, 13 boys).

Lesson observation at Vestal Middle School: Online chat.



Number of live chats: One at the start of the second week of the competition.

Student/computer ratio: 1:1

Number of lessons spent on I'm a Scientist USA: two

Scientists: Four scientists attended the live chat.

Lesson observation (Generic Learning Outcomes are noted in brackets)

The lesson started at 11:29am and ended at 12:09. Students came in and were instructed to collect their laptops by the teacher. A female student entering the class said "*I can't wait to speak to Jeff today"* (Enjoyment, inspiration, creativity).

Students were reminded what was going to take place during the lesson. The students had tested their log-ins, looked at the scientists profiles and prepared questions in a previous lesson.

Ms Hurlbut provided instructions and guidance on logging-in using the interactive whiteboard. She had to provide additional guidance for the students to locate the live chat.

Students worked independently on individual computers. A couple of students were unable to log-in initially. With help and retrying all but one were able to log-in with the details provided on their log-in cards. Ms Hurlbut provided the remaining student her own computer to ask questions.

Key observations in the classroom

- The class was generally focused on the live chat.
- Students had prepared questions in advance of the lesson and submitted them to the scientists during the live chat. (Activity, behaviour and progression)
- Some students talked amongst themselves about the questions they were posing, others were quieter and focused on the conversations on-line. (Skills)
- Quite a few students asked why the scientists weren't yet online or why their questions weren't being answered. (Attitudes and values)
- Another exclaimed "Yay, Kenzi's here!". (Enjoyment, inspiration, creativity)
- There was lots of interest in the GMO question: "Student : kenzi are you personally against gmo's @Kenzi Clark." "Kenzi : @Student- no, I'm not



personally against GMOs. I think they can be very beneficial, in some cases. They help reduce usage of pesticides on crops, have added Vitamin A to rice. Lots of good applications!" (Knowledge and understanding, Attitudes and values)

- The student provided with Ms Hurlbut's log-in got lots of compliments from other members of the class for asking good questions in the live chat. (Attitudes and values)
- One of the students lost track of the questions she had asked.
- The class collaborated to ask the scientists a question. (Skills)
- The live chat continued until the end of the lesson and some students started to pack up and log-off before the live chat had concluded.
- When asked what they thought of the live chat and if they had learned anything two students responded with "*it was fun"* and "*lots of stuff"*. (Enjoyment, inspiration, creativity)

Observation of one of the members of the class (284hyda26) identified the following student activity and reactions:

- Intermittently appeared interested but was consistently on task and involved in the class activity. (Activity, behaviour and progression)
- Appeared very confident in engaging through the live chat format. (Enjoyment, inspiration, creativity)
- Asked question in the live chat. (Skills)
- Appeared pleased with successes interacting with the scientists. (Enjoyment, inspiration, creativity)
- Engaged with other students in the classroom, for example:
 - "*let's ask another butterfly question"* (Skills)
 - Discussed what makes a good question. (Knowledge and understanding)
 - "Why do some students get better responses to their questions?" (Knowledge and understanding)
 - Discussed with his neighbour why some questions are deleted Ms Hurlbut pointed out to him that you need to take the activity seriously. (Activity, behaviour and progression)
 - □ Asked who user XXX is?
 - □ Asked the class if Lindsay had made the most comments.
 - "She answered about the pie!" (Enjoyment, inspiration, creativity)
- The student stayed logged in and asking questions after the lunch bell rang, finishing up and logging off when the live chat ended. (Enjoyment, inspiration, creativity)

Questions asked by the student (284hyda26) in the live chat:

"284hyda26: @jeff I know you have studied bats... How are bats related to birds... i know they both fly lol

@Zoe How long is the butterfly cycle??? Zoe : 284hyda26 -depends on the butterfly. some are only a few days, while others take years.

284hyda26 : @Jeff Why do bats hang upside down Jeff : @Saqqara and @284hyda26: bats hang upside-down because evolution has modified their arms into wings. this means they can't use their arms to hold onto things like other mammals can, so they hang upside-down as a result!"



Live chat excerpts

A lot of the interactions in the live chat revolved around straight-forward question and answers e.g.

"Student : Jeff what is the biggest bat that ever existed (wingspan etc.)" "Jeff : @Student : the largest bat is the giant golden-crowned flying fox, which can have a wingspan of 5-6 feet wide"

Students also commonly asked the scientists their opinions e.g.

"student : @Jeff, what do you think is the most interesting thing about bats? Mo : @student thats an opinion. Jeff : @student : i think the most interesting thing is that they're super diverse - so much more diverse than most groups of mammals, that can do many different things around the world"

They also asked about careers in science e.g.

"student : @kenzi how did you get into microbiology? Kenzi : @student - I took food microbiology and fermented foods courses in college that I really found interesting. Plus, I worked in a microbiology lab in undergrad. I had to start out washing dishes!"

Other comments and irreverent interactions included:

"439hyda26 : (0.0)/ so excited"

"Student : Mabye we're bombarding the scientists with too many Q(s)."

"jaimehurlbut : <3 all you scientists we have to go soon Thanks for being able to answer our questions"

"Student: @Lindsay @Jeff @Zoe @Kenzi Do you like pie? Jeff : @Student i love pie Zoe : @Student -i only like apple or strawberry rhubarb pie. do you like pie? Do you like Pi? Student: Yes I do! I love pie and pi! @Zoe Lindsay : @Student Pumpkin or Key-Lime, please! Zoe : my fingers are quite tired. Student: I can only imagine your pain... @Zoe Zoe : @Student -I think i will live. I just need some pie to make me feel better [smiley]"



7.2. Zoe Getman-Pickering, scientist

Zoe is a graduate student at Cornell University working towards her PhD. This is how she described her work to the students:

"I study predatory insects, and the fear they cause. I also study how plants talk to each other through huge underground fungus networks."

Zoe came fourth in the event but contributed the most lines of live chat



out of all the scientists. She took part in all 17 live chats and answered 96 questions.

Zoe was interviewed during the second week of the event in her laboratory in the Entomology department of Cornell University.

Where do you work?

Department of Entomology, Cornell University

What do you research?

"I study fear in insects, looking at how predators affect prey and change their behaviour. We're currently working Colorado potato beetles and spined soldier bugs."

Why are you taking part in I'm a Scientist?

"it sounded like fun. Science is useless without communication, so I wanted to get a little bit more practice communicating my research with all different age groups."

How did you hear about I'm a Scientist?

"I got an email from the Cornell Department of Entomology, we get requests for any sort of outreach activities about once a week."

How has taking part in I'm a Scientist improved your communications skills?

"Definitely getting better. We have a profile we have to build for I'm a Scientist and since it's started I've completely gone back, reworked a lot of my answers now that I realise what people are interested in and what about my work is interesting to other people."

What do you like most about I'm a Scientist?

"It's really great to expand your thinking; when you're a grad student you focus on this one tiny problem in this small subset of the broad picture of science and when you do I'm a Scientist you have to just totally get out of that narrow mind-set and put your work in a much larger context and it's a really great mental exercise."

What will you do with the prize money if you win?

"I would use that money to bring insects to a lot of the classrooms, especially the underfunded classrooms in upstate New York and possibly New York City. Kids love



getting to handle real live creatures and so I think that bringing insects into the classroom and letting kids handle them is a really great way to get kids interested in science and less afraid of insects in general."

What do your colleagues think of your involvement in I'm a Scientist USA?

"I've had to explain to a lot of the people I work with what it's like just because when I'm doing the chats either in the lab or in the office I am so focused on answering questions and interacting with students people will walk by and talk to me and I have no idea what they said, who they are, what's going on, so I have to apologise and explain after but they all seem to think it's a useful way to get better at communication."

Have you had any surprising moments or interaction?

"Just yesterday I was in the middle of a chat and one girl said she was really inspired by something I said, which was really wonderful to hear. When you are doing it you know that the point is to inspire kids but when you are busy in the middle of typing as fast as you can it can be difficult to know how much your words are getting through to them, so to hear that I was really happy and moved."

What do you think of the students?

"I was surprised at the level of the questions that we've been getting. I don't think I was that smart back in 4th grade, 5th grade, 6th grade, but we've been getting some really thought provoking questions and the kids are just so enthusiastic and so engaged during the chats."

What could be better?

"It's been pretty wonderful. I think the only thing that could be better is if the scientists had easier access to the students' profiles before and during the chats. I think that would help us target our answers to the interests of the students. When we are answering ASK questions we get a chance to look at the students' profiles and often there some interesting information such as they hate the tests or they love playing with machines and then we can target our answer and say if this interests you then take a look at this area of science, or a professional scientist doesn't have to take tests.

It would be nice if there was an easy transition between ASK questions so you could answer a question and then just hit next and it will take you to the next question that needs to be answered, that would just be slightly more convenient."

Can you sum up *I'm a Scientist* in 3 words?

"Challenging, enthusiastic, zen."

Other feedback

Zoe enjoyed that taking part resulted in her learning interesting facts such as "which insect is the most poisonous?"



7.3. Jeff Shi, scientist

Jeff is a graduate student at the University of Michigan working towards his PhD. This is how he described his work to the students:

"I study the world's bats, and how evolution has molded them into a group of superhero-like animals as spectacularly diverse as Batman's gadgets."

Jeff won the event. He also provided 33% of the ASK answers, answering 127 questions. He took part in 14 live chats and contributed 26% of the live chat content.



Jeff was interviewed after the event via a google hangout in his office at the University of Michigan. The following answers were transcribed from that interview.

Where do you work?

"The Department of Ecology and Evolutionary Biology and the University of Michigan's Museum of Zoology."

What do you research?

"My research is on bat evolution and I study modern bats and their patterns of evolution over long periods of time. What I'm really interested in is how their skulls have changed shape over long periods of evolutionary history."

Why are you taking part in I'm a Scientist?

"There are a few reasons I'm taking part in I'm a Scientist. One is to get my research out there and seeing how people react to science. I'm also interested in getting as many people as possible interested in science, especially from a very young age because it's great to see people being interested and maybe doing research themselves in the future or just generally supporting scientists in the future."

How did you hear about I'm a Scientist?

"I heard about it from a friend, who knew someone who had participated the UK event or had himself participated in it. He told me a week, or very soon before the deadline, so I just very quickly put together an application."

How has taking part in I'm a Scientist improved your communications skills?

"I think it's definitely improved my ability to communicate in just text and not being able to demonstrate anything or pick up anything or show anything, which I think is actually an important skill, especially as so much of science is done through writing and news releases and things like that."

What do you like most about *I'm a Scientist*?

"The best part is remembering that the vast majority of people are interested in very different things about bats and science and I forget that a lot of cool things about my science and my research. I think that was definitely the coolest part, putting myself



back in the shoes of a beginning scientist or someone who isn't so deeply embedded within the science."

"It's easy to get bogged down in minutiae and only talking to people who really get what you're doing."

What could be better?

"I think it would be great if we didn't have to type out the names of who you are responding to, if you had the functionality where you could click their name and it would just go to that person and tells you who you are responding to. We're trying to make really quick connections with students so I think it would really help to bond to specific students and not worry that we're missing x, y, z students because we're not typing all their names down."

What will you do with the prize money if you win?

"I'm using the prize money to 3D print a bunch of bat skulls that I'm going to use to do a lot of things. It's one of the easiest things to show just how different they look to each other and how different they look to other mammals. I like to demonstrate how different they look from mice and rats for instance. It's pretty easy to see if you have the skulls right in front of you."

What do your colleagues think?

"A lot of people in my department have been asking when it's happening again because they would like to give it a shot. A lot of people in my department do very cool work on very different organisms. It's a particularly good field for engaging young people, it's not sat in a lab all day."

Have you had any surprising moments or interaction?

"One student asked me how to specifically get into bat research. I just sort of fell into it by accident and there's no specific training for bat biologists, but I tried my best to tell them what sorts of organizations around the country are really involved in conservation projects, research projects and education projects. And hopefully he or she went to those websites."

What do you think of the students?

"One thing overall I was generally impressed with how engaged they were, because I work with students a fair amount and you get a whole variety of students , from ones who are very engaged and interested in everything you have to say to very unenthused students who are only there because teachers or parents are forcing them to be there. But I was genuinely impressed and surprised that the students were engaged, not just with me but with all four of the scientists and everything they were doing as well."

Can you sum up I'm a Scientist in 3 words?

"Chaotic (as a nice thing, a controlled chaos), engaging, educational."

Other feedback

"I think all four of us actually made real connections, even though it was over the internet and we didn't meet any actual new students I feel like I was actually doing some form of civic engagement it was really engaging."



"I learned a lot about how kids picture science. How they're teaching young students about science and I think it was very educational for me. I think it was very educational for the students but speaking entirely selfishly I learned a lot from the event."

"I just love that this event exists and I think the format is really cool, all the scientists are at least involved for one week so we can all learn about each other and get engaged with each other. I love that students would ask general questions and we would all answer and have debates about it. I think it was great that we represented so many different types of science. It's great for kids to see."

"Reinvigorating"



7.4. K. Lindsay Hunter, scientist

K. Lindsay Hunter works for a non-governmental organization – Sepela field programs- in South Africa. She was one of the "underground astronauts" involved in the Rising Star Expedition discovery of Homo naledi. This is how she described her work to the students:

"As a biological anthropologist, I study human bones and fossils to learn more about our past. I also look for new ways to keep monkeys and farmers from hurting one another. It's like a cross between "Bones" and Jane Goodall!."

Lindsay came second in the event. She provided 34% of the ASK answers, answering 128 questions. She took part in all 17 live chats and contributed 32% of the live chat content.



Lindsay was interviewed after the event via a Skype call to her home in South Africa.

Where do you work?

"I work with Sepela field programs and it is a private field guiding and scientific anthropological research organization that is based in Port St. Lucy in Florida."

What do you research?

"My work with Sepela is based on human wildlife conflict research, so it looks at how humans and non-human primates interact and ways that we can improve those interactions. Vervet monkeys in particular have a really bad rap down here in South Africa, if you are not from the area you think of monkeys as really amazing, which they are, however they are extraordinarily clever and can be very destructive and this is a huge problem for farmers who will sometimes use lethal means to control their populations. It's a subject that a lot of people, for instance in the US, who live in rural areas if they have problems with possums, raccoons or deer, are familiar with this type of human wildlife conflict. We're looking at ways we can improve the relationship and keep them separate, because we also know most emerging diseases are coming from wildlife, non-human primates in particular"

"I am a biological anthropologist by training, so that means I study humans, but I study them from a physical standpoint or a biological standpoint, I look at their bones. My specialty is ribs, in particular those from Neanderthals and early modern humans as well as a variety of eco-geographically distinct modern human groups who are living today."

How did you hear about I'm a Scientist and why are you taking part?

"I'm very interested in science communication and that was the first thing I had noticed about *I'm a Scientist*. Through Twitter I had seen *I'm a Scientist* UK and then saw the new iteration *I'm a Scientist US* and that just seemed absolutely perfect. I really, really, really wanted to take part because I love interacting with students so much."

"When you are growing up and trying to decide what it is you want to do the people who influence that the most are those that are able to give you a personal account of what it's like to do it that's not just about the science, but also how they felt about it, what they're scared of, what they enjoyed most. That helps you put yourself in that position



and that was the kind of thing I enjoyed doing and I really really wanted to do it with I'm a Scientist."

How has taking part in *I'm a Scientist* improved your communications skills?

"The chats were a little bit chaotic for me. I didn't type nearly as fast as I would have liked and I didn't feel I was answering questions as quickly or as completely as I would have liked to, or that I was able to follow up questions which I would have liked to. What I learned is that on the fly I do a lot better if I am able to speak loudly rather than type. I also learned that I do better with the ASK answers which were longer and I structured more like blog posts. I don't know if the kids responded well because we didn't get a lot of comments back. I like to think that those were informative. It's the kind of answer I would have liked so that's where I was coming from there."

What do you like most about I'm a Scientist?

"I really really thoroughly enjoyed the Ask questions. I enjoyed being able to answer those in a longer format. I liked that you had the chat paired with the ASK questions, you would recognise a handle from someone and you would be like, oh that was the person who I was chatting to and I was able to answer their follow up question in a longer format and give them a better answer. In a chat there are so many questions being asked of you and sometimes they're questions that really deserve a good long thoughtful answer."

What could be better?

"I don't know if it would be easier if all the kids chatted to one person at a time. It was confusing to have chats coming across to other people at the same time and I wasn't sure who they were directing questions to. The format where you're having to chat at someone was a little bit confusing because sometimes the kids would forget to add the persons' name. When you're doing it on the fly you're scrolling over to the left and seeing when your name pops up and trying to answer that question as quickly as possible, which is a bit hectic. A longer chat period or more structure to that, maybe where the scientist is open and they pick a time period and school students just come into it. The chat was so hectic, it was fun, like brilliant beautiful chaos, but I was always just like, nooo it's over and you didn't want to leave, there were more questions. It's difficult if the students are only asking one of the scientists' questions. I guess you have to get your hustle on."

Have you had any interest or support from your organization?

"Sepela thought it was fantastic, they tweeted and retweeted a lot of the information and shared information that I put out about it on their Facebook page and that was because education outreach is very important to our program. So being able to show we are out there is something we would like associated with our brand and the research we are trying to disseminate."

What do your colleagues think?

"I had an immensely positive response, from people that I know and all the people on twitter. I know that one scientist and one teacher have contacted you for more information and that they are interested in participating. Overwhelmingly positive."

Have you had any surprising moments or interaction?

"There were a couple of moments where they were asking about religion and science and that's something I wouldn't normally talk about, my religion. I feel it's important to



show that diversity because a lot of scientists aren't religious. I think for students who are interested in science and are religious it's nice for them to see that they don't have to pick one."

"The ability to talk about my ADHD, something you might not necessarily associate with a scientist and put a face on that and I'm doing well and successfully and able to do something you might be interested in. If you have something similar or see yourself in that then it might help. I think all of the scientists did something like that."

"Saying that this wasn't a subject I liked in school but I really needed it and I wished I'd paid more attention. I thought those moments were really great."

What do you think of the students?

"The kids seemed to love it, they love it and it's working, it's hard to judge as an adult because you're like, I had this agenda and this thing to say, this point to get across and maybe I'm just taking that too seriously."

"It's really easy to see where a class has been properly prepped in advance and they had questions ready and they had read the profiles and knew who they were going to speak to. I felt that when the class were prepared well it went really really well."

"The questions asked were very good, the students were very mature. We got a lot of questions, "what's your favourite colour?" "what's your favourite animal?" but I like getting those because I think it's nice for them to see that scientists don't just science all the time. The students seemed to be really interested and engaged."

Can you sum up I'm a Scientist in 3 words?

"Transformative"

Other feedback

"I had so much fun, thank you so much for inviting me, it was a really amazing experience. For two weeks it was *I'm a Scientist* all the time."

"It was exceptionally well managed, as far as any sort of communication event could be and I was very impressed. You did an excellent job moderating and I think it all went off very well, very professional."

"The communication aspect is going to be increasingly important for scientists in the future, you can't just do science, you have to be able to disseminate it well and communicate it well to all different kinds of audiences. That was important to me."

"Being able to interact with students gives you a greater perspective on what you are trying to achieve."

"It's a more personal level of communication. It's nice to feel directed towards a person rather than a vague audience. That you're interacting with someone."

"No-one walking out of that was the same, I'm a Scientist is amazingly transformative."

"It takes students and makes them scientists and scientists and makes them students and I think that it's an amazing project and I was so grateful to be a part of it."

"Everyone who participated had a lot of enthusiasm and empathy for the kids, and they were taking it seriously. It looked like everyone was enjoying themselves."



7.5. St. Mary's School, San Francisco, CA

School: St. Mary's School is a Catholic collegepreparatory K-8 school serving Kindergarten to 8th grade students.

Teacher: Jojo de Guzman

Students: Grades 5 and 7

Class size: Nine 5th graders and fourteen 7th graders.

Number of lessons spent on *I'm a Scientist USA*:

Number of live chats: One during the first week of the competition.

Scientists: Three scientists attended the live chat – Kenzi, Zoe and Lindsay.

Jojo heard about *I'm a Scientist USA* through Twitter from one of the participating scientists K. Lindsay Hunter. He was actively posting



🗘 Following

Students' reaction to Zoe's spider. Thanks again! @imascientistUS @Paleo_Bonegirl @clarkkenzi @CornellCALS #NGSS





tweets and photos during the event (see example picture on the right of the class looking at a picture of a spider Zoe sent to the class during a live chat).

Jojo enrolled one class in *I'm a Scientist USA*. A couple of years ago the school started implementing a STEM program and this year Jojo is adding blended learning and the flipped classroom into their teaching.



Live chat snippets

Student : @kenzi Who inspired you to be a scientist?

Kenzi : @*Student* - my mom and my biology/chemistr y teachers in high school! My mom always encouraged me to play around in the kitchen, and my teachers made science super fun and helped me apply it to food...something I already loved playing with.

Student : @zoe have u come across that spider that lives in a hole in the ground? Zoe : @*Student* -i have found spiders that live in holes in the ground. they look pretty cool.

Zoe : The coolest spider ever «link» Student : The spider has a face!!! OMG Student : @Zoe What kind spider is that NEVER saw onex Zoe : @ Student -its a peackock spider. they live in australia

Jojo was interviewed a few weeks after the event via Skype.

What subject do you teach?

"5th and 7th grade STEM and religion.



How old are your students?

"My 5th graders are 10 or 11 and my 7th graders are 12 or 13."

How did you hear about I'm a Scientist?

"Twitter."

What sounded the most appealing aspect of *I'm a Scientist* and what was the most important outcome for you as a teacher?

"The main reason is the connectedness and looking for ways to make science real to my students and I thought that interacting with real scientists and learning about what they do would be a great way to show the students different types of science."

Why did you decide your students should take part in *I'm a Scientist* and did they enjoy it?

"They enjoyed it because they were able to connect with scientists. They were able to ask questions that they may not have thought about asking me, or it's just something out of the range of my knowledge and being able to ask people that are experts on it. It would really get them to start thinking more about science and not just things they would read in textbooks or online and think about other careers that are possible."

"My students have so many questions that I don't know how to answer."

Did your students enjoy the event and are they more excited about science?

"Absolutely, they are excited about what is out there, seeing how much people love what they do for a living and I think there is nothing that can really replace that. If you see a genuine love for what you do it's contagious."

Are your students more aware of careers in science?

"I hope so, it's something we try to push to students to think about the world out there. We know that it's not just about making money, they have to find something that they love, something that's worthwhile for them, something that's interesting and something that's going to make them excited about going to work every day. Having met those scientists is really an eye opener for them."

Do your students have a better understanding of the practices of scientists?

"Even when we go on field trips there are some questions they can ask one or two scientists in the museums, but to have the dedicated time for your questions to be answered and some of your classmates answers may really make you think about certain fields of science; that was really good."

Are your students more confident in debating science issues?

"I'm not sure, but it definitely got them thinking about things we wouldn't normally talk about. We focus a lot on the standards and the grade, but it did give us the time to almost take a little break from the daily grind of the classwork and projects and do something that is more forward thinking, that is thinking of long term goals."

Do your students have a more positive view of science?

"Yes, absolutely."

Are your students more confident in asking questions about science?



"Some students are really shy, their range of willingness to be open is quite big, but the shy ones were some of the most talkative in chats and I like to see that."

Are you more aware of your students interests?

"Yeah, I remember one of my students was really interested in bacteria in food and I didn't know that. There was another student who wanted to know about being a moderator because he was interested in that. It allows me a chance to see more from their point of view."

How did you run *I'm a Scientist* with your students and how many lessons did you spend on it?

"I had three days. I didn't use the whole science class for two of them because we have a schedule. The first day we set-up the accounts, getting them prepped, explaining the goal and what's going to happen. Second day we talked about the scientists section, going through the teacher pack and doing the dating lesson. That got them ready for the chat. The day after we had the chat. The day after that we back tracked; "what did they learn from it?" "what did they like?". I was able to keep going for about a week or so when they were voting and that brought back some of the conversations, that I was then able to use as a springboard for further discussions."

How has taking part in *I'm a Scientist* improved your lessons or your teaching?

"Once I knew what interested the students it made it easier for me to connect science more towards their interests. I think throughout the year you're always trying to find ways to connect to your students and find out what will bring the best out of them and knowing what interests them is a good way to understand how to reach them and connect with them."

How well did I'm a Scientist fit the curriculum?

"It didn't take too much time and it's flexible and you can do a lot of things with it, but for me it's more than the standards and I think that the school would agree with that too. Standards are great but we talk a lot about 21st century skills, that they're able to communicate, being able to be respectful in the chatroom is something that was important. It's something you won't see in NGSS or California science standards, but it's still an important skill to have."

Does I'm a Scientist offer any advantages over other STEM programs?

"It's nice because a lot of the resources are provided. It makes my job a lot easier. It was nice because it was stretched out. We've had some people come in and give presentations, but that was a one-time thing. We've had STEM fairs that have been very intensive, but this lets them take a break, we're still talking about science and learning those 21st century skills but it's not labor intensive. But it also could be, I could have the students do more research. I thought it was good to just let it grow organically, so the students could take or put as much or as little into it as they wanted. For the most part all the students put something in and got something out of it. They were excited to see their favorite move on and they were sad when they eventually got kicked out. But they enjoyed it and they were still focused on science"

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



"I like it, I know the scientists tried to get as much information as possible out there whilst still making it feel informal and not just, here's the question, here's the answer. I liked the back and forth that they had."

"Students had to logout and log back in to get everything working, but that was the only thing. In terms of technicality it seems pretty straightforward."

What would you do differently next time or what advice would you give other teachers taking part in *I'm a Scientist*?

"I wish I had got them to create their usernames earlier, I had to give them time to do that, but it helped them feel unique, that there not just another person on the chat, that they have a voice that is unique to them."

Other feedback

"Nothing beats hands-on training, we can talk about it all we want and give them worksheets and tell them this is how you're supposed to act when you're online, but having a chance to do it in class, nothing beats that, because who knows what they do once they are at home and they're talking to their friends on social media. Having something in the classroom you can control and having you there as moderator, made it so much easier. It's nice that there is a voice that says what is acceptable and gets the conversation back on topic."

"I'd like it if the chats were available so we could go back to it and dive into it in more detail, to use as a springboard to more questions and to review what went on in the chat."

"It helped them see you've gotta participate, you've gotta make your voice count."

"Having the one that they wanted not win was a good learning experience for them. They need to understand that. Failure is OK. You fail and you get up and it's how you react to it. We encourage making mistakes if you are going to learn. That was a really good real life example."

"That's what makes the class a community, finding a common theme everyone can get behind. Rooting for a scientist to win."



7.6. Kearney High School of International Business, San Diego, CA

School: Kearney High School of International Business is a High School serving 435 students in grades 9 to 12.

Teacher: Lesli Horowitz

Students: Her students are 15-16 years old. Lesli enrolled two classes from grade 10.



Class size: 30

Number of lessons spent on I'm a Scientist USA: One per class.

Number of live chats: Two, both in the first week of the event.

Student/computer ratio: 1:1

Scientists: Three scientists attended each of the live chats – Lindsay, Jeff and Zoe.

Kearney High School of International Business is an inner-city high school that "implement the principles of the small school methodology while remaining focused on the needs of our unique student population, 74% of whom receive a free or reduced lunch and 34% of whom are English Language Learners." (Principals message <u>http://www.sandi.net/domain/3843 Accessed June 2015</u>). Almost 20% of students are English learners and over 50% are of Hispanic or Indochinese ethnicity. With the advent of the district's Integrated 21st-Century (i21) Interactive Classrooms technology program, all classrooms now feature a Promethean interactive whiteboard and have either a cart of netbook computers or iPads.

Live chat snippets:

"374hyda39 : are there any internship programs for students interested in researching and learning more about bats?

Jeff : @374hyda39: depends where you are! there are definitely places all around the world to help you learn more. Bat Conservation International is a great place to start learning more"

Lesli was interviewed via Skype.

Where do you work?

"I work at the Kearney High School of International Business in San Diego."

What subject do you teach?

"I have been teaching Biology there for nine years."

How old are your students?

"They are sophomores in high school so they are generally fifteen years old."

How many students are in your classes?



"They average thirty students."

How did you hear about I'm a Scientist?

"I am trying to set up a student scientist program for my classes with scientists from the Salk institute. I met Dr Abby Buchwalter at an event and she is interested in doing something similar and she told me about you guys and forwarded your information to me."

What sounded the most appealing aspect of I'm a Scientist?

"I think the live chat is fantastic. When we got on and the first student asked a question and the scientist responded directly to them using their username they just shouted in the middle of the class "They answered my question!" and that in itself was something they had never experienced before, they just know teachers in that capacity."

"I really liked that they were young scientists, sometimes it's hard for my students to identify with your typical stodgy scientist and my goal is for my students to see themselves in those shoes, so somebody they can identify with is a lot better."

"Also the geography, because I'm in San Diego we have a lot of science here and I can bring in guest speakers but they don't leave the community, they don't have opportunities, they haven't travelled, some never even get to the beach and they live 20 miles inland. So the fact that one girl was online from South Africa and one of the guys was from Michigan, the fact they were somewhere else was appealing because I want to grow an international connection for my students.

Why did you decide your students should take part in *I'm a Scientist*?

"All of the students have no experience or access or any idea what the scientific community looks like or does, have never met a scientist, the majority of their parents haven't graduated college, they are first generation, a lot are fairly new to the country and my initial goal was just trying to expose my students to the community so they have an idea of what it even looks like."

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

"I wanted an enjoyable activity because it's getting near to the end of the school year and everyone is getting pretty tired and not so interested in school work, so just to have a positive experience. Connecting them with people and having a positive personalized experience, that was the best part. The students felt the scientists were talking to them as individuals, they were very excited about that."

"In the future I'm interested in building more longer terms relationships between the scientific community and my students. I will likely design curriculum around it that supports Next Generation Science Standards and Common Core. I would like to integrate it to support our new standards."

Did your students enjoy the event?

"Every time a scientist would answer a question one of them would turn to me and raise their hand or yell "They answered my question!" and they've just never experienced something like that before in a traditional classroom setting."

"I've had guest speakers and even when it's a Skype guest speaker with the more formal setting they are very intimidated to ask questions. But with this forum because it was an online chat they jumped right in."



"Bats and bugs were very easy for them to jump in and get excited about. So I do think topic choice or scientist choice is an important contributing factor in how the chat goes."

Are your students more excited about science?

"I can't really say that based on two 30 minute experiences. I believe that over time if students have many opportunities like this my students will have a positive feeling about science so that when they are out of school they're not intimidated to read science articles and they have a positive view of the scientific community and they are not skeptical and that they participate as citizens and when they vote they are comfortable reading scientific information and asking questions. So it doesn't feel like this elitist community that they can't communicate with. I think programs like this will probably lead to that."

Are your students more aware of careers in science?

"Yeah I think they do. We hadn't really covered ecology yet and I hadn't talked to them about what it's like to be a field scientists so realizing that normal human beings go out and study this, I think some lights may have gone off in their brain. When we show some video about scientists doing some studies or field work it still feels very far off to them."

"I would like to do it again with the same scientists, so the students had the opportunity to follow that particular scientists work and get to know them. I think that could possibly have a larger impact."

Do your students have a better understanding of the practices of scientists?

"From two 30 minute chats, we didn't really get into that it was much more questions about the scientists particular topics and not how they practice or the scientific method but if we had more time with the same scientists I can see how that would easily become part of the discussion."

Are your students more confident in debating science issues?

"It was really factual and nothing I felt was controversial. I think that would be fun. My students do enjoy debate but to do that it would be nice to know in advance, is there anything controversial about studying bats. If I know that in advance I could have my students do some research and then talk to the scientists about what they thought and their experience."

How did you run *I'm a Scientist* with your students and how many lessons did you spend on it?

"Aside from the live chats, other than talking about some questions the day before, I didn't have any additional lessons on it, but I fully intend to coming around to the fall."

How well did I'm a Scientist fit the curriculum?

"Common Core and Next Generation Science Standards are really encouraging students to do research and learn how to use peer review science sources. That's something I'm trying to include in my curriculum and being able to tie it into a live chat would be very nice."



Does I'm a Scientist offer any advantages over other STEM programs?

"One of the aspects that I'm a big proponent of, in something like this, is the multidirectional interaction, there's no lecturing to on the part of the scientist. There aren't many places you are going to get that unless you're in a one on one type of program."

"The honest truth is I haven't been able to take my students to a museum in about five years due to budget cuts. So we don't get out of the classroom, so I have to figure out ways to bring science in. I have guest speakers but the ones that go well are always multidirectional, even if it's online."

"This wasn't part of yours but they love the virtual tour, they love seeing equipment, seeing someone use it, they love seeing what the lab looks like. They have no idea what anything in science, outside of the classroom, looks like. If the scientists in your program had a video component before, or some kind of a video virtual tour, I think all of that would be very helpful. Then the students when they are chatting have a better idea of what they are talking about and are able to ask better and deeper questions."

Have you had any interest from other teachers or staff in your school?

"In the fall I would definitely pass on the information to the other scientists in my school."

What advice would you give other teachers wanting to take part in *I'm a Scientist* with their students?

"The one thing I wish in the future is to take advantage of the follow up opportunities and build a little bit more of a relationship with the scientists."

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

"We did have some technical problems but I think it was our end. We had some logging in problems and I remember some of the kids saying you have to use Chrome. For the few students who couldn't log on I just had them double up. It was fine."

Can you sum up *I'm a Scientist* in 3 words?

"A bridge to the scientific community"



7.7. Laura Smallbone, Garth Webb Secondary School

School: Mixed state secondary school serving grade 9 to 12.

Teacher: Laura Smallbone

Class: Grade 12, Biology, 19 students (9 girls, 10 boys).

Number of live chats: One

Computer/student ratio: 1:1

Number of lessons spent on *I'm a Scientist USA*: three

Scientists: Four scientists attended the live chat

Students really liked Zoe.

Garth Webb Secondary School is a large urban school in Ontario, Canada.

Laura was interviewed at her home.

What subject do you teach?

"I teach primarily biology, so grade 11 and grade 12 biology and junior science, grade 9 and 10 which is a mix of biology, chemistry, physics and environmental science. I also teach environmental science in grade 11."

How old are your students?

"The ones that participated in this activity were mostly 17 to 18 years old."

How did you hear about I'm a Scientist?

"One of my best friend's husband runs the program."

What sounded the most appealing aspect of I'm a Scientist?

"That my students were able to interact with people who are actually working in the science field. It gives them more of an idea of the variety of careers that exist in science."

Why did you decide your students should take part in *I'm a Scientist*?

"Many of my students come to me in grade 12 biology with aspirations to be doctors, physicians of some sort, veterinarians, dentists; and they don't really have a broad view of the field of science. Being able to see that there are people working in science and there are different careers is great for them, especially for those who might never become a doctor but love science, they may find a more creative or different way to work in science. They are making decisions about their future and careers, so that might help them with making those decisions."

"I chose that class in particular because it is my smallest class and they are very well behaved. Usually when I try a new activity, for the first time I try it with students I know will take well to the activity and that I don't anticipate having any problems."





"I wanted them to do activities like this because some students have misconceptions that scientists are very nerdy, look nerdy, behave in a nerdy way. I like them to see scientists are normal people that have normal extra-curricular activities and they're not just people dressed in a lab coat wearing goggles."

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

"I wanted them to see they could choose something like bats or insects and if they are interested in it they can do research in that focused area of science or biology."

Did your students enjoy the event?

"When I first told them about it they thought it was an interesting concept. They're familiar with American Idol so they know how voting off people in shows work and they liked that concept, it was more interesting for them."

"I think they also liked the break from the normal routine of the class, in that grade 12 university level biology is a pretty heavy course, it enabled them to do something different and not have to worry about content for a couple of days."

"In general students like to be able to choose. They liked that they get to ask the questions and get answers that are not dictated or expected of them, and to ask questions that someone else didn't make up."

"They told me afterwards that they really enjoyed the event."

Are your students more excited about science?

"I think they are more excited about science. I chose the students because I thought they would be really receptive to the activity. I think the ones who didn't know about their future options in science got out more."

Are your students more confident in debating science issues?

"I'm not sure about this, because I did the activity towards the end of my term I didn't get to see all of the impacts it may have had on them. In future if I do the event earlier in the semester then we might be able to see that sort of outcome."

Are you more aware of your students interests?

"There were some interesting things that came out of doing the activity in that, yes, I was able to see the ones who had interests in different areas of biology than I would have realized. For them to be able to see outside of the curriculum was good. By doing this event we weren't just following what is dictated by the Ministry of Education in Ontario, they could see different aspects of science."

How did you run *I'm a Scientist* with your students and how many lessons did you spend on it?

Lesson one – discussion about what makes a good scientist. Carried out as a class activity using a projector and the whiteboard. (half a 75 minute period) Lesson two – reading scientists' profiles, preparing questions, practicing logging in. Students were instructed to come up with five questions, any five questions they wanted. (half a 75 minute period)

Lesson three – live chat. (75 minute period)

Follow up – Did you enjoy it? Yes. Would you like to do it again? Yes

How has taking part in I'm a Scientist improved your lessons or your teaching?



"I think it has made realize the importance of careers. Making the knowledge of the careers available more accessible."

How well did I'm a Scientist fit the curriculum?

"It's interesting because in the Ontario curriculum there is a part 'required' to talk about careers and many of us will skip that part because we'll try to focus on achieving all the other objectives that our student will need the knowledge of to continue on in their education. Doing this event allowed me to do that in a much more creative and engaging way than I would have done myself. It allowed me to cover that part of the curriculum where normally I don't."

Does I'm a Scientist offer any advantages over other STEM programs?

"We go to science museums and waste water management facilities and I am a big proponent of field trips and experiential education. I think both of these events serve different purposes. Going on a field trip allows students to be active and this event allows students to interact with adults and have online chats that might be something that is a part of their career in the future, having online chats with professionals.

What did you think of the scientists?

"The students really liked Zoe."

Can you sum up I'm a Scientist in 3 words?

"Engaging - My students spent the whole period of the chat either coming up with their own question or reading other peoples responses"

"Informative - My students learned a lot about careers"

"Easy - It was easy to execute as a teacher. Instructions were mailed to me. I didn't have to do everything that was included in them. They were easy to follow. I didn't have to do very much prep at all, which is a great thing"

Live chat excerpts

A lot of the interactions in the live chat were about the scientists work and their experiences e.g.

"Bea : What's the coolest cave you've been in? Lindsay : @Bea Armageddon--the largest cave in South Africa and possibly the oldest cave on the planet at about a billion years old!"

"York : What type of bug is the most delicious to eat? Zoe : @York -Honey ants. they keep a honey like sugar substance in their abdomens so if you eat them they taste like a honey gusher. Sadly they live in Australia or i would eat them all the time. I bet most insects are tasty if you cover them in enough chocolate. [smiley]"

They also asked about careers in science e.g.

"York : @zoe I actually wanted to be a vet

Zoe : @York-Respect. Thats a hard career, but you get to work with a lot of cool animals."


"York : @zoe if I want to study entomology what programs do i have to take in university?

Zoe : @York-ask me that in the question section and i will write you a much longer guide. I would recommend taking Chemistry, statistics, Python or R computer programing, and a few ecology or entomology classes. Its more important that you find a lab you can volunteer/work in to get experience. That's how you get the good jobs. usually you start volunteering, then you get the good paying jobs."

Other comments and irreverent interactions included:

York : @zoe Dont' the aquatic ones carry an oxygen bubble on their butt?

"laurasmallbone : Thanks so much to everyone for taking the time to chat with my class today! They really enjoyed it! Thanks @modtristan for this opportunity!!"



8. Discussion

Initially it will be useful to consider the results in terms of the evaluation objectives described in the introduction:

- To run the event pilot (website, competition and supporting materials)
- To run a general "zone" featuring competition of five scientists talking to 20 classes of students. This equates to approximately 400 students.
- To evaluate the project at the beginning and the end to see if the desired outcomes have been achieved.
- To secure funding to allow I'm a Scientist USA to continue

8.1 Event objectives

The pilot event was very successful based on the degree to which the website was fully functional, the number of schools and scientists who participated and the supporting materials that were developed alongside the successful communication and logistical planning of the event.

A large amount of the website development work was undertaken by Gallomanor Communications staff who set-up the *I'm a Scientist* template and associated applications on WordPress. There were no problems with the functionality of the site and only minor layout and format changes were occasionally made, such as the presentation of



the link to the Hydrogen Zone on the homepage (see above).

Teachers reported using a variety of devices to access the site including tablets, laptops and desktop PCs on both Apple and Microsoft operating systems. Some teachers did report problems having all their students log-in. In most cases the problems were quickly and easily identified and resolved. Some students reported issues with certain browsers, but that that logging in using Chrome was effective. In those situations where students could not log-in they invariably paired with other students and were still able to engage well with the live chats. In consultation with Gallomanor Communications the likely origin of ceilings to the number of students who could be logged in at one time lay with school IT systems or settings.

Feedback from Gallomanor Communications indicate that in comparison to other *I'm a Scientist* pilots the event went very well.

The evaluation of specific aspects of the event are analysed in more detail in the sections below.

8.2 Zone objectives

In order to deliver a general zone five scientists working in different fields are required. The initial recruitment was able to identify five suitable candidates but a second round of



applications substantially expanded the available pool of scientists to thirty. Due to this we were able to choose scientists who represented both genders and worked in a variety of different organizations; academic, non-governmental, industry, geographically spread out and at different stages in their careers. Their work covered a wide spectrum of topics, though they were all biologists. A substantial proportion of the applicants were biologists, and in order to include a wider range of science subjects, greater efforts to reach chemists, physicists, earth scientists and those from other disciplines will be required during any future recruitment efforts.

One of the greatest disappointments of the event was the absence of one of the scientists from the live chats and the ASK section of the site. Following submission of her profile and a positive response to the first ASK question "*Are you ready for I'm a Scientist?*", on the eve of the event she ceased to engage with the website and there were no further responses from her, despite numerous attempts at contact. Due to this failure to establish contact the reason for her sudden withdrawal could not be established and it was too late to include a replacement. This is a rare occurrence in the UK event and strategies to deal with similar instances in the future will be developed.

In the run up to the event considerable effort was made to contact and recruit schools. Particular efforts were made to recruit local schools, however the closest school who signed up was approximately an hour's drive away. The lack of uptake from local schools may be due to the plethora of opportunities already available for STEM engagement with Cornell University scientists. The schools who did sign up were from across the country and covered a large spectrum of size, age range, demographics, type of school and location. It would not have been possible to choose a more diverse spectrum of teachers and students than those who took part and this was fortuitously successful. The eighteen classes who signed up for the event was just short of the targeted 20 classes. In comparison the average number of classes in a UK *I'm a Scientist, Get me out of Here!* zone is fifteen from nine schools. The recruitment of schools for the zone was therefore very successful. Based on the live chat schedule there was capacity to accommodate a few more classes in the zone. The 17 live chats that took place were on par with the average of 18 per zone in the *I'm a Scientist, Get me out of Here!* June 2015 event.

The 262 students who took part were lower than projected due to smaller class sizes. Despite this there were still 385 answers to 260 approved questions in the ASK section which compares very well to the levels of engagement in the zones of *I'm a Scientist, Get me out of Here!* events which have on average 297 approved questions per zone. The percentage of students who were active in the zone are also very similar with 80% almost matching the UK average of 83%.

8.3. Evaluation Objectives

Both a zone report and a pilot evaluation of the event have been conducted. A large amount of data has been collected about the event and reported in these two documents. The evaluation objectives have been met successfully with informative results and useful suggestions for improvements that can be made.



8.4. Funding Objective

The pilot event was undertaken to assess the feasibility of moving forward with *I'm a Scientist* in the USA. Prior to the pilot event it was decided by the Board of Directors that options for fiscal sponsorship, as an interim status on the way to full 501(c)3 status, would be explored. Following the success of the pilot event and discussions with a local fiscal sponsor, The Centre for Transformative Action (CTA) (<u>www.centerfortransformativeaction.org/</u>), an application for fiscal sponsorship has been submitted to CTA. Securing fiscal sponsorship will be an essential step towards securing funding for future *I'm a Scientist USA* events.

8.5 Formative Evaluation Outcomes:

• What worked well and not so well? and What aspects of the program administration and website could be improved?

The event went very well:

"It was exceptionally well managed, as far as any sort of communication event could be and I was very impressed. You did an excellent job moderating and I think it all went off very well, very professional." – **Lindsay Hunter**

Extensive evaluation identified areas that could be improved and these have been listed at the end of the evaluation outcomes.

• The impact on students' education and their attitudes to science.

Due to the relatively short nature of the students' involvement, the timing of the event towards the end of the academic year and the low survey response rate from students it is hard to assess the level of impact on the participating students' educational achievement. Despite a lack of student assessment data the large number of questions answered by the scientists indicated a significant amount of knowledge was imparted to the students.

Responses from teachers indicated a significant impact on the students' attitudes to science and their awareness of scientific jobs and careers. The students' responses to the profile questionnaires suggested that they found science jobs more interesting following the event and the proportion of students who were unsure decreased. Based on observation of the live chats the students were inspired and excited by the scientists and had very positive opinions of scientists following their interactions.

• The value to scientists and their organizations

The scientists all reported that their participation had a significant impact on them. Lindsay said the event was "transformative" and her organization placed a high value on her participation.

"I wanted to thank you so much for the opportunity to interact with so many amazing schools and students! I never expected to make it as far as I did, but I am very grateful. This was a really transformative experience for me." - Lindsay Hunter



Indicators of the value placed on the event by organizations included twitter activity by Lindsay's employer, Sepela field programs, in support of her involvement and a write



SepelaFieldPrograms @SepelaPrograms - May 21 Follow Research Associate @Paleo_Bonegirl in @imascientistUS

K. Lindsay Hunter @Paleo_Bonegirl Only two more votes and one more chat left before we have a winner for @imascientistUS! The suspense is killing me! #scicomm #STEMeducation

up about Jeff's involvement in a news article on the University of Michigan website(<u>www.lsa.umich.edu/ummz/News_Events/newsDetails.asp?ID=207</u>).



• The benefits to teachers and any challenges

There were many benefits to teachers from the relatively small amount of preparatory work required by teachers to the ability to overcome financial and geographical barriers, helped by the fact that it was a free event. Providing an inspiring experience for the students was the paramount aim for teachers and they felt that the event achieved that for them.

The primary challenge faced by teachers is finding an appropriate time to take part in the event which coincides with the work students are doing in class. There weren't any other challenges to taking part identified from the participating classes. However, due to the difficulty in recruiting local schools there may well be barriers to participation that the evaluation wasn't able to capture. Challenges for *I'm a Scientist USA* identified during the event and evaluation included recruiting more schools and choosing a suitable time of year for the next event.

Evaluation Objectives for delivery:

• The means of communication between I'm a Scientist USA, and teachers and scientists

In the run up and during the event communication was conducted via email, phone, twitter, Facebook and Skype. The primary means of communication was email. Both teachers and scientists responded well to email communications. In some cases teachers were more readily contacted by phone or by twitter direct messages. In future email would be the most appropriate means of communicating with both scientists and teachers, but it will be important to obtain twitter handles and phone numbers to provide alternative means of communication.



• The clarity of information provided

Teachers and scientists reported being very happy with the information they received and the overall communications, for instance:

"Your communication has been above and beyond! Thanks!" – Marsha Graves, STMS, Rock Hill, South Carolina

There were relatively few email or phone queries from teachers or scientists, the questionnaire found that all the teachers and scientists rated the briefing resources as 'quite' or 'very useful' and they were all happy with the information they received by email. Teachers reported that the voting process was clearly communicated and this is backed up by the large number of votes cast by the students.

A few teachers were initially confused about the topic of the Hydrogen Zone (29% according to the post-event questionnaire), assuming the students would be required to ask questions about hydrogen, not realising that it was a general science zone. To counter this teachers were reminded by email that it was general science zone and that their students could ask questions about any science topic they liked. The zone description was also amended to make the general nature of the zone more overt (see right).



• The materials provided

Each teacher received a pack containing a teacher guide, log in cards and debate pack. Teachers were very happy with the materials they received and 85.7% reported using the lesson plans or picking bits out of them for use in class.

"I like that it's "organized"- with Lesson plans." – **Teacher** response from the questionnaire

These resources overcome one of the most time consuming aspect of teaching, preparation, and address one of the biggest obstacles to the adoption of educational technologies in the classroom.

"Easy - It was easy to execute as a teacher. Instructions were mailed to me. I didn't have to do everything that was included in them. They were easy to follow. I didn't have to do very much prep at all, which is a great thing" – Laura Smallbone, Garth Webb Secondary School

The teacher resources were adapted for the USA by Tristan MacLean and checked by a US scientist with experience in outreach. Differences in US terminology and spellings were identified so that US versions could be produced by the designers. One notable difference that was not envisaged prior to production was the difference in the paper size standards between the US and Europe. The materials were reformatted to fit a standard US letter size and this will need to be borne in mind when adapting any materials for use either side of the Atlantic.



The log-in cards were produced in the UK and shipped to the US. This worked well, but in order to reduce the lead time for production and provide the flexibility for changes at short notice a US based digital printer will be contracted to produce them. This is less of an issue with regards to debate packs, though local production would have advantages and may be required to satisfy the needs of funders.

As noted by one scientist, her colleagues were not aware of what she was doing when passing her office during live chats. In light of this for the next event we will make sure that we produce *I'm a Scientist USA* <u>Do Not Disturb Signs</u> and suggest their use by the participants.

• The ease of use of the website

With regard to the live chat, one teacher described it thus "It was simple and very user friendly."

The site was very easy for 29% of teachers and 50% of scientists, whilst 25% of scientists and 42% of teachers found it quite simple and straightforward. One scientist reported that it was difficult to begin with but quite easy when they got used to it.

Some teachers did report problems finding the zone page, scientist profiles and the chat bookings. This is in part due to the way the zones are separate sites in the WordPress content management system. This is less of an issue once multiple zones are running for each event as they are clearly displayed on the home page. Overall the response is very positive but it will be worth considering options that will bring more fluidity and signposting to the site to improve the user experience.

• The timing of chats and voting

There are three main components to *I'm a Scientist* events; ASK, CHAT and VOTE. The ASK activity is available to students 24/7. They can log-on, ask questions, review answers and comment on answers at any time of day. Students can also cast their votes at any time of day. However, CHAT and announcement of voting results require careful scheduling to serve the needs of teachers and students and create an exciting atmosphere.

Timing of the chats and the voting during the pilot was successful. There weren't any reports of classes or scientists missing live chats or scheduling errors due to time zone differences. Chat bookings based on EDT did not appear to pose any difficulties for teachers. In order to accommodate west coast based schools, unlike the UK which operates on one time zone, bookings could be made as late as 8 pm EDT. The earliest chat was 9 am and the latest chat was 2:40 pm EDT. Had some schools made late chat bookings this may have posed difficulties for scientists to attend, especially Lindsay who was based in South Africa.

The counting of votes and announcement of eliminations took place at 5:30 pm EDT during the second week. Students were reminded to vote during live chats and through emails to teachers. Voting levels were an area of particular success in the Hydrogen zone with 396 votes cast versus a UK average of 270.



"The voting is a great idea and the kids really liked to end the session by voting and learning more about the scientists." - **Stephanie DeBiasio, Hamilton Middle School, Hamilton, Montana**

The importance of the voting to creating an experience with real consequences and giving the students involved a stake in the outcome was expressed very well in these tweets:

	I'm a Scientist USA @imascientistUS - May 21 Ms Scharnau "You should see and hear them standing and clapping when they realized Zoe could still answer and that Lindsay was back, too!"						
	4 13 3 ★ 4 ····						
E	I'm a Scientist USA retweeted Jojo de Guzman @Eyes_On_Me · May 21 @imascientistUS Things got real for my students when they realized that Zoe got evicted. #LetsDoThis						

Evaluation Objectives for scientists:

• The extent of change – new skills, confidence, changing views on public engagement, young people, science etc

All of the scientist strongly agreed, or agreed that taking part had enabled them to report the 'Broader Impacts' of their work and increased their science communication profile. The other two highest rated outcomes for the scientists were re-energising them about their work and encouraging them to do more public engagement. All of the scientists were experienced in outreach and had a high baseline confidence in communicating with young people. Despite this they still reported a further increase in their confidence discussing social, ethical and environmental issues.

"Being able to interact with students gives you a greater perspective on what you are trying to achieve." – Lindsay Hunter

• How successful was the recruitment of scientists and are there barriers to recruitment?

The recruitment of scientists was slow to start with but very successful. Thirty scientists applied for the five available spaces. Initially all five applicants who had submitted suitable applications were male. Following a further round of calls for applications from female scientist the total rose to 30 applicants. Further scientists have signed up during and since the event. Keeping in contact with all the scientists who have applied, or expressed an interest, and informing them of upcoming events will hopefully lead to their future involvement. Efforts will also be made to recruit new applicants for future events.

Barriers to recruitment would include the time required and possible perceptions of the program. A question that was asked by a couple of scientists who were enquiring about the program was "*How much of my time will it take?*". Advice on this aspect of the event is available on the website and often included in communications to scientists but it is a recurring query and due to the significant workload many scientists have it will remain a barrier to greater uptake. The questionnaire found that for 3 out of the 4 scientists who engaged in live chats "It didn't take too much of my time to prepare for" and none of



the scientists spent more than 3 hours a day on the event. In future it will be important to ensure the time required by scientists to carry out any activities that are not central to the event are kept to a minimum and that the time commitment of previous participants is clearly conveyed to anyone expressing an interest in taking part.

One scientist, who expressed initial interest in the program, went on to outline her objections to taking part because she felt that scientists could become entertainers and shouldn't be judged on "like-ability" and instead on the "validity of the content". This is a misconception about the event that can arise if people are unaware that students decide on the criteria for judging the scientists in Lesson 1 – "You're the Judges!" which involves 24 criteria on which the contestants could be judged. It will be important to highlight this aspect of the event in any promotional or recruitment communications to avoid this misconception.

• The identification of most appropriate ways to attract scientists.

Scientists reported hearing about the event through twitter, word of mouth and institutional newsletters. Continuing to increase the reach of the twitter account <u>@ImascientistUS</u> and disseminating details of the program and upcoming events to institutional communications departments will help maintain fresh applications. The participating scientists did not hear about the event from STEM outreach organizations or professional associations or learned societies and going forward greater communications efforts should be focused on these organizations. Attendance at the IPSEC 2015 conference has already started to raise awareness with organizations such as The American Society for Biochemistry and Molecular Biology (ASBMB) and the American Association for the Advancement of Science (AAAS).

• Were scientists' expectations met?

The scientists' objectives for taking part were primarily to inspire and engage the students. Their feedback and comments after the event indicated that the event achieved that for them. Jeff himself stated that he had no idea what the event would entail when signing up, despite this in his winners blog post he stated:

"I cannot imagine a better use of my time the last two weeks than interacting with my fellow scientists and the amazing students that whole time." – **Jeff Shi**

The scientists placed a high importance on communicating science to the general public and found that I'm a *Scientist* enabled them to achieve this.

"One of the most important things in science is communicating what you learn to other people." – **Zoe Getman-Pickering**

In comparison with other STEM outreach activities the scientists found it less formal, but by clearly communicating what the event aims to achieve it met their expectations.

"It was considerably more informal, but that went a long way towards the stated goals of the program."

According to the pre-event survey another important motivation was to enrich student knowledge of the science careers available. Following the event teachers reported this as one of the primary outcomes for their classes' involvement.



• Was there a different impact depending on type of scientist etc?

All of the scientists who took part in the live chats and answered questions were well received by the students and there was no noticeable difference in the impact they had on students. However, due to the small sample size and the fact that all the scientists were biologists it was difficult to identify any patterns or correlations between the reported outcomes and the scientists' background or work.

• Are they more likely to do public engagement activities again?

All the scientists reported that they would take part in the event again. All the participants are already involved in, or have experience of, outreach activities and it is likely that they would continue to engage with the public.

"I spend a ton of time on outreach and education, and I think it's one of the most important things scientists can do." - **Jeff Shi**

• What help do they need for future events?

In future scientists may benefit from guidance on the best way to manage their interactions during live chats so they feel less "chaotic" and more "lively". This could be remedied with future technical updates to the site.

Evaluation Objectives for teachers

• The extent students have changed – attitudes, empowered, more discussion in class, etc

Teachers provided many accounts of students expressing enthusiasm and demonstrating a greater willingness to share their own thoughts and opinion. There was also ample evidence of learning taking place during live chats. The two most common areas in which students exhibited changes were in their attitudes towards scientists and science careers, and their overall enthusiasm to engage in their science lessons. This ability to reach even normally disinterested students was summed in the following feedback:

"Thank you guys soo much! I was so surprised how much the kids got into it. Thanks for taking time out of your day to chat with the kids. Even the kids who I thought wouldn't care too much were some of the most eager! I am always looking for ways to engage those kids who don't see science as "fun" and I am glad that your lighthearted and enthralling answers inspired them! Keep up the GREAT work!!" - **Stephanie DeBiasio**, **Hamilton Middle School, Hamilton, Montana**

• Is I'm a Scientist USA valued by teachers?

There is definite value to teachers; they were able to cover parts of the curriculum they previously had difficulty with, they were able to provide enrichment opportunities otherwise unavailable to their students and they were all eager to take part again.

• Whether teachers have changed their practice?

Teachers reported gaining new ideas and perspectives for their future teaching practice as well as developing a greater awareness of their students' interests. In the questionnaire 85.7% of teachers reported that it gave them new ideas for teaching. The clearest example of a change in teaching practice came from the interview with Laura



Smallbone who described the difficulties of educating her students about science careers when faced with a large amount of course content on which they are examined. Her classes' participation in *I'm a Scientist* provided a way to cover this aspect of the curriculum and she now intends to spend more time on this topic with her students. Linda Horowitz stated the importance of student-scientist interactions to her teaching philosophy and the advantages of the *I'm a Scientist USA* format that would enable her to further her teaching approach. She explained how she planned to develop curricular materials to support the inclusion of *I'm a Scientist USA* in her future teaching. With more time to prepare schemes of work and plan the incorporation of the event into their calendars it is likely that most teachers would have examples of the ways in which the event had changed their teaching practice.

• Have teachers developed any new skills?

Many of the teachers who took part were already reasonably comfortable with online technologies and didn't express any indication of having improved their skills in this area.

• Were they supported enough?

Teachers found both the resources and communications to be excellent with help booking chats, navigating the site and support troubleshooting technical issues available by email and phone. There were no requests for support that wasn't provided and some of the features of the event were particularly well received, such as live chat moderation:

"I also like how there is a monitor. I could warn the kids to keep questions appropriate and if not they would be kicked out. They can really turn on the maturity if they know that this is an authentic experience. Thank you so much and I look forward to doing this more in the future!!" - **Stephanie DeBiasio, Hamilton Middle School, Hamilton, Montana**

• Is the content in a useful format?

The teachers were all very happy with the website and the resources provided. One teacher did specifically request <u>PowerPoint versions of the lessons</u>. Some teachers did report amending the lesson plans and cherry-picking activities to fit their own lesson planning.

• Are the debate kits useful?

As the event was held towards the end of the academic year many teachers were unable to carry out more activities other than those directly related to live chats and the competition itself. Some teachers did report that the debate kits looked very good and that they would be using them in the future. According to the questionnaire 57.1% of the teachers intend to use them at a later date.

• Are their expectations met?

The event was a huge hit with teachers and in many cases exceeded expectations:



"The chat went better than I expected! I was so impressed with how much the kids got into it and how fun and interesting the scientists were. The kids did NOT want to stop!" -**Stephanie DeBiasio, Hamilton Middle School, Hamilton, Montana**

• Does I'm a Scientist support or enhance their curriculum?

All the teachers surveyed and interviewed said that *I'm a Scientist* would/did fit with their curriculum and given more time to prepare could be more fully integrated into their lesson planning and schemes of work.

Evaluation Objectives for students

The conclusions that can be drawn about the impact on students comes primarily from teacher feedback and their activity in live chats and ASK due to the low post-event questionnaire response rate.

• Have their attitudes to science changed?

It was clear from comments made in chats and after the event that students gained a much greater appreciation of the work of scientists and any existing stereotypes were dispelled.

• Do they have a better understanding of the practices of scientists?

A large proportion of the live chat involved factual question and answer discourses. Students didn't engage in many conversations about the way in which the scientists conduct science or carry out research. Teacher feedback was also that the preparation for the event and the live chats they carried out were largely involving factual queries, but that in future events they would like their students to ask deeper questions about the practices of the scientists.

• Do they feel more empowered to make decisions relating to science?

Careers and science jobs were areas in which students were much better placed to make decisions following the event:

"They were asking a lot of good questions about science careers and school during and after. I would definitely do this again!! Thanks for letting is participate!!" - Laura Smallbone, Teacher

Students were more informed about issues such as GMOs and climate change after the event which could translate to better decision making on these issues:

"Student : kenzi are you personally against gmo's @Kenzi Clark." "Kenzi : @Student- no, I'm not personally against GMOs. I think they can be very beneficial, in some cases. They help reduce usage of pesticides on crops, have added Vitamin A to rice. Lots of good applications!"

• Are they more confident in asking questions and contributing to discussions?

Students were capable of engaging in discussion with the scientists during live chats but it was harder for teachers to assess the increase in the students questioning abilities. The ability to ask questions and get quick responses from real scientists was hugely appreciated and liked by the students:



"Student: omg I l.o.v.e scientists, i can't believe I'm talking to a real scientist anyway can I ask you some questions" – **Kindezi school**

"I enjoyed how you responded to my questions so quckly. I also enjoyed how you made your answers very clear. The thing I enjoyed the most was the way you shared your answers in scientific as well as interesting ways. I voted for you because you get into science. You don't just look at a insect and assume how it works." – Kaiya, Student

• What is the biggest impact of I'm a Scientist USA?

The biggest impact on students was simply the ability to engage with real scientist. Before the event teachers hoped to have excited students with a more positive attitude to science, who were aware of careers in science. Following the event teachers that reported that their students enjoyed it (85.7% of teachers agreed or strongly agreed with this statement) and indicators of excitement and positive attitudes were abundant in all the other data collected.

The other major impact related to careers. During chats, from the student and teacher questionnaire data and feedback from teachers, a greater awareness of science careers, was a recurring trend. There were many instances when students indicated they would consider a science career when they previously hadn't.

"I possibly will become a scientist, you guys have some awesome careers!!" - Kearney International School of Business Student

• Were they inspired by scientists?

Inspiration was one of the most common descriptors used by students and teachers.

"I enjoyed chatting with you because you responded quickly. I also enjoyed chatting with you because you inspired me to work with bats." – Camille, Student

"Thank you very much for your time and inspiration to the students at St. Mary's School! We appreciate being a part of this!" - Jojo de Guzman, St. Mary's School, San Francisco

"They were so inspired yesterday and can't wait to see which scientists remain. Thanks!" – Susan Scharnau, Indian Creek Elementary, Marion, Iowa

• Did some types of classes, etc benefit more?

All of the classes engaged very well during live chats and their teachers reported that they had gained a lot from the event. The event is aimed at ages 13 and upwards and yet it was noticeable that some of the most engaged classes were in grades 4 and 5. Based on some of the live chats and classroom observation, schools from economically disadvantaged areas were particularly engaged with the event.

8.6 Suggested changes and implementation

- 1. Enabling one click access to student profiles from chats.
- 2. Navigating between ASK questions with a 'next' button.



- 3. Change of chat booking clock format. "In the US, we only really use a 24 hour clock unless in the military, so it looks weird to us when chats are set for, say, 14:00. We're full-on AM/PM people" Lindsay Hunter
- 4. Enabling one click replies in live chats.
- 5. Providing teachers with chat transcripts for future reference.
- 6. Providing scientists with feedback reports.
- 7. Provide teachers with an advance highlight of potential discussion and debating topics in the featured scientists' field of study.
- 8. Provide future engagement opportunities with the same scientists so students can develop longer term relationships.
- 9. Changes to the live chat format.
- 10. Incorporating video interactions Requests for a video component have been made by both teachers and scientists in other feedback and this addition is worth considering in future technical upgrades to the site or alterations to the format of the event.
- 11. Produce virtual tours of scientists' work places, possibly via video.
- 12. Provide resources for teachers that help them educate students about effective, safe and appropriate behaviour online.

Suggestions 1-3 are relatively minor website functionality changes that would have little to no effect on the scientist-student interactions and could be applied to the site without significant time or costs being incurred.

One click navigation would likely speed up interactions and enable more scientiststudent interactions. Live chats are particularly pressed for time and both students and scientists have expressed their frustrations in achieving interactions with all the students in the time available. Enabling this feature may require more significant development time and costs.

The pilot event was relatively small and it is possible with such a small event to send teachers a text document copy of the transcripts from their classes live chat. There are two issues with this approach a) Scaling this procedure for a larger event would be somewhat time consuming b) a straight forward copy-and-paste of the chat window transcripts saved to a text document do not provide teachers with a very user-friendly format for reviewing the live chat conversations. An automated procedure for saving and providing teachers the transcripts in a more accessible format would be desirable. Enabling this feature is something Gallomanor Communications are currently working on and could be applied to the *I'm a Scientist USA* site.

After the pilot event it was possible to provide the scientists verbal and written feedback on their communication skills. With a larger event, that may feature 100 or more scientists, this would become quite time consuming and add substantially to the amount of reporting alongside zone reports, evaluations and reports to funders. There are a number of inherent features of the event which provide a degree of feedback to the scientists about their communication skills a) the direct interactions with students and their responses b) the votes that the scientists receive c) the comment and like function in the ASK questions and d) the zone reports. It may be inferred that what scientists would value more than feedback about their communication skills would be advice on how to improve and change their communicating approaches for greater impact. This could be achieved without producing individual written reports in a couple of ways; technically or through other forums. A feature could be created alongside voting whereby students would have clickable options for providing feedback to the scientist



specifically about their communications skills. Very careful thought and trialling would be required for this approach to ensure that positive and helpful feedback was received by all the scientists and that it wasn't a time consuming procedure that detracted from the students' interactions with the scientists or their voting. Alternatively seminars providing advice to a large number of scientists could be delivered at one time, such as the session that we have submitted to the AAAS annual conference - *Outreach that boosts your career; competing to communicate,* or online webinars that scientists could access without having to travel.

Providing teachers with an advance highlight of potential discussion and debating topics in the featured scientists' field of study should be relatively easy by asking scientists to provide this information and forwarding it on.

I'm a Scientist doesn't feature repeat appearances by scientists for a number of reasons, most importantly to enable as many scientists as possible to take part. Once schools have been in contact with a scientist through an event it is possible for them to develop a longer term relationship and continue to carry out activities separate from *I'm a Scientist*. One of the challenges of scientists taking part *I'm a Scientist* again is the competition format of the event which may not work as well a second time round when students would be looking for a deeper level of engagement with one scientist. That being said it would be worthwhile to consider what sort of longer term relationships could be established. One of the programs that can facilitate such longer term engagements is *Decipher my Data* and a US version of this might be possible in the future.

Live chats are the most energetic and lively aspects of *I'm a Scientist*, but they are also a part of the competition that often receives suggestions for format changes from participants. Live chats are well received by the teachers, whereas scientists were less comfortable with format. Changes to the format may lead to the loss of the many varied interactions and conversations that can occur in the current format. These interactions were prized by teachers as one reported in the post-event questionnaire:

"My students enjoyed reading each other's messages and the replies they were getting"

Teachers also found the multi-directional nature of the interactions to be particularly engaging and beneficial for their students learning and enjoyment. At this stage it is therefore better to direct efforts towards streamlining interactions in the current live chat format through smaller changes, such as one click responses and the enabling of emojis that make it quicker and easier to communicate.

The addition of video to the site seems an obvious enhancement when it is becoming far more abundant in online content and the means to engage in video communications has become ubiquitous through applications like Skype and Google Hangouts. Despite the commonplace use of video communications there would be considerable technical challenges and costs associated with adding video to the site. The implementation and subsequent impact on the event has been considered but discussion is outwith the scope of this evaluation.

An alternative to live chat video could be the provision of the ability to load video to the scientist profile page. If scientists are provided the option to upload a pre-recorded



video to their profile they could give the students a greater insight into their work while avoiding some of the technical and format issues live video would create.

9. Conclusions

In conclusion the pilot event was a tremendous success and there are many benefits the program can provide to scientists, students and teachers in the USA. Further work will need to be carried out to determine the value stakeholders and funders place on the event and to establish sustainable funding to continue and expand the program to serve more schools across the country.



APPENDICES

Appendix 1 - Survey Questions

Scientist – Pre-event survey

- 1. How did you hear about I'm a Scientist?
 - □ From a previous participant
 - □ From a university/research institute
 - □ Through the company I work for
 - □ From a professional association e.g. learned society
 - □ From a STEM outreach organisation
 - Twitter
 - Facebook
 - LinkedIn
 - □ Found the site in an internet search
 - Other (please explain)
- 2. What appeals to you most about I'm a Scientist?
- 3. Please rank the following outcomes in terms of importance for you.
 - Having a better understanding of how students view science
 - Developing links with other scientists
 - Students becoming more engaged with science
 - Winning \$500 to spend on outreach
 - Increasing my science communication profile
 - Becoming re-energised about my work
 - Students becoming more aware of careers in science
 - Being recognised by my employer for my volunteering activities
 - Becoming more confident in using online tools
 - Being more aware of what other scientists do
 - Boosting my science communication career
 - Being able to report on the Broader Impacts of my work
 - Becoming more confident in communicating my work
- 4. How confident do you feel about communicating with young people?
 - a. Very
 - b. Reasonably
 - c. A bit
 - d. 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?

- a. Very
- b. Reasonably
- c. A bit
- d. Not at all
- e. Don't know

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



- a. Visit to a local school
- b. Science festival
- c. University/institute organised events
- d. Other tell us what Please enter an 'other' value for this selection.
- 7. Are there any other comments you would like to add?

Scientist – Post-event survey

- 1. Overall, did you enjoy taking part in the event?
 - a. Yes, it was fantastic
 - b. Yes, it was OK
 - c. Not really, it was a bit of a chore
 - d. 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
- I have a better understanding of how students view science
- I am re-energised about my work
- I have developed links with other scientists
- I am more confident in using online tools
- I want to do more public engagement
- I am more aware of what other scientists do
- I increased my science communication profile
- I can report the 'Broader Impacts' of my work due to taking part
- I have been recognized by my employer for my participation
- It has improved my prospects of having a science communication career
- 3. How confident do you feel communicating to young people following the event?
 - a. Very
 - b. Reasonably
 - c. A bit
 - d. Not at all

4. Now you have taken part in the event how confident do you feel about discussing social, ethical and environmental implications of your work with members of the public/people outside your field?

- a. Very
- b. Reasonably
- c. A bit
- d. Not at all
- e. Don't know

5. To what extent do you agree with the following statements about I'm a Scientist?

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 students effectively
- It improved my communication skills



- The students seemed to enjoy the experience
- Overall I was satisfied with the experience

6. How do you think it compared to other forms of science engagement or dialogue you may have been involved with?

7. Would you participate again?

- a. Yes
- b. No

8. Would you recommend it to a colleague?

- a. Yes
- b. No

9. 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 scientist profile

10. How did you find the scientist briefing notes?

- a. Very useful they told me everything I needed to know
- b. Quite useful they covered most points but had some gaps
- c. Not very useful I had lots of questions after reading them
- d. Not at all useful a waste of paper
- e. I didn't read the briefing notes
- f. I didn't receive any briefing notes
- 11. From a technical viewpoint, how did you find using the site?
 - a. Difficult throughout
 - b. Quite difficult to start but easy once I was used to it
 - c. Quite simple and straightforward
 - d. Very easy
 - e. I didn't use the site
- 12. How do you think the CHAT facility could be improved?

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

- a. Up to 1 hour a day
- b. 1-2 hours a day
- c. 2-3 hours a day
- d. 3-4 hours a day
- e. More than 4 hours a day (please specify)

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

- a. Just right
- b. Too many the emails were too regular
- c. Not enough I would have liked more regular emails



15. How useful was the content of emails you received?

- a. Very useful contained everything I needed
- b. Quite useful contained some useful information
- c. Not particularly useful didn't contain much useful information
- d. Not useful I didn't use any information in them

16. Can you suggest any information you feel was missing from emails about the event?

17. 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 scientists
- Keeping up to date with how the event's going overall
- Sharing questions with scientists in different zones
- Reporting and hearing about problems
- Letting colleagues and friends know about the event

18. What do you think about naming general science zones after elements of the periodic table? Do you have any suggestions of other ways to name general science zones?

19. 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?

Student – Pre and Post-event surveys

- 1. What is your I'm a Scientist username (the username that appears on the card you were given)?
- 2. What grade are you in at school?
- 3. Are you a...
 - a. Boy
 - b. Girl
 - c. Group of students
- 4. How does school make you feel about science?
 - a. Excited I love science!
 - b. It makes me interested to learn more
 - c. I don't really have an opinion on it
 - d. It doesn't really excite me much
 - e. Bored I don't really like science
- 5. Are you planning to choose a science subject at the next stage of your education?
 - a. Yes; bring it on!
 - b. I probably will
 - c. Hmmm not sure...
 - d. I probably won't
 - e. No thanks!
- 6. Do you think jobs involving science are interesting?
 - a. Yes very!
 - b. Yes fairly
 - c. I don't really know
 - d. No not really
 - e. No definitely not!
- 7. When you finish your education, how likely are you to look for a job that uses your science knowledge and skills?
 - a. For sure!



- b. I think I probably will
- c. Hmmm ask me in a year...
- d. Not very likely if I'm honest
- e. Definitely not interested!

Teacher – Pre-event survey

- 1. What appeals to you most about I'm a Scientist?
- 2. 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).
 - a. Students are more excited about science
 - b. Students are more excited about science
 - c. Students are more aware of careers in science
 - d. I am more confident in teaching science practices
 - e. Students are more confident in debating science issues
 - f. I am more confident in using online tools in lessons
 - g. Students have a more positive view of science
 - h. I am more aware of cutting edge science
 - i. Students are more confident in asking questions about science
 - j. I am more aware of the insights my students have into science
 - k. Students have a more nuanced view of science
 - I. I will gain ideas for teaching in the future
- 3. Is there anything else not mentioned in Question 2 that you're expecting as an important outcome?
- 4. How are you planning to run I'm a Scientist?
 - a. In lessons as part of the scheme of work
 - b. In lessons as enrichment
 - c. Outside lessons as part of a themed day/week
 - d. Outside lessons in a STEM club
 - e. Other tell us how
- 5. What grade(s) of students are you planning to run I'm a Scientist with?
 - a. grade 4
 - b. grade 5
 - c. grade 6
 - d. grade 7
 - e. grade 8
 - f. grade 9
 - g. grade 10
 - h. grade 11
 - i. grade 12
 - j. STEM Club
 - k. Other
- 6. Have the class(es) you're running I'm a Scientist with taken part in any of the following science enrichment projects?
 - a. Visit from a scientist
 - b. I'm a Scientist, previously
 - c. Visit to a local science centre/museum
 - d. Visit to a science festival
 - e. Other tell us what
- 7. Have you taken part in any of the following science enrichment projects?
 - a. Visit from a scientist
 - b. I'm a Scientist, previously
 - c. Visit to a local science centre/museum



- d. Visit to a science festival
- e. Other tell us what
- 8. How many lessons do you plan to spend on this project?
 - a. 1
 - b. 2
 - c. 3
 - d. 4
 - e. 5+
- 9. Are you planning on also running other major science enrichment activities over the next few months? If yes, tell us what
 - a. No
 - b. Yes tell us what

Teacher – Post-event survey

- 1. Name of school
- 2. What grade(s) of students did you run I'm a Scientist with?
 - a. grade 4
 - b. grade 5
 - c. grade 6
 - d. grade 7
 - e. grade 8
 - f. grade 9
 - g. grade 10
 - h. grade 11
 - i. grade 12
 - j. STEM Club
 - k. Other Please enter an 'other' value for this selection.
- 3. 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
- My students are more excited about science
- My students are more aware of careers in science
- My students have a better understanding of the practices of scientists
- My students are more confident in debating science issues
- My students have a more positive view of science
- My students are more confident in asking questions about science
- My students have a more nuanced view of science
- I have gained new ideas for teaching
- I am more confident in using online tools in lessons
- I am more confident in teaching Science Practices from the NGSS
- I am more aware of cutting edge science
- I am more aware of my students interests
- I am more aware of my students' attitudes to science
- I found the event easy to implement
- Overall I was satisfied with the event

4. What was the single most important outcome for you as a teacher?



5. Does I'm a Scientist align with the curriculum?

Yes No Yes, but not during this event N/A

- School curriculum
- State curriculum
- Next Generation Science Standards

6. Is I'm a Scientist an effective way to overcome potential barriers to STEM education? Yes No

- Geography e.g. enabling students to engage with scientists in the classroom
- Gender e.g. connecting female students with good role models
- Poverty e.g. establishing a level playing field for student interactions with scientists
- Ethnicity e.g. reflecting the diversity of the STEM workforce
- Stereotypes e.g. dispelling the image of the mad scientist

7. Would you participate again?

- a. Yes
- b. No

8. If you would participate again, would you sign you students up for a general science zone OR a topic specific zone e.g. astronomy?

- a. General science zone
- b. Topic specific zone
- c. Different zones for different classes

9. Was it clear the Hydrogen zone was a general science zone featuring scientists from a range of disciplines?

- a. Yes
- b. No

10. Would you recommend taking part to a colleague?

- a. Yes
- b. No

11. How did you run I'm a Scientist?

- □ 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 Please enter an 'other' value for this selection.

12. How many lessons did you spend on I'm a Scientist? *This question is required.

- a. O
- b. 1
- c. 2
- d. 3
- e. 4
- f. 5+



13. From a technical viewpoint, how did you find using the site?

- a. Difficult throughout
- b. Quite difficult to start but easy once I was used to it
- c. Quite simple and straightforward
- d. Very easy
- e. I didn't use the site
- f. If you had any problems please describe them Please enter an 'other' value for this selection.
- 14. How useful did you and your students find the following parts of the site?

Very useful Quite useful Not that useful Not

Not at all useful We didn't use it

- ASK students asking questions
- CHAT live chat
- VOTE student voting
- Pupil profiles
- Live chat booking form
- Staffroom
- Teachers resources

15. 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 Scientists
- Lesson 3 Live chat
- Vaccination debate kit

16. How would you rate the teacher briefing notes?

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

17. If you used the CHAT (live chat) facility, what worked well about it? How do you feel it can be improved?

18. If you didn't book a live chat, can you tell us why?

19. Was the VOTE part of the competition clear? Did your students vote more than once? Please tell us about ways it could be improved or how it worked well with your students.

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

- a. Just right
- b. Not enough I would have liked more regular emails
- c. Too many the emails were too regular

21. How useful was the content of emails you received?

a. Very useful - contained everything I needed



- b. Quite useful contained some useful information
- c. Not particularly useful didn't contain much useful information
- d. Not useful I didn't use any information in them

22. Can you suggest any information you feel was missing from emails about the event?

23. 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?

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

25. What was the best thing about I'm a Scientist? *

Appendix 2 – Observation checklist

Observation Check possible factors	dist :							
CHILD								
ACTIVITY								
Time								
Looks interested								
Involved/focused/motivated								
Confident in activity								
Interacting on task								
Interacting off task								
Asks questions								
Express information (Show)								
Discusses								
Problem solving								
Teamwork								
Pleased with success								





Appendix 4 - Interview Questions

Scientist

- 1. What do you research?
- 2. Why are you taking part in *I'm a Scientist*?
- 3. How did you hear about *I'm a Scientist*?
- 4. How has taking part in I'm a Scientist improved your communications skills?
- 5. What do you like most about I'm a Scientist?
- 6. What could be better?
- 7. What will you do with the prize money if you win?
- 8. Have you had any interest or support from your department?
- 9. What do your colleagues think?
- 10. Have you had any surprising moments or interaction?
- 11. What do you think of the students?
- 12. Can you sum up I'm a Scientist in 3 words?

Teacher

- 1. What subject do you teach?
- 2. How old are your students?
- 3. How did you hear about I'm a Scientist?
- 4. What sounded the most appealing aspect of I'm a Scientist?
- 5. Why did you decide your students should take part in *I'm a Scientist*?
- 6. What was the most important outcome for you as a teacher?
- 7. Did your students enjoy the event
- 8. Are your students more excited about science
- 9. Are your students more aware of careers in science
- 10. D your students have a better understanding of the practices of scientists
- 11. Are your students more confident in debating science issues
- 12. Do your students have a more positive view of science
- 13. Are your students more confident in asking questions about science
- 14. Do your students have a more nuanced view of science
- 15. Are you more aware of your students interests
- 16. Are you more aware of your students' attitudes to science
- 17. How did you run I'm a Scientist with your students?
- 18. How many lessons did you spend on I'm a Scientist?
- 19. How has taking part in I'm a Scientist improved your lessons or your teaching?
- 20. How well did I'm a Scientist fit the curriculum?
- 21. Does I'm a Scientist offer any advantages over other STEM programs?
- 22. What do you like most about I'm a Scientist?
- 23. What could be better?
- 24. Have you had any interest from other teachers or staff in your school?
- 25. What do you colleagues think?
- 26. What advice would you give other teachers wanting to take part in *I'm a Scientist* with their students?
- 27. Have you had any surprising moments or interaction?
- 28. What did you think of the scientists?
- 29. From a technical viewpoint, how did you find using the site?
- 30. How would you describe the live chats?
- 31. Would you take part again?
- 32. What would you do differently next time you take part?
- 33. Can you sum up I'm a Scientist in 3 words?



Appendix 4 - Feedback quotes

TEACHERS

We had a good day today with a lot of engagement. The kids were actually talking science today as they thought about things they are curious about so this was really nice to see as was the fact that all engaged in finding out about each scientist by working on a "treasure hunt" I put together for them to work on. – Alan Siegel, High School of the Future, Philadelphia, Pennsylvania

Your communication has been above and beyond! Thanks! – Marsha Graves, STMS, Rock Hill, South Carolina

We have enjoyed participating and will be better prepared next year and plan to include a science class. Thanks for offering this educational experience to our students. - **Marsha Graves, STMS**

Thanks again for yesterday's chat session! The kids really enjoyed it. I look forward to doing it again next year, if it is available! - **Stephanie DeBiasio, Hamilton Middle School, Hamilton, Montana**

The chat went better than I expected! I was so impressed with how much the kids got into it and how fun and interesting the scientists were.

The kids did NOT want to stop! I am hoping that we might be able to schedule it again in the next few weeks but I haven't checked to see if there are spots open. I also would love to get my other science classes involved but that would be another 100 kids!

The voting is a great idea and the kids really liked to end the session by voting and learning more about the scientists. Now that I know what to expect a little better I will allow more time for the kids to get the know the scientists profiles ahead of time and get some questions in the "ask" section first.

I also like how there is a monitor. I could warn the kids to keep questions appropriate and if not they would be kicked out. They can really turn on the maturity if they know that this is an authentic experience.

Thank you so much and I look forward to doing this more in the future!! - **Stephanie DeBiasio, Hamilton Middle School, Hamilton, Montana**

My classes had a great time on the first chats and I am pretty sure they all voted. I would like to have my classes next school year participate as well. Please thank Jeff, Zoe, and Lindsey - they were awesome and my students had a great time. - Lesli Horowitz, Kearny High School, San Diego, California

That went really great -- my students really enjoyed themselves and were beyond stoked every time their questions were answered. We did have some problems with a few of the logins -- I had everyone login and set up their profile on Monday and they were all working, but then a few did not work this morning. It wasn't a big deal because I simply had them team up with another student whose login was working, but I just thought you might want to pass it along to the tech. people. When I have time either tonight or tomorrow, I can probably send you the all the usernames and passwords that did not work. I'm looking forward to this afternoon's second chat with my other class. thanks again - **Lesli Horowitz, Kearny High School, San Diego, California**



They were so inspired yesterday and can't wait to see which scientists remain. Thanks! – **Susan Scharnau, Indian Creek Elementary, Marion, Iowa**

Hi! Just had the first chat and the kids loved it! They actually want to send the scientists they voted for letters explaining why they chose them. - Johari Harris, Kindezi School, Atlanta, Georgia

Thank you guys soo much! I was so surprised how much the kids got into it. Thanks for taking time out of your day to chat with the kids. Even the kids who I thought wouldn't care too much were some of the most eager! I am always looking for ways to engage those kids who don't see science as "fun" and I am glad that your lighthearted and enthralling answers inspired them! Keep up the GREAT work!!

They really enjoyed the links that you shared as well! Some of them were blocked due to your school filters but some were really engaging and inspired the kids to find their own answers! Way to go! - **Stephanie DeBiasio, Hamilton Middle School, Hamilton, Montana**

They like looking through the profiles and they really enjoyed the live chat. They were asking a lot of good questions about science careers and school during and after. I wish I could have done another chat but it is hard to give up that much time with my 12s because the curriculum is so packed and we only have 3.5 weeks left until exams. I would definitely do this again!! Thanks for letting is participate!! - Laura Smallbone, Garth Webb Secondary School, Ontario, Canada

"You should see and hear them standing and clapping when they realized Zoe could still answer and that Lindsay was back, too!" – **Susan Scharnau, Indian Creek Elementary, Marion, Iowa**

@imascientistUS Things got real for my students when they realized that Zoe got evicted. #LetsDoThis - Jojo de Guzman, St Mary's School San Francisco, California

Thank you very much for your time and inspiration to the students at St. Mary's School! We appreciate being a part of this! - **Jojo de Guzman, Teacher**

STUDENTS

The last thing I learned is how fun it is to talk to a real scientist. I really hope you win! - Amir

I appreciated that you answered all my questions with details. I also appreciated that you were being realistic. Lastly, I appreciated that you were telling the truth. I voted for you because you inspired me to observe bats. Hope you win the \$500! – **Cheyenne**

I learned that you are cooler scientist than the other cool scientist! I also learned that me and you aren't so different. I learned really cool things about you. Thank you so much!! I hope you win!! – **River**

I enjoyed chatting with you because you responded quickly. I also enjoyed chatting with you because you inspired me to work with bats. I enjoyed chatting with you because you made your job sound interesting. Even though your job is a lot of work, I still like it. **– Camille**

I voted for you because you stood out to me. We are also very much alike. We both travel and I like seeing fossils and learnig about them. You also give very truthful responses even if they don't make you look perfect. This is why I voted for you. I



learned that you should pay attention in all classes because you don't know what will benefit you in the future. – **Chris**

I enjoyed how you responded to my questions so quckly. I also enjoyed how you made your answers very clear. The thing I enjoyed the most was the way you shared your answers in scientific as well as interesting ways. I voted for you because you get into science. You don't just look at a insect and assume how it works. - **Kaiya**

I voted for you because I wanted to study bats but I never have before. I also voted for you because it sounded like you were telling the truth. I voted for you because you're cool, brave, and you're not scared of the night. – **Justin**

I really enjoyed the chat! I really liked that you answered all my questions with the best answer. You were also respectful to me. You were very nice. This made me feel like you deserved to win. - **Ava**

I am so loving this - Ariela

I am so glad I am actually talking to real scientists! Thanks for the great experience! - Hamilton school student

thank you this was a great experience - Anna

Student: omg I l.o.v.e scientists, Student : i can't believe I'm talking to a real scientist anyway can I ask you some questions - **Kindezi school student**

Jocelin : I possibly will become a scientist, you guys have some awesome careers!! - Kearney International School of Business student

SCIENTISTS

Lindsay : @msnascimento I've been meaning to do a reddit and I've done Twitter chats with educators, but not with students before! This is awesome and so fast-paced! It really keeps me on my toes! - **Lindsay Hunter**

I wanted to thank you so much for the opportunity to interact with so many amazing schools and students! I never expected to make it as far as I did, but I am very grateful. This was a really transformative experience for me. - **Lindsay Hunter**

It's so much fun! I'm trying to make all of the chats that I can. The kids are great! - **Kenzi Clark**

I cannot imagine a better use of my time the last two weeks than interacting with my fellow scientists and the amazing students that whole time. – **Jeff Shi**

Thanks for letting me take part in this amazing event! So much fun! – Kenzi Clark, Scientist

I've always loved spreading my love of science and the natural world to as many people as possible, and this whole experience has only solidified that desire. It's always music to my ears when I hear about young students wanting to be scientists, though I have to say this is the first time I've heard them specifically say they want to study bats! But who am I to complain? – **Jeff Shi**

I do wish we could get feedback on what we're doing right, and what we need to improve. The most important thing in the end is that we learn to improve our science communication for young people so that you all can take our places in the future, and do the science that we could only dream of right now! – **Lindsay Hunter**



How do you think we're doing? What kind of answers do you like to see for your questions? How does that affect your voting? – **Lindsay Hunter**

In the US, we only really use a 24 hour clock unless in the military, so it looks weird to us when chats are set for, say, 14:00. We're full-on AM/PM people – **Lindsay Hunter**

Everyone has been really respectful as far as I can see, and I'm really glad to have met the other scientists because I've enjoyed learning about their work as much as you all have! I've been very sad to see people go and, of course, hope that I can win so that I can make my outreach project happen.

I think the good thing about this competition is that really, you just try to give the best answers that you can, and hope for the best. As scientists, we're kind of used to this. We're always competing for funding for our projects, but don't always come out on top. I also think that being snarky or mean wouldn't help inspire anyone to be a scientist and isn't the type of environment in which good science thrives. – **Lindsay Hunter**

I do feel good that no matter which scientist wins, YOU ALL WIN because that person is going to try their hardest to bring their amazing science to you in their own unique way. Sure, we may prefer our own projects or methods, but in the end, whatever inspires the next generation of scientists (that's YOU), is a win for us all! – **Lindsay Hunter**

It's also a huge honor to still be standing after facing so many great questions from young scientists and students. – **Jeff Shi**

I wanted to be a constestant to meet people just like you all, and hope that I can answer all possible questions about science, bats, and everything in between. - **Jeff Shi**

I saw an advertisement for "I'm A Scientist" on Twitter, and wanted to be a part because science education outreach is very important to me. I've always gone to classrooms, libraries, etc. and shared fossil casts with students and people of all ages. So, basically, I wanted to be a contestant so that I could spread the excitement of science and help others to do the same! - - Lindsay Hunter

One of the most important things in science is communicating what you learn to other people. – **Zoe Getman-Pickering**

A huge THANKS to @imascientistUS & all the participating #schools for allowing me to chat so many awesome #students! – **Lindsay Hunter**

Lindsay : @all I've had such a great time, I wish it didn't have to end! – Lindsay Hunter

Jeff : @jaimehurlbut: absolutely - I spend a ton of time on outreach and education, and I think it's one of the most important things scientists can do. - **Jeff Shi**



Appendix 5 – School data

School of the Future https://webapps.philasd.org/school_profile/view/1030

Microsoft School of the Future (commonly referred to as the School of the Future) is a public high school located in Philadelphia, Pennsylvania, United States that serves grades 9 through 12 as part of the Philadelphia School District. The school opened on September 7, 2006.

Hamilton Middle School http://hsd3.org/middle-school/

Report - <u>https://pollmanshsd3.files.wordpress.com/2014/11/annual-report-2014-</u> 2015.pdf

Hamilton Middle school caters to students in grades 6 to 8. The school has one of the lowest per student funding rates in its district.



Kindezi school http://kindezi.org/results

The Kindezi School at West Lake is an Arts and Leadership focused charter school based in Atlanta Georgia serving kindergarten through eighth grade. Open to all students living within the Atlanta Public Schools zone, but priority placement is granted to students living in the former Walter White Elementary School zone. The following performance data is reported by the school:

"The Kindezi School at West Lake has become one of Atlanta's top performing schools and one of Georgia's highest performing charter schools in just four years.

In our most recent Criterion-Referenced Competency Tests (CRCT) testing session, Kindezi scored well above the Georgia and Atlanta averages despite having a population





that would typically be predicted to perform below average."

The graph above tells the standardized testing story in its simplest form. Despite having a Title I* population with 70% qualifying for free and reduced lunch, Kindezi outperforms 75% of Georgia's schools on the CRCT. On the 2013 Beating the Odds report, **Kindezi scored at the 99th percentile** of all charter schools in Georgia, which is the highest possible score. It's a good start but we can and will do better. 2013-2014 <u>Annual Report PDF</u>.

* Title 1 are local educational agencies (LEAs) and schools with high numbers or high percentages of children from low-income families



CRCT performance in Science compared to other schools:

Saluda Trail Middle School (STMS) <u>http://st.rock-hill.k12.sc.us/</u>

STMS is a magnet school serving grades 6-8 in South Carolina.

STMS has been chosen as a pilot site for the Transform SC 10 year initiative. Teachers are receiving professional development and training to adapt the system of learning to the student, rather than forcing the student to adapt to the system.



The Transform SC collaboration is helping pilot schools by providing hands-on support, networking opportunities, and advocacy for policies that give schools the flexibility to transition to new classroom strategies.

STMS students will benefit from this transformation by receiving personalized instruction, self-paced learning, blended instructional models, and integrated curriculum opportunities using problem based units of study around real-world problems.

	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14
Enrollment	16114	16511	17140	17336	17653	17718	17181	17255	17631	17553
F/R Count	6178	6892	7152	7631	7943	8624	9261	9500	9697	5294
%F/R	38.3	41.8	41.7	44.0	45.0	48.7	53.9	55.06	55.00	57.09

Changes in Free and Reduced Lunch Rates

Student performance data is available here - <u>http://st.rock-</u> <u>hill.k12.sc.us/UserFiles/district/Documents/Planning/2014-</u> 2019%20Strategic%20Plan%20update%20Worksheet%20started%20April%2014.pdf

Vestal middle school <u>www.vestal.stier.org/</u>

Report - http://www.vestal.stier.org/Downloads/2012-13ReportCard_vms.pdf

Vestal Middle school serves grades 6 to 8. Students are predominantly white (86%) and there is a relatively low level of disabilities or economically disadvantaged students. Class sizes are average. Science results are marginally better than schools in other districts or statewide.



Students by Ethnicity

American Indian or Alaska Native	Black or African American	Hispanic or Latino	Asian or Native Hawaiian/Other Pacific Islander	White	Multiracial
2	26	18	56	741	20
0%	3%	2%	6%	86%	2%

Other Groups

Limited English Proficient Students	Students wit	h Disabilities	Economically Disadvantaged Students		
	116	13%	178	21%	

*Fields with dashes have data suppressed in order to prevent reporting personally identifiable information.



Grade 8 Science

Data in the bar charts include those for grade 8 students who took the New York State Grade 8 Science Test and grade 8 students who took a Regents science test in lieu of this test. Mean scores and data in the table for grade 8 science include only those for grade 8 students who took the New York State Grade 8 Science Test.



Acera School http://aceraschool.org/

The Acera school is a private school in Massachusetts focused on science creativity and leadership, catering to Grades K-8 in multiage classrooms. There are 99 total students (2014-15 school year). The school admits high-ability students and accelerated learners with diverse strengths, profiles and interests and claims to have small class sizes with an excellent student teacher ratio.

Hilltop High School <a href="http://h

Page | 106



School data - https://drive.google.com/file/d/0B9zm6GSINUBYMEhhWnI1aVBNazQ/edit

Hilltop High School is part of the largest secondary school district in the nation. It has 2,103 students. This comprehensive high school serves an ethnically diverse population of students: 77.3 % Hispanic, 14.7 % White, 1.8% African American, 3% Filipino, .3% Asian, and 2.9% other. In English Language Development (ELD) classes we have 63 students (3%). Hilltop's 266 English Learners comprise 13% of the school population. The special education program serves 220 students (11%), including services for the visually impaired. The Resource Specialist program has 146 students (6%) and there are 71 students (3%) in Special Day Class. The moderate/severe program includes three teachers and 39 students (2%), utilizing three converted classrooms and a specially renovated restroom. There are 416 students (18%) identified for the Gifted and Talented Education (GATE) program.

Student performance in Science is on par with district and state scores.

Dropout rates are lower and graduation rates higher than district and state figures.

Grade Level	Number of Students
Grade 9	539
Grade 10	510
Grade 11	532
Grade 12	632
Total Enrollment	2213

Student Enrollment by Grade Level (School Year 2013-14)



Student Enrollment by Student Group (School Year 2013-14)

Group

Black or African American

American Indian or Alaska Native

Asian	0.7	
Filipino	1.4	
Hispanic or Latino	82.6	
Native Hawaiian or Pacific Islander	0.5	
White	9.8	
Two or More Races	3.4	
Socioeconomically Disadvantaged	54.9	
English Learners	12,3	
Students with Disabilities	11.6	


California Assessment of Student Performance and Progress/ Standardized Testing and Reporting Results for All

Students in Science – Three-Year Comparison

	Per	cent of Stud	ents Scoring	at Proficient	or Advanced	(meeting or	exceeding the	state standa	ards)
		School			District			State	
Subject	2011-12	2012-13	2013-14	2011-12	2012-13	2013-14	2011-12	2012-13	2013-14
Science (grades 5, 8, and 10)	67	68	61	64	62	63	60	59	60

Note: Science assessments include California Standards Tests (CSTs), California Modified Assessment (CMA), and California Alternate Performance Assessment (CAPA).

St Mary's School San Francisco www.stmaryschoolsf.org/

St. Mary's School, a results-oriented private Catholic Kindergarten to 8th grade school, is located in the heart of San Francisco. The curriculum of the school is geared toward molding its students into world citizens and leaders in their own communities, focusing on STEM education. St. Mary's School teaches through the utilization of an Integrated STEM Curriculum. This philosophy embodies a rigorous academic curriculum that challenges children to learn in an interactive atmosphere of cooperation, curiosity, excellence, and concern for others. The school has a special emphasis on comprehensive science and technology instruction. Instructional strategies and student activities include, but are is not limited to discovering practical solutions to scientific problems and student-generated questions.

The school is a high-performing, Catholic college-preparatory K-8 school – a 2012 survey of our most recent college-graduating class, showed that 20% are pursuing doctorates and all graduated college.

Kearney High School of International Business <u>www.sandi.net/kearnybusiness</u>

Kearney school serves grades 9 to 12. It has a high proportion of economically disadvantaged students (72.5%). Almost 20% of students are English learners and over 50% are of Hispanic or Indochinese ethnicity. With the advent of the district's Integrated 21st-Century (i21) Interactive Classrooms technology program, all classrooms now feature a Promethean interactive whiteboard and have either a cart of netbook computers or iPads.

At a Glance: 2013-14

School type:	Senior High
Schedule:	Traditional
Grade levels:	9–12
Total enrollment:	435
Total teachers:	21
Per-pupil expenditure (12–13):	\$6,628





Student Group	Number of Students	Percentage of Enrollment
African American	50	11.5
Asian	29	6.7
Filipino	21	4.8
Hispanic	186	42.8
Indochinese	76	17.5
Native American	1	0.2
Pacific Islander	6	1.4
White (Not Hispanic)	40	9.2
Two or More Races	26	6.0
Socioeconomically disadvantaged	315	72.5
English learners	82	18.9
Students with disabilities	33	7.6

Performance in Science is above the state average:

CAASPP: Science—Three-Year Comparison

The following table shows the percentage of students scoring at the Proficient or Advanced levels (that is, meeting or exceeding the state standards) on the CAASPP over the most recent three-year period. Science assessments include California Standards Tests (CSTs), California Modified Assessment (CMA), and the California Alternate Performance Assessment (CAPA).

	School		District			State			
Grades	2011-12	2012-13	2013-14	2011-12	2012-13	2013-14	2011-12	2012-13	2013-14
5, 8, & 10	92	90	92	64	63	66	60	59	60

Note: Scores are not shown when the number of students tested is 10 or less, either because the result is too small for statistical accuracy or to protect student privacy.

CAASPP: Science-By Student Group, 2013-14

Science assessments include California Standards Tests (CSTs), California Modified Assessment (CMA), and the California Alternate Performance Assessment (CAPA) in grades 5, 8 and 10.

Student Group	Percentage of Students Scoring at Proficient or Advanced
All students in district	66
All students at this school	92
Male	89
Female	95
African American	-
Asian	91
Filipino	_
Hispanic	91
Native American	-
Pacific Islander	-
White (not Hispanic)	100
Two or More Races	—
Socioeconomically Disadvantaged	90
English Learners	78
Students with Disabilities	90

Note: Scores are not shown when the number of students tested is 10 or less, either because the result is too small for statistical accuracy or to protect student privacy.

Dropout rates are lower and graduation rates higher than district and state figures.

Robert Hunter Elementary

http://www.frsd.k12.nj.us/Domain/381

School data http://www.frsd.k12.nj.us/cms/lib01/NJ01001104/Centricity/Domain/861/2012-2013%20NJ%20Performance%20Report.pdf



Robert Hunter serves grades K to 4. This school's academic performance is high when compared to schools across the state. Additionally, its academic performance is about average when compared to its peers. The vast majority of students are white. Over a fifth of all students have a disability. The school has a low staff to student ratio of 10.7.



Enrollment by Ethnic/Racial Subgroup This graph presents the percentages of enrollment for each

subgroup defined by the No Child Left Behind Act of 2001



Current Year Enrollment by Program Participation

2011-2012	Count of Students	% of Enrollment
Students with Disability	94	21%
Economically Disadvantaged Students	63	14.3%
Limited English Proficient Students	18	4.1%

Indian Creek Elementary

https://sites.google.com/a/linnmar.k12.ia.us/indiancreeklm/home

School data

http://www.linnmar.k12.ia.us/files/5FB34D998B174A7D86D3E6E0E010A5E9/2012-2013%20final%20report%20to%20comm.pdf

Grades: Kindergarten - Fifth Grades **Enrollment:** 505 as of 10/2014



Students and Schools

Enrollment	Schools	Students
Elementary (K-5)	7	3237
Middle School (6-8)	2	1561
High School (9-12)	1	1864
TOTAL*	10	7061

*Total includes home school students, preschool & alternative programs.

Student Demographics

Race	/Ethr	nicity
nucc	/ Lun	nerty

White	86.08%
Asian	5.74%
Black or African American	4.96%
Hispanic/Latino or any race	2.65%
American Indian/Alaskan Native	0.45%
English Language Learners (ELL) Total	1.69%
Special Education	8.11%

Linn-Mar Statistics

English Language Learners	119
Special Education Students	573
Attendance Rate (9-12)	96%
Graduation Rate	94%
Average Class Size (K-5)	22.9
Student/Computer Ratio	4:1