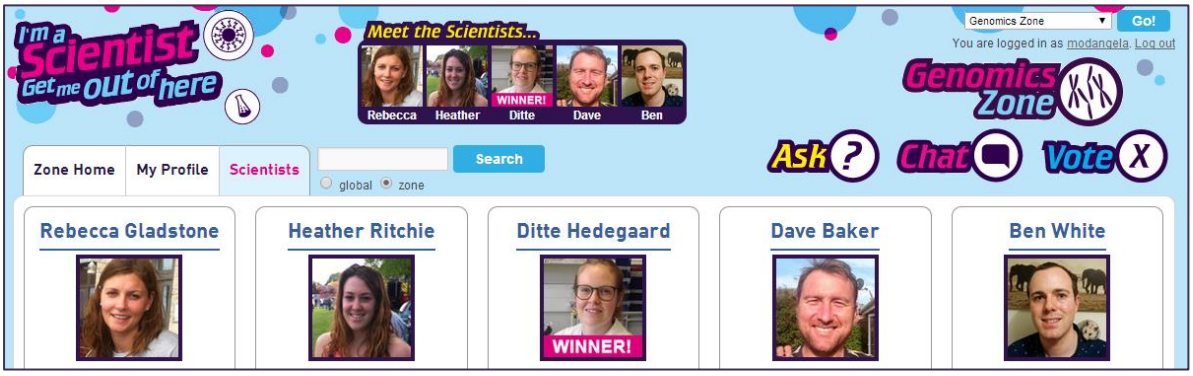
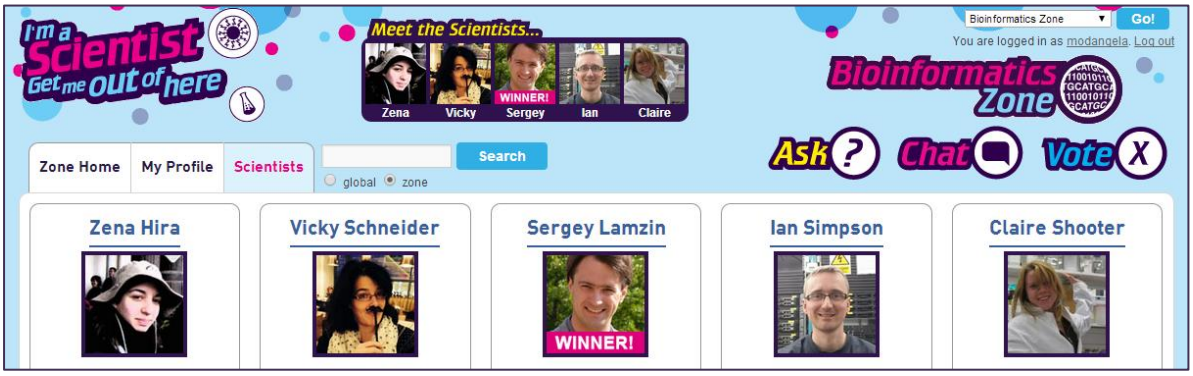
Evaluation Report

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

Bioinformatics and Genomics Zones – June 2014

Funded by The Genome Analysis Centre





Gallomanor
creating community conversations

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I. Executive summary

Here is a summary of our main findings after evaluating the Bioinformatics and Genomics Zone of *I'm a Scientist, Get me out of here!* June 2014.

1. **The students were interested in the scientists**: Students read the scientist profiles and asked about the research of each individual scientist. They were also very keen to learn more about the scientists; daily lives and hobbies, as well about their opinions on topical issues like animal testing.

2. **Students were interested in Genomics and Bioinformatics**: Two difficult subjects which many of the students might not have been familiar with before the event. In fact, one teacher in the Genomics zone said she was pleasantly surprised with the level of the students' questions and how the scientists explained what genomics is.

3. **The Bioinformatics and Genomics Zones exposed students to the new trends in biology**: Students learnt how biology is much more than identifying plants and animals, especially since the radical change that computers and Big Data have generated in the field. As one teacher said *"The genomics zone attracted us as it was a chance to expose kids to seeing biology as a difficult subject (which normally they don't) and also speak to people in the research side of the subject. We felt it would link to a lot of topics in our current themes like microbes and reproduction."*

4. **Scientists improved their science communication skills**: For some scientists, *I'm a Scientist, Get me out of here!* was their first public engagement activity, and it served as a good pilot experience. They learnt about students' interests and how to communicate with them in a more efficient way.

2. Introduction and background

I'm a Scientist, Get me out of here! (IAS)

I'm a Scientist, Get me out of here! is an online event where students get to meet and interact with real scientists. It's an X-Factor style competition between the scientists, where students are the judges.

The event has 3 parts: ASK, CHAT and VOTE. Students ASK questions which the scientists try to answer by the next day, and have text-based live CHATs with the scientists. Students learn more about the scientists, and let scientists know their opinions. And finally, students VOTE for their favourite scientist to win £500 prize to be spent on more science communication.

The event takes place over two weeks, online at imascientist.org.uk, and it is split into "zones", which are either general (named after an element) or themed. In each zone there are 5 scientists and around 350 school students in 20 classes. IAS is designed to to bring real science to life for students, supported by carefully developed classroom resources.

Gallomanor (GM) and The Genome Analysis Centre (TGAC) teamed up to run two Big Data themed zones: The Genomics Zone and the Bioinformatics Zone, each featuring at least two TGAC scientists. The event ran from 16th-27th June 2014.

The Genome Analysis Centre

TGAC is one of the leading UK research and innovation research centres specialised in genomics applied to plants, animals and microbes.

Its mission is to apply of state of the art genomics and bioinformatics to advance to promote a sustainable bioeconomy. TGAC is a hub for innovative bioinformatics founded on research, analysis and interpretation of complex data. They host one of the largest computing hardware facilities dedicated to life science research in Europe.

3. Activity in the zone

The Bioinformatics and the Genomics Zones ran alongside 15 other zones in *I'm a Scientist* in June 2014. The Bioinformatics Zone was above average in most measures of activity such as the number of students, number of live chats, number of votes, lines of live chats and the percentage of students that actively participated. The Genomics Zone had the highest percentage of active students, which made a lively zone in spite of having only three schools taking part. 93% of the students registered asked or commented on a question, chatted with the scientists or voted for their favourite.

We try to even out expected turnout from schools in a number of ways, such as limiting the number of schools which are new to the event in each zone. It is difficult however to guarantee a good turnout from school and we are working on ways of improving this.

Page views of various pages in the I'm a Geoscientist site

BIOINFORMATICS ZONE	PAGE VIEWS	ZONES AVERAGE
Total zone	18,115	16,052
ASK page	1,162	1,091
CHAT page	1,378	1,699
VOTE page	819	968
GENOMICS ZONE	**PAGE VIEWS**	**ZONES AVERAGE**
Total zone	8,189	16,052
ASK page	632	1,091
CHAT page	893	1,699
VOTE page	312	968

Figures from *I'm a Scientist* June 2014 for the Bioinformatics and Genomics Zones, and the average of the 17 *I'm a Scientist* zones in June 2014

	BIOINFORMATICS ZONE	GENOMICS ZONE	ZONES AVERAGE
Registered students	363	171	282
% of active students (used ASK, CHAT, VOTE or commented)	76%	93%	80%
Questions asked	805	197	488
Questions approved	240	91	217
Students who asked questions	175	71	119
Questions asked per student	2.2	1.1	1.8
Questions answered	240	87	207
Answers given	546	185	429
Comments	64	41	54
Votes	211	161	219
Live chats	13	8	12
Lines of live chat	4659	2563	4020
Students who chatted	253	150	197
Schools	5	3	6

4. Questions and live chats

In the Bioinformatics Zone there were three persistent themes throughout the two weeks: brains – how they work and how to control and enhance brain function, cures for and scientific understanding of cancer, and the ethical implications and necessity of animal testing. It was also clear that the students read and based questions on the scientists' profiles, referring to their research as well as exploring their hobbies and interests in more detail.

Live chats in the Genomics Zone followed topics such as DNA and gene analysis as well as the scientists' work and research. Students picked on Ditte's research on the hepatitis virus and Rebecca's work on bacterial DNA. The questions in ASK section were generally of a scientific nature, again focusing on DNA and gene analysis and how they relate to diseases and viruses. There were also questions on some science topics such as space, dinosaurs and animal testing, which are common to most zones.

Example questions in the Bioinformatics Zone
"Do you use an RNA sequence?"
"What are the most common bioinformatics programs?"
"How do the programs analyse cancer?"
"What is Statistical Genomics?"
"How many GB do you think a brain could hold?"
"why are you blonde? tell me a biological reason why people's hair is different"

Example questions in the Genomics Zone
"*What are some of the techniques that you use, to determine the gene codes of the hepatitis C. virus?*"
"*when bones brake, does the DNA continue to move around that area or does it avoid that area because the bone is broken????*"
"*what type of virus mutates so frequently that you need a vaccination for it every year?*"
"*can you please send me the link for the extracting dna from strawberries*?"
"*What is PCR?*"
"*What is genetic testing?*"

Question coding

Questions posed through the ASK facility are moderated by GM before being sent to the scientists. Due to the large volume of questions asked there are options to mark questions as a duplicate of another, refer the student to see the scientists' profile if the question has been answered there, and delete inappropiate questions (see more about moderation policy: http://imascientist.org.uk/scientists/help-2#moderation)

To see what themes came out in the ASK section we analysed the questions which were approved in each zone. The questions were sorted by two measures: type of question (whether it was asking for a fact or opinion) and question subject matter.

Fact or opinion

Of the questions asked to the scientists in the Bioinformatics Zone, 87% were asking for facts (What? Where? Why? and How?) and 13% asked for the scientists' opinions (What do you think?). In the Genomics Zone, only 4% of questions asked for an opinion.

Type of question Bioinformatics Zone	Count	%
Fact	**209**	**87%**
Opinion	**31**	**13%**

While the majority of questions tried to find an answer to questions, students were also keen to engage with the scientists on a personal level, asking their opinion about scientific topics (such as cloning or the beginning of life),as well as about other more personal themes, such as their hobbies and interests.

Type of question Genomics Zone	Count	%
Fact	**87**	**96%**
Opinion	**4**	**4%**

Question topics

Moderators tag keywords for each question so when people are browsing the website, the site can suggest 'related questions' on a similar topic. Tagging the questions was fairly subjective, as some questions could fit into multiple topics. The top categories are shown in the next page.

About 58% of the questions the students' in the Bioinformatics Zone asked were about different concepts and facts related to bioinformatics, they also asked scientists about their careers and works (around 29% of the questions) or about their personal interests and day to day lives (14% of questions).

In the Genomics Zone the percentage of on-topic questions went up till 78%, whereas 18% of questions were about the scientists' work and only 4% about their personal hobbies and lives.

Keywords in the Bioinformatics Zone (zone topic is not used as a keyword)

Keyword	Number of times	Keyword	Number of times
work	53	life	9
personal	43	inspiration	9
preference	36	cancer	7
quirky	19	cure	7
research	17	disease	7
human	16	program	6
career	15	animal	6
education	14	computer	6
brain	13	body	6
gene	12	future	6

Keywords in the Genomics Zone (zone topic is not used as a keyword)

Keyword	Number of times	Keyword	Number of times
work	17	preference	4
DNA	13	personal	4
animal	11	universe	4
gene	10	vote	4
virus	5	dinosaur	3
win	5	organism	3
body	4	quirky	3
research	4	computer	3

Examples of good engagement

All of the scientists in the Bioinformatics Zone had an enthusiastic and engaging tone, although Claire and Sergey were particularly notable. Here is an example of Claire joking with a student at the same time she explains a scientific concept:

> *"@ Claire do you like the fact that one day there might be a mutant outbreak" – billylovesvicky69*, student
>
> *"@billylovesvicky every time someone is born it's a mutant outbreak - all of you have at least around 6 mutations that are different from the DNA you got from your parents. WE ARE ALL MUTANTS"* – Claire Shooter, scientist
>
> *"@Claire u blow my mid!!!!"* – billyaddison, student

Claire was also was very good at taking what could appear as an unimportant question and giving a very interesting answer:

> *"Can you genetically mutate a pig and make it green"* – thedjagomaster, student

In the Genomics Zone, the scientists also used humour to engage with the students:

> *"@heatherritchie whats the strangest thing you have seen at sea?"* – ellyellie432, student
>
> *"@jellyellie432 Now that is a tough one! My hair gets pretty strange at sea with the salt water does that count? haha. We once filmed an eel we had never seen before and instead of biting it opened it's mouth, clamped itself onto the bait and used its tail to screw itself inside the bait! Also the supergiant amphipods are always cool to see!"* – Heather Ritchie, scientist

Students followed up on information and suggestions given by the scientists, and as a result, live chats linked up with questions in ASK:

> *"can you please send me the link for the extracting dna from strsawberries because im not allowed on that sight at school"* – jxliawilken, student

The most popular used words from the Bioinformatics Zone live chats that took place over the event. The size of the word represents its usage and popularity.

The most popular used words from the Genomics Zone live chats that took place over the event. The size of the word represents its usage and popularity.

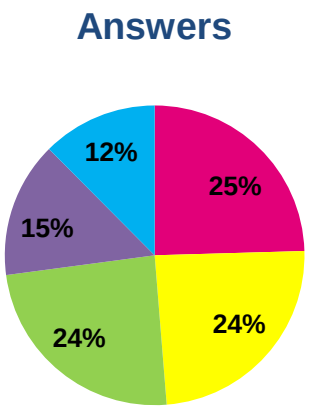
5. Participation

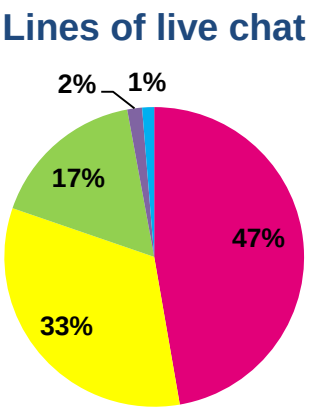
Scientists

When the scientists apply to take part in *I'm a Scientist*, they write a one sentence summary of their work. This summary is sent to students and teachers, who rate the scientists based on their descriptions and how much they'd like to see them in the event. We also try to get a mix of research interests and academic levels (from PhD students to Professors), variety of institutions, and a balance of female and male scientists.

In each of the zones, there were four rounds of voting with one scientist evicted at each round. Students could cast their vote in each round. Sergey Lamzin, member of TGAC, was crowned the winner of the Bioinformatics Zone and Ditte Hedegaard was the winner of the Genomics Zone.

Scientist in the Bioinformatics Zone	Institute	Brief description of their research, written by the scientist for rating by students & teachers	% of votes
Sergey Lamzin (TGAC)	The Genome Analysis Centre (TGAC)	I program. I program computers, plants, microbes, animals, people. You name it!	35%
Claire Shooter	King's College London	I study the genetics mutations that cause blood disorders and work out how to spot them more easily in the future	34%
Ian Simpson	Biomathematics and Statistics Scotland (BioSS)	I use computers to study how genes work in the brain; 86 billion cells, 100s of trillions of connections and 24 thousand genes, it's a big computer.	25%
Vicky Schneider (TGAC)	The Genome Analysis Centre (TGAC)	Passionate about building communities, working and engaging with others and bridging the gap between biologists and computational scientists.	3%
Zena Hira	Imperial College London	I write computer programs to analyse huge quantities of cancer medical data	1%

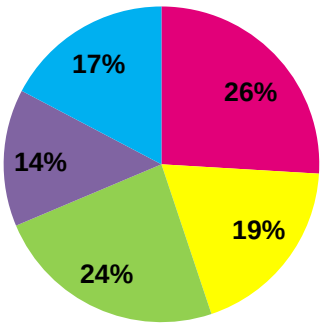




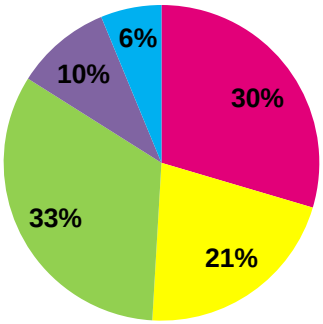
Scientist	Position	Profile views
Sergey Lamzin (TGAC)	Winner	761
Claire Shooter	2nd	659
Ian Simpson	3rd	812
Vicky Schneider (TGAC)	4th	617
Zena Hira	5th	694

Scientist in the Genomics Zone	Institute	Brief description of their research, written by the scientist for rating by students & teachers	% of votes
Ditte Hedegaard	University of Birmingham	I'm a training virologist (a person who works on viruses) and every day I get to work with the genes of hepatitis c virus	32%
Dave Baker (TGAC)	The Genome Analysis Centre (TGAC)	I work with really expensive machines that read the DNA of all living things	28%
Ben White (TGAC)	The Genome Analysis Centre (TGAC)	I help scientists from around the world understand the genes in everything from tomatoes to naked mole rats.	18%
Heather Ritchie	University of Aberdeen/Marine Alliance for Science and Technology for Scotland	When I'm not off gallivanting at sea collecting samples for my studies then I am usually based in my lab where I look at the differences in the genomes, DNA, genes etc to better understand why these creatures are so unique and how they can live at the very bottom of the sea.	14%
Rebecca Gladstone	Wellcome Trust Sanger Institute	We sequence the DNA of 20,000 of bacteria that cause meningitis and pneumonia from around the world and I compare the DNA from before and after vaccines!	8%

Answers



Lines of live chat



Scientist	Position	Profile views
Ditte Hedegaard	Winner	403
Dave Baker (TGAC)	2nd	342
Ben White (TGAC)	3rd	449
Heather Ritchie	4th	239
Rebecca Gladstone	5th	303

Scientists' interviews

We conducted a telephone interview with Ditte Hedegaard, the Genomics Zone winner, and a joint Skype interview with several members of TGAC: Sergey from the Bioinformatics Zone, Ben and Dave from the Genomics Zone and Ricardo, another TGAC scientist from the Agriculture Zone; funded by the Wellcome Trust.

Living up to expectations

Ben had a look at what previous scientists participating in the event had said about it, so he had some idea of what to expect from the two weeks taking part in *I'm a Scientist*.

Ditte said she was *"slightly scared about the type of questions I'd be asked. I didn't know if I'd be able to answer them. I'm so specialised, that I wasn't sure if I was going to be able to answer questions about broader Genomics."* However, she was happy to find out that "*it wasn't as difficult as I thought. I learnt that it was OK to write 'this is not my area, but I think the answer is…'".* She also mentioned being shocked about how busy the chat rooms were and how quick you had to be.

Dave said he was expecting to have a higher number of chats, as they were just a few in the Genomics Zone. This point will be discussed in more detail in the next section, Schools.

Time commitment

There were mixed perceptions on this. Ditte was unemployed at the time of the event, so time wasn't a problem for her. Sergey mentioned that he, as a PhD student, doesn't have time strict time requirements or a fixed working schedule, so time didn't represent a problem either.

Dave said that it was ok, *"chats are 30 minutes and you can schedule your day. In terms of the questions, it's what you want to make it. So you could spend a lot of time or you could spend little. Personally I didn't spend much time on the questions, but that was my personal choice."*

Benefits from taking part

Participating in *I'm a Scientist* seemed to have had different benefits from the interviewed scientists. For Ben, it was useful as a pilot experience in case he does anything similar in the future "*Good idea of how to answer a variety of questions from people with more or less experience of what the science actually is."* Sergey said it would look good on his CV.

Ditte said she thinks she is now less shy about "*This is not my area, I cannot answer that question"*, and that she learnt about students' interests and how to communicate with them in a more efficient way, for instance using the *yuck* factor.

Suggestions of how to improve the event

Both, Ben and Ditte agreed that it would have been nice to have more information about the students they are chatting to in order to pitch their responses to the right level. We do provide the year group in the chat booking list. However, this is often not a good or strong indicator of the science background, as it tends to be fairly variable depending on the particular class.

Ditte said that, *"chat rooms were a little bit mental sometimes, especially when I was the only scientist attending. I was exhausted afterwards. In those cases, it was nice to have a moderator in the chatroom."*

Sergey mentioned that, *"you cannot really initiate dialogue (in the ASK section) and if any students have comments or follow up questions to your answers you are not notified, so there's no way of knowing whether a dialogue had started there or not."* In reality, the majority of the comments left by students are little more than a thank you note, encouraging no further engagement. Scientists are not notified of these comments as we try to limit the number of email notifications sent out, and we feel these would do too much to clog the scientists' inboxes. On the occasion that a student seeks further discussion in a comment, the scientist is notified; this is however rarer than we might like and we are looking for ways to improve dialogue in the ASK section. Sergey's observation may be down to disinterest in such dialogue rather than a deficit in the notification system.

Sergey also suggested other changes; like using Google hangouts to talk to students, having individual 10 minutes discussions with each of them or, in case using our chat facility, limiting the number of questions asked by each student to control the chat flow. However, we think implementing these changes would change the core spirit of *I'm a Scientist*, which satisfies 97% of the teachers and 99% of the scientists who provided us with feedback.

Schools

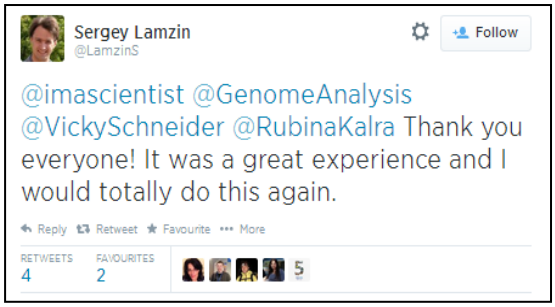
All the five schools which were given a place in the Bioinformatics Zone took part (in red). However, only three of the five schools given a place in the Genomics Zone took part (in blue). As may have been expected, we see a cluster of schools in London. We also saw one school in Norfolk, where we usually are quite sparse on schools.

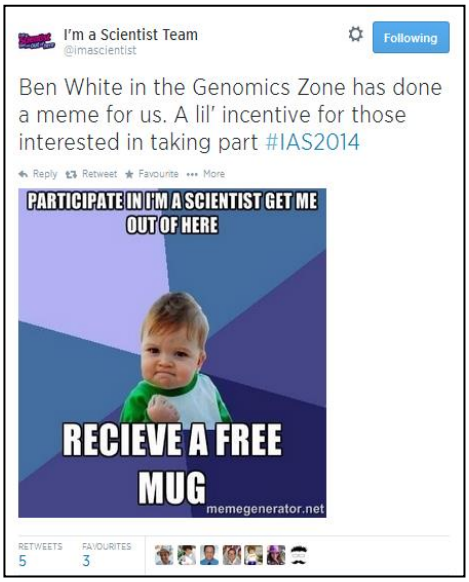
We try to even out expected turnout from schools in a number of ways, such as limiting the number of schools which are new to the event in each zone. It is difficult however to guarantee a good turnout from school and we are working on ways of improving this. After every event, we chase the teachers who didn't show up to find out if why they didn't participate in the end. In this case, one of the teachers who didn't show up in the Genomics Zone told us that she had been ill at the time, and unable to run the event.

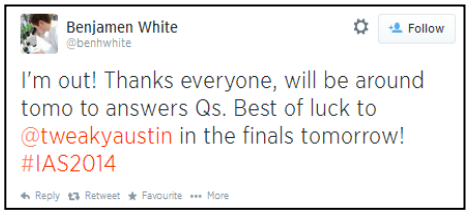
Some topics seem to attract more attention from teachers than others. For instance, a teacher who signed up late and was given a place in the Genomics Zone said that given the choice, she would not have selected to take part in that zone, but was pleasantly surprised with the level of the students' questions and how the scientists explained "genomics". However, another teacher, said: *"The genomics zone attracted us as it was a chance to expose kids to seeing biology as a difficult subject (which normally they don't) and also speak to people in the research side of the subject. We felt it would link to a lot of topics in our current themes like microbes and reproduction."*

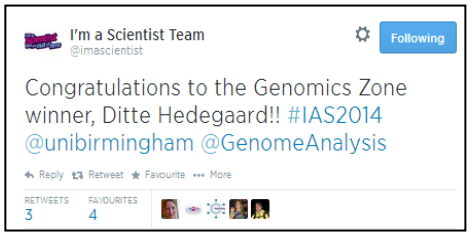
6. Publicity

I'm a Scientist (@imascientist) regularly tweeted event updates and popular questions asked across all zones and linked to @GenomeAnalysis. Sergey and Ian, in the Bioinformatics Zone and Ben from the Genomics Zone, also joined the conversation on Twitter.









7. Benefits

Scientists

Scientists improved their communication skills, enjoyed talking to other scientists, learned about the students' interests and often fell reinvigorated to do more science outreach:

> *"Wow, this has truly been an amazing experience and I feel honoured that you have chosen me as the winner of the Genomics Zone."*– Ditte Hedegaard, scientist

> *"This has been a great experience for me and I would totally do it again! It made me remember that the most complicated things can be explained in a simple and fun way."* – Sergey Lamzin, scientist

Students and teachers

Students gained an increased awareness of what scientists actually do and what they are like. Students engaged in debates with scientists during the live chats, and asked them about their personal opinions and experiences. It also showed students that scientists don't know the answer to everything and that they also go through challenges in life, just like any of us.

Many students left positive comments during or after live chats, including:

> *"the more questions are asked and answered, the more I think about joining you guys as a scientist"* – whatisinmypocket, student in the Genomics Zone

> *"bye thank you so much I have learnt a lot"* – hardyl, student in the Bioinformatics Zone

> *"Thank you for the great answer, I now know when an RNA scan is used"* – krazykid456, student in the Bioinformatics Zone