

**I'm a
Scientist**
Get me **OUT** of here



The Darwin Tree of Life activity
March 2021 to July 2022

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Foreword

The Schools@Darwin Tree of Life project took place during a tumultuous period with Covid-19 rampant in UK schools despite older generations beginning to receive vaccinations.

We have demonstrated that the approach of providing 6th form students with online access to modern cutting edge research projects is effective at:

- Increasing understanding of modern science
- Raising intentions to study science at the next level
- Supporting science capital

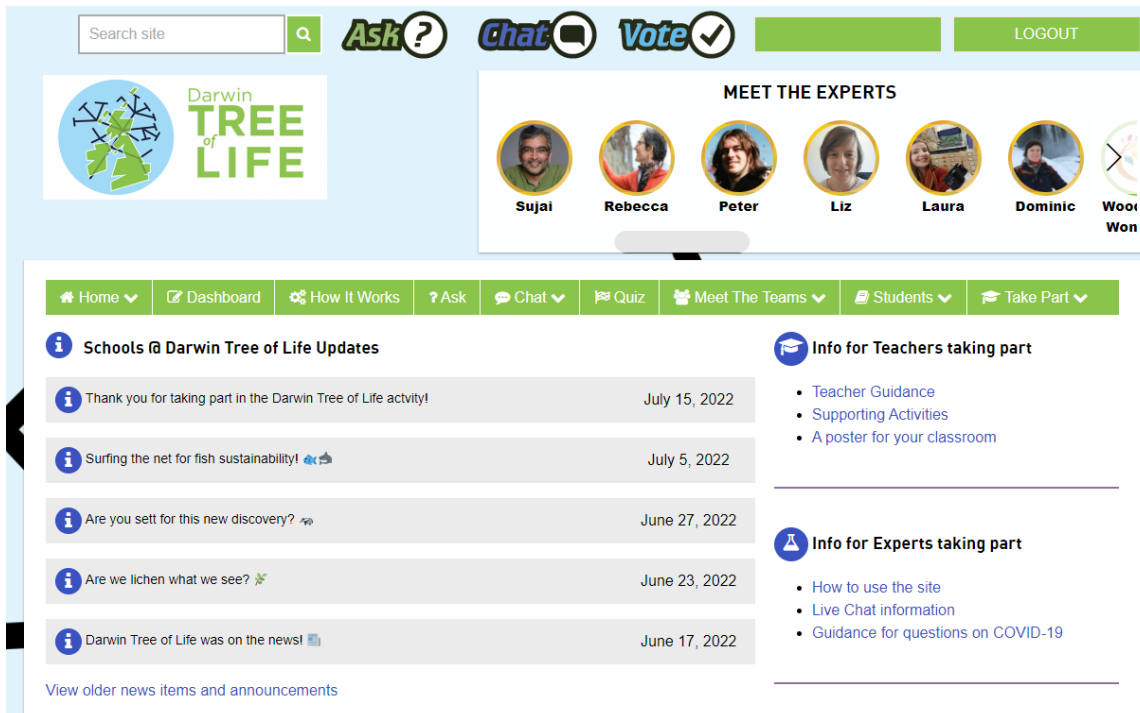
The situation in schools meant the project didn't always run smoothly. Our launch was over optimistic. British Science Week in 2021 seemed like a good idea, but on reflection it was wrong for attracting Y12 students who would shortly be very focused on mock exams, while their teachers got overloaded with setting Teacher Assessed Grades and having to set and mark A-Level exams for their Y13 students.

We thought that being online we would be protected against pandemic restrictions, but in reality all enrichment activities were severely restricted especially for 6th formers due to curriculum pressures.

We also took the attention of the participating scientists for granted. The lack of activity from schools between June 2021 and March 2022 meant that they lost interest in the project and didn't respond or were no longer in position when they were needed. We needed to find ways to keep them on board.

The legacy of this project will be two-fold. Firstly, the students who participated will be better equipped as they apply to universities this autumn. Secondly we are launching the CERN Zone in *I'm a Scientist* where the learning from this project is being applied to help Y12 physics students.

Background



The Schools @ Darwin Tree of Life activity ran from March 2021 to July 2022 and was designed to allow school students an insight into the Darwin Tree of Life (DToL) project.

The Darwin Tree of Life project was commissioned by and funded through the Wellcome Sanger Institute.

The original proposal was drawn up in February and March 2020, before the COVID-19 pandemic. It outlined an extended *I'm a Scientist, Get me out of here* platform.

The activity was given the go-ahead in November 2020. It was agreed to focus on sixth form students and was launched during British Science Week (BSW) in 2021. The timing was chosen to maximise awareness among teachers.

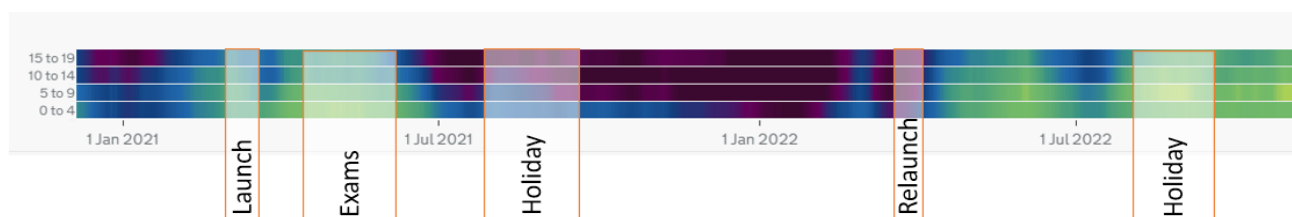
This report contains a narrative of how the project developed, and then follows our Theory of Change for *I'm a Scientist* project:

1. Inputs
2. Outputs
3. Outcomes / Impact

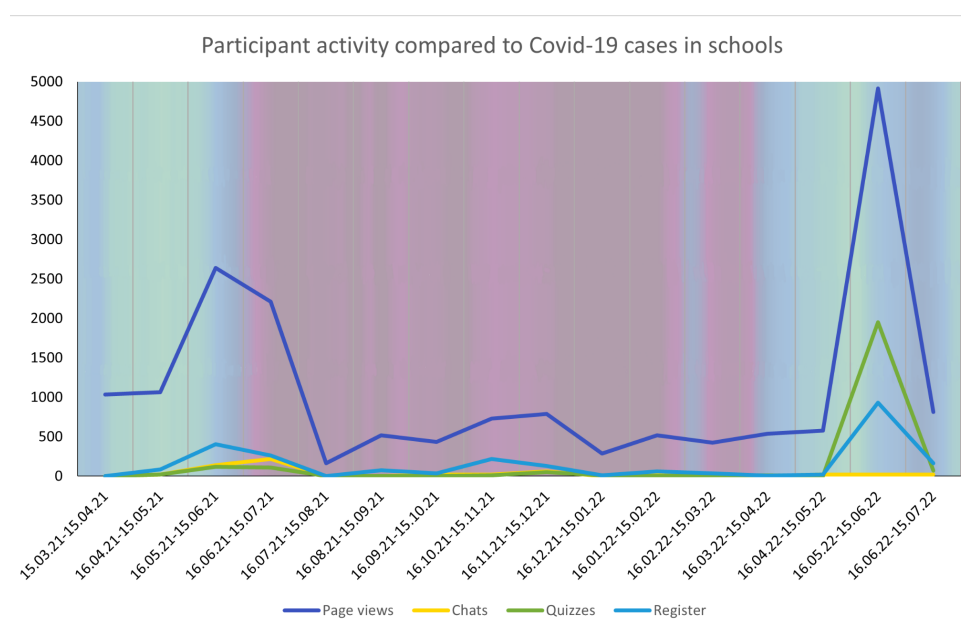
Narrative

Timeline

This project took place during a period of extremely high rates of Covid among 15 - 19 year olds. This caused immense disruption and anxiety to the year group and their teachers.



This graphic shows key moments in the project overlaid on the rates of Covid in school-age children. Purple is high, yellow is low. Data comes from data.gov.uk.



The Launch in March 2021 was well-received by teachers with 57 signing up. Unfortunately this did not translate into high levels of activity within the Zone. Curriculum pressure was immense, due to:

- missed time in 2020
- fast approaching exams for Y12 & 13
- Teacher Assessed Grades (TAG) for Y11

To maintain the scientists' interest, we invited lower year classes to take part in some live Chats. This was successful in increasing Chat activity but the students taking part in these Chats were too young to complete follow-up activities independently.

Activity failed to pick up throughout 2021 and the early part of 2022. The intense purple colour, in the graphs above, indicating very high prevalence of Covid-19 goes a long way to explaining this. Students and teachers were absent from school

We reviewed and refreshed the project in March 2022 to refocus how we were communicating the project to students. The change focussed on student engagement with a whole range of features on the site, and not just the Chats.

1.1. Review

The changes involved:

- Creating a video guide for students
- Increased promotion and functionality enabling students to track the DNA sequencing progress of specific species through a portal
- More promotion for Quizzes to embed learning
- Tagging scientists in curated updates from the DToL site
- Creating a student certificate which could be downloaded to demonstrate activity
- New, improved Dashboard for students
- Printed posters for inside the classroom
- Improved communication with teachers and scientists

One consequence of the period of reduced activity between 15.07.2021 and 15.05.2022 was that we lost the scientists: through job changes; losing interest in taking part; or simply having other commitments taking up their time. The majority stopped responding to emails about Chats, updates and answering questions.

At the end of May, we stopped promoting the option of live Chats to teachers due to the limited availability of scientists. The live Chats that did take place were open to all students.

2. Inputs

2.1. Scientists

We recruited 58 scientists working on different components of the Darwin Tree of Life project. Each team had a team-leader who was responsible for completing the team page and keeping it up-to-date as their project progressed.

The research teams represented 7 different organisations across the UK.

- Wellcome Sanger Institute (14)
- Earlham Institute (8)
- Natural History Museum (14)
- Royal Botanic Gardens, Kew (8)
- Royal Botanic Gardens, Edinburgh (4)
- University of Oxford (4)
- Marine Biological Association (6)

Their location can be seen in the map on the right. The number in the brackets indicates the number of scientists from that institution.



The activity was actively promoted to researchers within each institute, and its partners. Researchers were invited to participate, and were asked to form a team according to their research area and involvement in the DTOL project.

2.2. Students, schools and teachers

Key figures

Students logged in	645
6th-form students	375
Younger students	279
Schools signed up	126
6th-form schools	21
Teachers signed up	150

Over the course of the year, **150 teachers from 126 schools** signed up to allow their students access to the Schools @ Darwin Tree of Life site. Their location is shown in the map on the right.



Students were able to follow species, take part in live Chats, ask follow-up questions and complete a quiz.

645 students from **41 schools** logged into the Schools @ Darwin Tree of life activity. The blue markers on the map to the left show schools logged on. 375 of those students from 15 schools were sixth formers.

Students from 30 schools were active in the activity, indicated with a yellow marker on the map to the left. 13 of these schools were sixth forms.

57% of schools that took part were priority schools. Schools are classed as priority if they are more than 30 minutes away from HEI and have an above average percentage of students eligible for free school meals.¹

¹ <https://about.imascientist.org.uk/under-served-and-wp/>

3. Outputs

3.1. Key data

Zone activity	March 21 - March 22	March 22- July 22	total
Quizzes completed	34	202	236
Species followed	10	130	140
Certificates downloaded	0	40	40
Live Chats taken place	24	4	28
Lines of live Chat	5,891	418	6,309
Questions asked	33	139	172
Questions approved	32	120	152
Answers given	55	20	75
Page views	13,963	13,146	27,109
Page visits	3,949	2,067	6,016
Scientists logged in	45	17	45
Scientists active	35	11	37

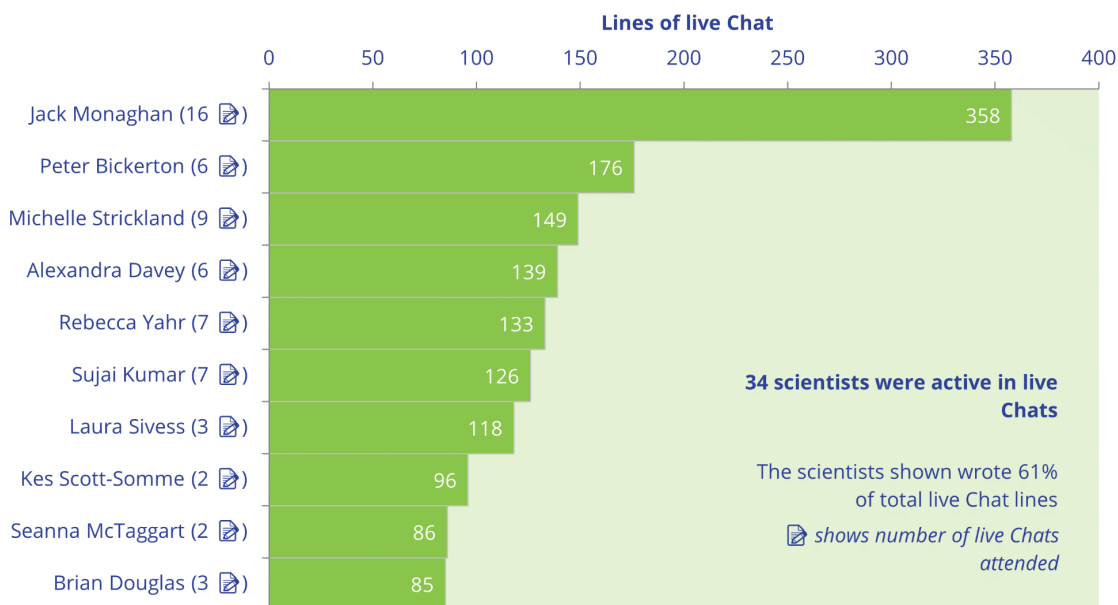
Following the project refresh in March 2022 we saw a significant increase in desired activity.

3.2. Scientists

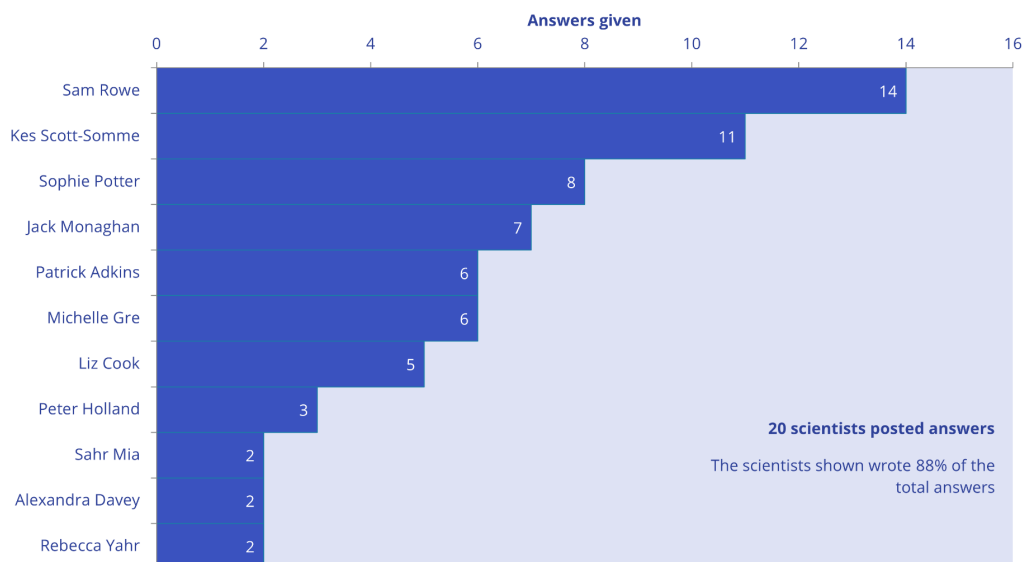
Across the time of the activity, 37 scientists were active within the Schools @ Darwin Tree of Life activity by taking part in live Chats and asking follow-up questions.

Scientists wrote 2,400 lines of Chat and gave 75 answers to follow-up questions. Unfortunately, 106 students' questions remained unanswered.

10 most active scientists in live Chats



10 most active scientists in posting answers



Although opening the Zone to younger year groups increased the number of Chats, the activity of the scientists decreased. This was due to the lack of activity from July 2021 to May 2022.

Although activity increased again following the refresh many of the scientists were inactive. As a result of this, the activity was no longer promoted to school teachers.

School term	Scientists active
Spring/Summer 2021	35
Winter 2021	18
Spring 2022	7
Summer 2022	11

3.3. Students

415 students took part actively by asking a question, taking part in a live Chat, and completing a quiz.

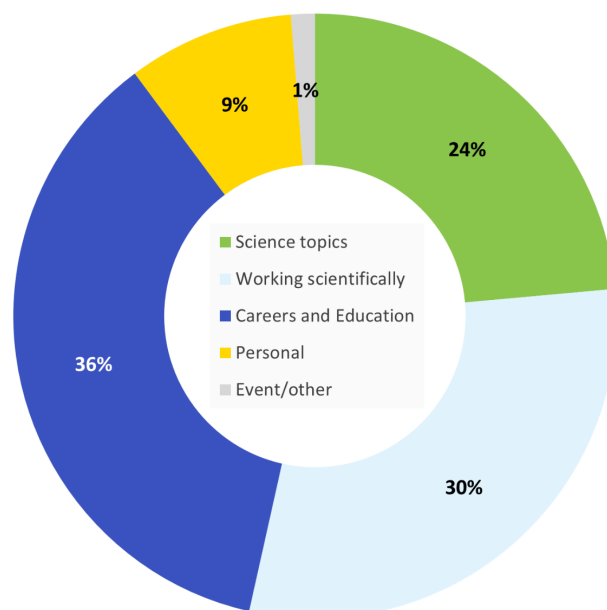
397 students actively participating were sixth formers.

The follow-up questions submitted by students are coded according to their theme. The chart on the right shows the proportion of questions in each theme.

In total, 172 questions were asked. Examples and answers are provided and linked below.

- 160 of these were asked by sixth form students.

Unfortunately, 106 students' questions remained unanswered.



In total, scientists and students produced **6,309 lines of live Chat**. The students wrote 3,909 lines of live Chat. The below word cloud shows the most common words used in live Chats. Size of the word is proportional to frequency of use:

4. Outcomes

We have measured the impact of the activity on both students and scientists.

For students we have looked at 4 key measures:

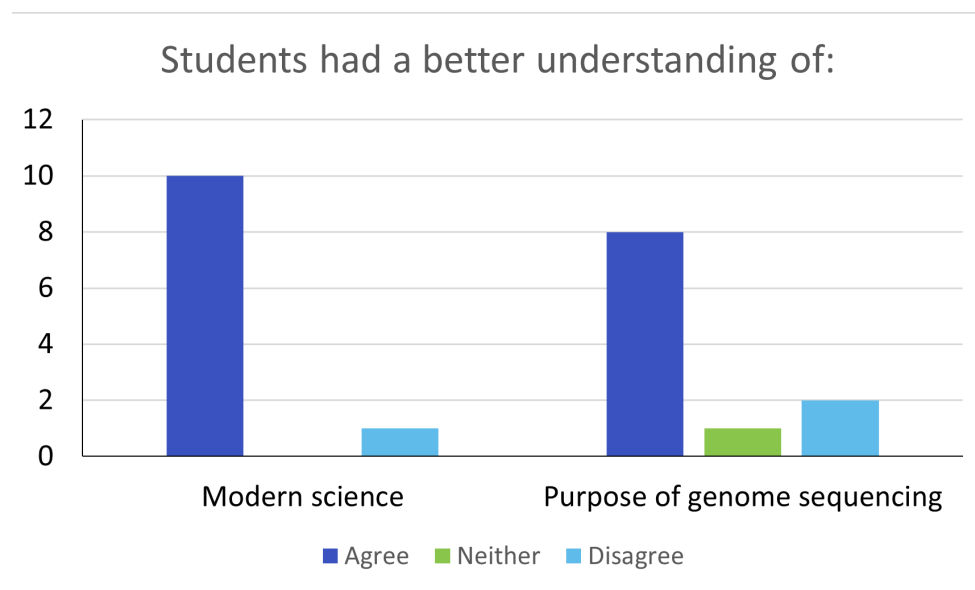
1. Understanding of modern science and the DToL project
2. Understanding the purpose of gene sequencing
3. Perception of value of project for applying to Higher Education
4. Supporting Science Capital

We have assessed each measure through a mixture of survey responses from students and teachers, and observation of activity on the site combined with select web metrics.

4.1. Students

4.1.1. Understanding of modern science and the DToL project:

- 10 out of 11 respondents reported a better understanding of modern science projects.



- We can see from Chat transcripts that students were interested in the Darwin Tree of Life project.

Student 1: What is the darwin tree of life project?

Liz (scientist): Hi. The Darwin Tree of Life Project is a big project that is trying to find the DNA sequence (genome) of all species in the UK. It's a pretty big project!

Student 1: How many hours do you spend doing research particularly in the lab?

Sophie (scientist): I personally don't work in the lab at all anymore (though in my PhD I spent a lot of time watching aquariums and studying fish behaviour), but both Joanna and Liam spend a lot of time doing research in the lab and field

Student 1: Do you overlook the research done and organise it?

Sophie (scientist): I've had a lot of different jobs since I joined the Tree of Life programme, but yes, I help the scientists talk to the people who fund our research and write the reports on what we've been doing.

Student 1: What job did you initially do to get involved in DToL?

Sophie (scientist): That is a very good question - my career path has been quite varied. I previously worked in science funding, but I have an MSc in Biodiversity and so I was always interested in wildlife. After I finished my PhD, I took a research administrator role at the Sanger institute and ended up working on the DToL project - perfect combination of wildlife and admin for me!

- Examples from ASK:
 - Why is it important that we are always studying species?
 - Why do you think the work you are doing is important?
 - What is the Darwin Tree of Life about?
 - What is your research project?

4.1.2. Understanding of the purpose of gene sequencing

- Student survey responses showed that 8 out of 11 respondents felt they had a better understanding of the purpose of genome sequencing since having taken part in the DToL activity

- Examples from Chats:

Student 1: What kind of information can genetic testing give me?

Alice (scientist): I took the 23&me DNA test and that (un)surprisingly told me I'm from Italy

Laura (scientist): The great thing about 23&me is that you can download your raw data and interpret that - I love the website geneticlifehacks

Student 1: Can you explain a bit more about what DNA Barcode analysis involves?

Brian (scientist): We use a small part of the DNA of organisms as species-level "barcodes" - it forms a unique pattern of nucleotide "letters" such as CAGT, of around 500-1000 letters long. Using these unique sequences we can try to identify species

Student 2: What technology is used in this process?

Brian (scientist): we use DNA extraction (just breaking up cells in various buffers), then the polymerase chain reaction (PCR) to amplify DNA, and then Sanger sequencing to read the amplified DNA

Student 2: What is Sanger sequencing?

Brian (scientist): Sanger sequencing is quite an old type of DNA sequencing - you take a single region of DNA that is highly amplified, and then fluorescently tag each nucleotide (DNA letter) with a different colour.

You can then run this tagged sequencing reaction through a machine to detect the different tagged nucleotides, in sequence, to read them. It's a bit more complicated than that but that's essentially what happens.

It's a bit like using barcodes in a shop to identify products - but it only matches exactly when someone else has produced a reference barcode sequence. Otherwise we have to produce the first reference barcode sequences for a species

- Examples from Ask:
 - [Do you think that the project is likely to help us find ways of advancing agriculture in the future? If so, how?](#)
 - Hi, why is it important to find out the genome sequence of different organisms?
 - How can we actually identify which bases are which in a DNA sequence? Do they each have specific parts that stand out e.g. number of hydrogen bonds or is there biochemical tests we can do to identify them?

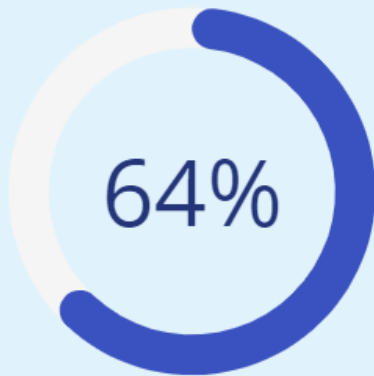
4.1.3. Using the activity to showcase one's motivation on the UCAS application

- 40 certificates of participation were downloaded by students
- Student survey responses showed that since having taken part in the DToL activity, 7 out of 11 students were more likely to choose a STEM subject at university, and 7 out of 10 students who wanted to go to university wanted to study a STEM subject. The remaining 3 wanted to go into a medical field.



7 out of 11 students were more likely to take a STEM subject at university following taking part in Schools @ Darwin Tree of Life

- 7 out of 9 students who responded to the survey wanted to use the DToL activity to showcase their motivation on their UCAS application

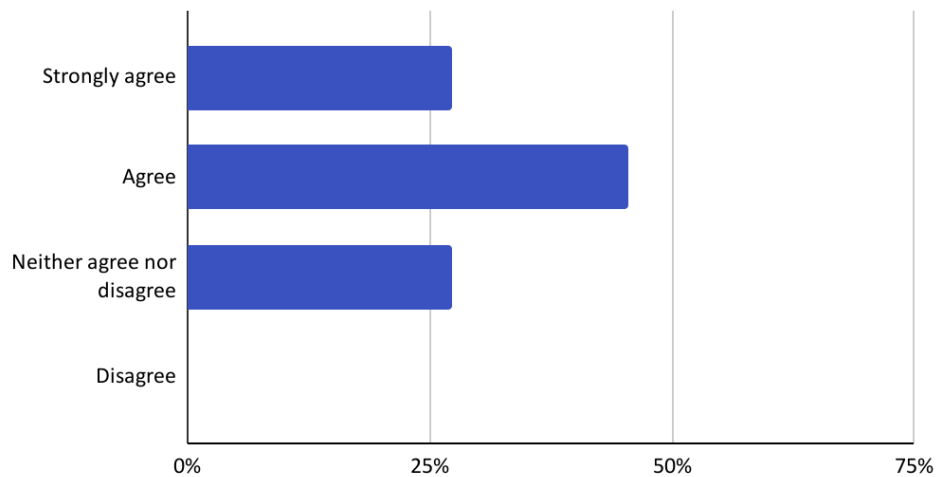


64% of students planned on using the activity to showcase motivation on their UCAS application

4.1.4. Supporting students science capital

- 8 out of 11 students felt they were able to ask questions that were of interest to them in the DToL activity. An important part of the science capital teaching approach is supporting students' science aspirations and making them see science as something that could be 'for them'. By asking questions of value to them, students can link science to their experiences, interests and everyday life, supporting their science capital.

In the activity I was able to ask questions that were interesting to me.



- 8 out of 11 students felt the scientists taking part in the DToL activity seemed like normal people. Knowing people that work in science is an important part of science capital. It allows students to see scientists as 'normal' people that come from similar backgrounds to them, and have the same hobbies and interests.



- Examples from Chats

Student 1: What is your favourite species and why?

Owen (scientist): I find most species fascinating. BUt I particularly like butterflyed, especially the swallowtails and the world's biggest butterflies, the birdwings

Student 1: Thank you

Owen (scientist): What about you - what's your favourite species?

Student 1: Platypus! I love all their adaptations. Also I think their babies are called puggles!

Owen (scientist): I was lucky enough to see them in the wild a few years ago. They are *very* cool! Didn't see any puggles tough

Student 1: very jealous!

Owen (scientist): Echidnas are very cool too and very tame. Australia has the most amazing biology

Student 1: would love to visit quokkas!

Owen (scientist): me too!

- Examples from ASK:
 - Is it hard passing science GCSE?
 - Have you been diving?
 - [What is your favourite thing about the squid?](#)

4.2. Teachers

We contacted teachers that had students signed up for the Darwin Tree of Life activity. We asked them if, and how, they promoted the activity; used the materials; and encouraged students to take part in independent study. We also asked for general feedback about the Zone.

According to feedback we received:

- Teachers promoted the activity to their students in different ways by displaying the poster in common rooms and classrooms, as well as sharing the sign-up link through online methods.
- The questions students asked encouraged discussion in the classroom and were used by teachers to further their students' engagement.

Teachers appreciated the opportunity for their students to engage with the scientists. It allowed students to deepen their understanding and knowledge in the subject area. Feedback given by students told us they found the activity interesting and helpful for enriching their personal statements.

Additionally, teachers confirmed the reasons that reduced the activity in the Zone, specifically mentioning exams and exam preparation.

4.3. Scientists

A select group of scientists and team leaders were contacted through the Wellcome Sanger Public Engagement team. They were asked for responses to some questions as well as providing the option for general feedback.

Responding scientists felt the Chat and Ask function to work well and enjoyed taking part in Chats and answering questions, although it was difficult to understand the impact and value to students. Despite this responding scientists agreed that students valued the opportunity to Chat with scientists and asked interesting questions.

Scientists felt there were a good amount of opportunities to connect with students, however, more variety in times for live Chats would have been useful to open it up to more scientists who have regular fixed work commitments.

In terms of scientists profiles, there were mixed responses. Some felt the number of questions were too many, making the process lengthy, whereas others felt the number of questions allowed students insight into them as people and encouraged them to go beyond their work.

Overall, scientists enjoyed the opportunity to connect with school students and felt the process of taking part was straightforward and easy.