

Connect Physics Evaluation 2021-2022 Executive Summary

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The Connect Physics Programme

The Connect Physics Programme is a series of three workshops for year 8 students to be delivered across an academic year. The workshops aim to answer the questions:

What is physics?
Why do physics?
How do we do physics?

The workshops encourage students to think of the bigger picture through connecting different ideas, such as topics from KS3 science, the latest physics research or their everyday lives. They are able to find out about careers that are available after studying physics and they are given a chance to develop their skills using the scientific method and the peer-review process by tackling an open-ended problem with no given solution.

By the end of the workshops all students should have explored their thinking around the following:

- Anyone can do physics.
- Physics is exciting, relevant & important; it goes beyond the classroom.
- Studying physics further broadens career possibilities.

The workshops are based on the recommendations from the ASPIRES research¹ and were developed by Science Theatre on behalf of SEPnet.

Evaluation

Over the course of the academic year 2021-2022 a full programme evaluation was carried out. This was to measure an indication of participating students' baseline science capital, see whether their science related aspirations were impacted by the programme, and identify recommendations to improve the programme. We collected data on the students' genders and ethnicities, allowing us to disaggregate results by these factors.

The evaluation consisted of baseline, midline and endline forms completed by students during the sessions, focus groups with participating students, and observations of sessions.

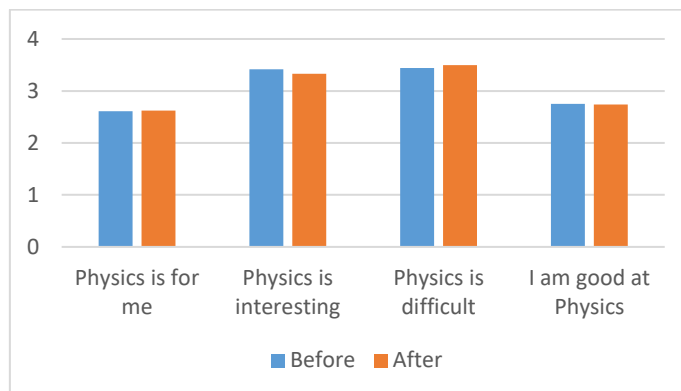
Key findings

Science Capital

The questionnaire responses give some interesting insights into science capital and science related aspirations of the year 8 students we engaged with. Some of the demographic data shows similar trends to those identified in the ASPIRES work. The students we worked with as a whole display a

¹ <https://www.ucl.ac.uk/ioe/departments-and-centres/departments/education-practice-and-society/aspires-research>

mid- to high- level of science capital, with those reporting their ethnicity as Asian consistently scoring higher in science capital questions than those from other ethnic groups.



We asked students their opinions on four statements about Physics at the start and end of the programme. In both before and after questionnaires the two highest statements were ‘Physics is Interesting’ and ‘Physics is Difficult’. Although a core message of the programme is ‘Anyone can do Physics’ we had not explicitly built in messaging to counter the ‘Physics is Difficult’ narrative – this is a feeling shown across all evaluation strands, with students often seeing physics as interesting because it is difficult, and seeing skills from physics as being valuable because you have to be clever in order to do it.

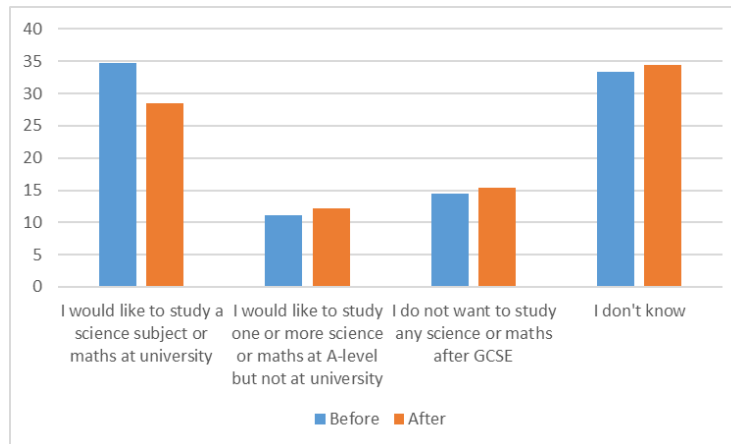
In spite of the perception of physics being difficult the statements ‘Physics is for me’ and ‘I am good at Physics’ both scored above the mean across the cohort.

We attempted to measure the significance of measured change by using the chi squared test, however found this to be an inappropriate tool. In fact, due to the fact that our before and after samples were of different sizes and not drawn exclusively from the same cohort we realised that there is not a suitable statistical tool which can be used for this analysis.

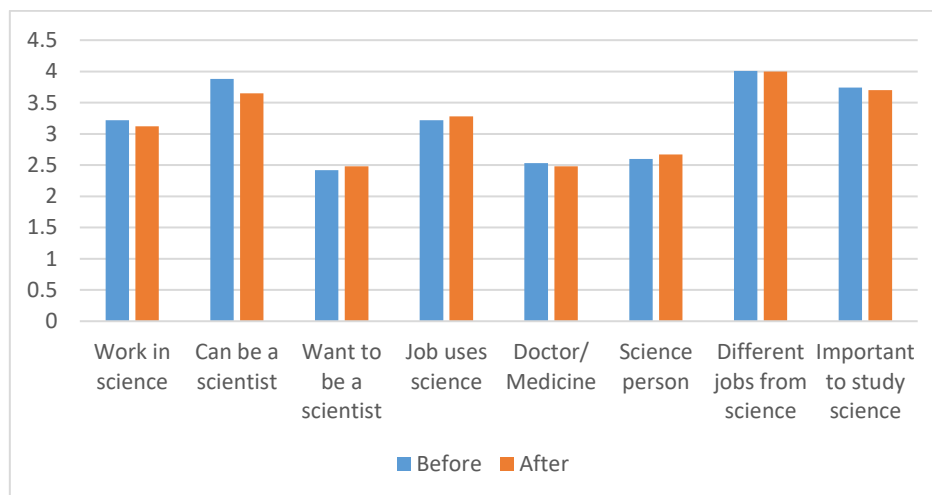
Science Related Aspiration

We asked the students about their science-related aspirations both before and after the workshop, to see what these were and to measure whether any change had taken place.

When asked about their future study plans a large proportion did not know whether they wanted to take any science subjects beyond GCSE. This is understandable as they are still a few years off from making these decisions. Of those who did have an idea what they wanted to do around a third said they wanted to study maths or a science subject at university, with this proportion falling slightly over the course of the year.



We also asked a range of questions about how they viewed themselves in relation to science. Of the statements given the highest scoring were 'Anyone can be a scientist', 'A science qualification can help you get many different types of job' and 'It is important to study science even if you don't want a science job in the future'. This highlights that by year 8 students are well aware that valuable skills can be gained from science, and these could be used in many different types of jobs.



Focus Groups

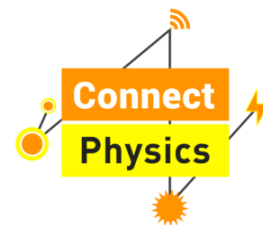
Two focus groups were held at different participating schools after the three workshops had run. Analysis conducted across these identified three key themes that the students kept coming back to. These were:

How good they are at physics

What skills they gain from Physics

How much they like physics

Overwhelmingly the students considered physics as hard, and many said it was not one of their favourite subjects. There was discussion about what skills you could gain from physics that could lead to good, well paid jobs, but also the feeling that most wouldn't study physics unless they



needed it for their future careers. There were some in the group who felt they did well in physics, or were good at it, but this was generally alongside them stating that they didn't enjoy the subject.

The focus groups demonstrated that by year 8 physics is already perceived quite negatively by most students. The Connect Physics workshops do aim to demonstrate the range of jobs available from physics, which was something the students demonstrated awareness of. The workshops also aim to communicate that 'anyone can do physics', however don't explicitly aim to counter the narrative that physics is harder than other subjects. This may be messaging that we should consider explicitly building into the workshops to help counter the 'physics is hard' narrative.

Observations

All three Connect Physics were observed across two different schools. This allowed us to see how the sessions were being received by the class as a whole, and by individual students, and to identify areas of strength and weakness in the programme. A SEPnet outreach staff member not involved in delivery sat in each session, and observed the behavior of individual students throughout the workshop.

Through observations we identified areas where students had a reasonable amount of pre-existing knowledge; they knew what physics was and could go some way to describing it, and they were aware of a range of physics related jobs. It also highlighted areas where we had assumed they would have more knowledge, for example it became clear that the students had not had the opportunity to do hand on physics practicals in class. Similarly observations allowed us to see how different student responded to the varying activities in the workshops, and in particular highlighted that some of these would benefit from having differentiated versions to use with different students or groups.

From the observations we could see that the sessions were generally well received by students, and that most students were engaged throughout. At the end of the 'What' session students commented that it had been the 'best science lesson ever' and during the mystery tube activity in the 'How' sessions many of the students were keen to stay at the end to show the presenters their models.

Recommendations

The evaluation process have been very insightful to flag some areas to gather further data, as well as areas in which we can improve the workshops themselves. The following recommendations are provided in order to better assess the impact of the programme, and as amendments to some of the sessions:

- Gather control data across the academic year from year 8 students not taking part in Connect Physics. This will provide a comparison point for the survey results.
- Broaden the messaging in the workshops to explicitly counter the 'physics is hard' perception, which was demonstrated through both the surveys and focus groups.
- Add in more explanation to the 'How' session of what experiments are in science and why we do them.
- Create different versions of the connections wall and recruitment agency games to make these more accessible across the range of student abilities.