



Young people's views on science education

Key findings from the
Science Education Tracker 2019

Wave 2

Key findings

41%

of young people in years 7–13 considered an understanding of science as important to their everyday life

62%

of year 7–11s wanted to do more practical work

27%

of year 10–13s wanted to do STEM-related work experience but were unable to

42%

of year 7–13s with no family science connections were interested in a STEM career compared to 68% of young people with many family science connections

53%

of female students in years 10–11 felt anxious about science tests or exams most times, compared with 28% of males

The Science Education Tracker is a survey of young people's attitudes towards and experiences of science education and careers.

This is the second wave of our Science Education Tracker, in which we surveyed over 6,400 students between years 7 and 13 (aged 11–18) in state-funded schools and colleges in England during 2019.

We first ran the survey in 2016, when we surveyed more than 4,000 students between years 10 and 13 (aged 14–18) in state-funded schools and colleges across England.

Read and download the full report:
wellcome.ac.uk/set2019

What we think

Young people are rarely asked their views on education, and Wellcome's Science Education Tracker reflects the growing global recognition that their voices do matter. This report presents the results of our second survey of young people across England exploring their attitudes, experiences and aspirations in science and related disciplines.

Wellcome first commissioned a survey of young people in 2016, covering ages 14–18. This new survey, conducted in 2019, follows up on that research, introduces new questions and now includes views from students throughout secondary school (ages 11–18). We received responses from over 6,400 young people and the sample is nationally representative by gender, ethnicity, region and socioeconomic status, allowing us to identify and explore some interesting demographic trends.

Schools and teachers are clearly crucial to young people's enjoyment and experiences of STEM learning, and they deserve thanks for their untiring efforts to inspire and educate young people. More than half the students surveyed explicitly say that they value the ability of a teacher to explain things well and a third say that having a good teacher motivates them to learn science. This highlights how essential it is to value and support teachers' continuing professional development throughout their careers, so they can build the skills that keep students engaged. And research shows that such professional development also helps with improving teacher retention, which benefits students because experienced teachers are likely to be able to engage with them better.

It is deeply concerning that only 41% of young people believe that understanding science is important to their everyday life and there has been a 11% drop in thinking that science is important for society in general. Practical work emerges as the top motivator for studying science, and students who are traditionally less engaged in science are more likely to want to do more. The decline in practical work from 2016 to 2019, combined with the lack of STEM work placements, is thus a cause for concern and may be contributing to the increase in students who do not view science as relevant to their own lives.

Gender gaps continue to be a major issue – both in the type of sciences young women do and don't choose to study and pursue as careers, and in their self-perception of their ability in science. The pattern set at school continues into adulthood: the Wellcome Global Monitor (wellcome.ac.uk/monitor), a survey of adults in 140 countries, found that men have more confidence in their scientific knowledge than women across the globe. If women are to take their rightful place in a STEM-rich society and economy, it is vital that we address these gender gaps urgently.

Experiences outside school play an influential role in the trajectories of young people's lives. While poverty does not necessarily dampen enthusiasm for STEM, it is strongly linked to having fewer choices and opportunities both in and out of school, impeding progression in these fields. Families and their connections also matter a lot in shaping young people's aspirations and experiences in STEM.

From advising on GCSE choices and careers

to brokering informal learning experiences outside school and work placements, parents make a big difference. To make STEM access and opportunities equitable for all young people, we must work more holistically, taking account of all the factors that support and prevent young people's engagement with STEM.

The benefits of better and more equitable STEM education extend way beyond improving young people's own experiences and job prospects: it will help to build a more STEM-literate society and a more highly skilled, innovative economy. And greater equity for students today can contribute to a more diverse and inclusive STEM sector tomorrow.

I hope that young people's voices, as represented in the Science Education Tracker, will not only guide Wellcome's education and learning activities but also inform others who wish to help young people achieve their potential. They have spoken; it's now up to us to listen and respond.



Dr Anita Krishnamurthi

Head of Education & Learning
Wellcome

Background to the survey

This booklet presents key findings from the 2019 Science Education Tracker (SET 2019) survey, the second wave of a survey series that began in 2016 (SET 2016). The survey series is conducted by Kantar on behalf of Wellcome, with additional funding support from the Department for Education (DfE), UK Research and Innovation (UKRI), the Royal Society and the Department for Business, Energy & Industrial Strategy (BEIS).

The SET survey series provides evidence on a range of key indicators for science engagement, education and career aspirations among young people in England, allowing changes to be tracked over time.

The SET 2019 survey is a nationally representative sample of 6,409 young people in school years 7 to 13 (aged 11–18) attending state-funded schools in England. SET 2019 was broader in scope than SET 2016, which was based on a smaller sample of young people in years 10 to 13 only. In addition, the SET 2019 questionnaire was redeveloped to reflect updated policy priorities, although core measures could still be tracked.

SET 2019 fieldwork was conducted online between 13 July and 2 September 2019.

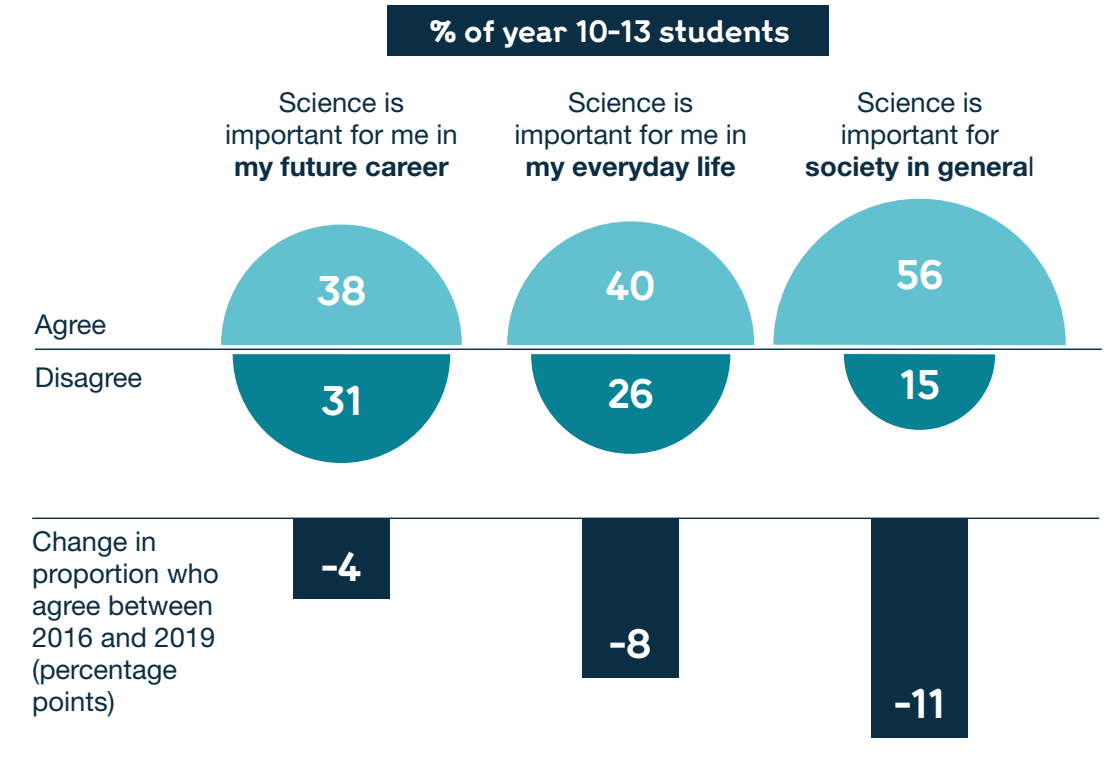
Relevance of science to everyday life

Most students do not see science as relevant to their everyday life.

- Two in five young people in years 7–13 (41%) considered an understanding of science as important to their everyday life. Although relevance to real life was one of the more motivating aspects of science lessons, still only 27% of young people selected this as a motivation to learn science.
- There were declines in the proportion of year 10–13s who felt that understanding science was relevant to their everyday life (from 48% in 2016 to 40% in 2019) and to society in general (from 67% in 2016 to 56% in 2019).

Relevance of science

Less than half feel that understanding science is relevant to everyday life and this has fallen since 2016



Family science connections

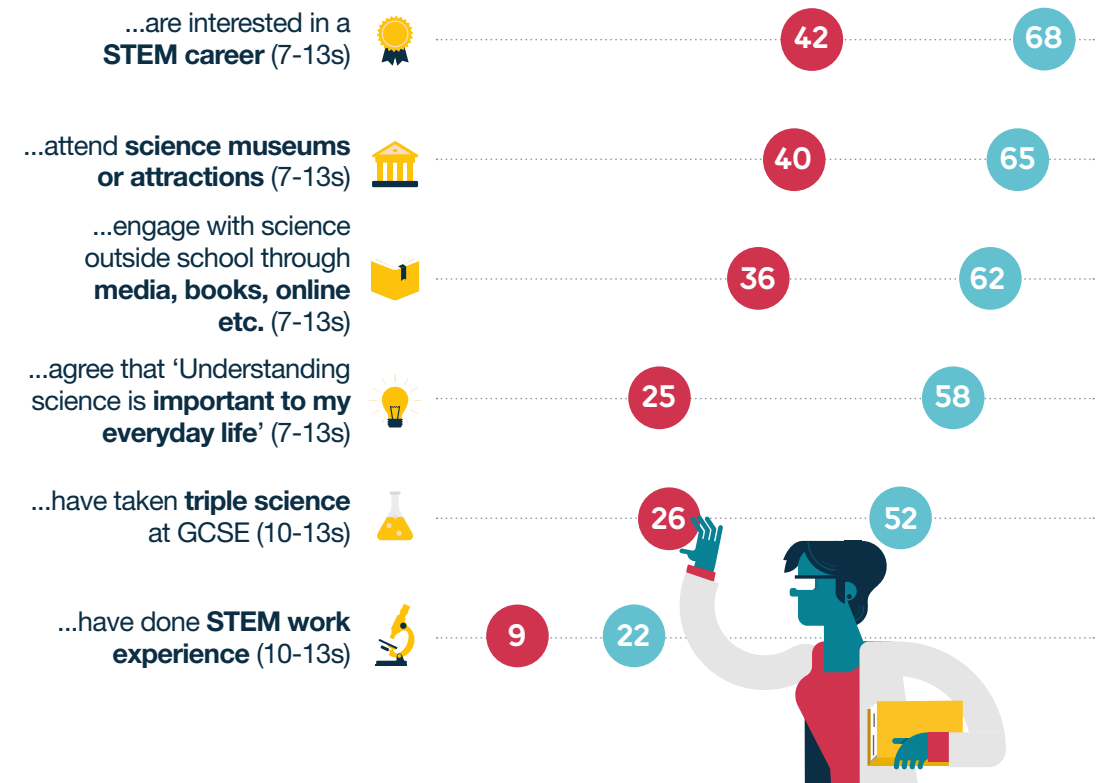
Family and especially parents are very influential in shaping young people's education and career choices. However, family science connections are more concentrated among students from more advantaged backgrounds, which perpetuates inequalities in access to STEM.

- Using a specially constructed Family Science Connections Index, stronger family science connections were found among students from more advantaged backgrounds as measured by low area deprivation, a lack of free school meal entitlement and parental attendance at university. White students living in the most deprived areas were notably more likely to lack family science connections, while black students (overall) were more likely than other ethnic groups to have family science connections.

- Stronger family science connections were linked to higher access to informal science learning, triple science, STEM work experience and a wider range of careers advice. Students with stronger family science connections were also more likely to consult parents about GCSE choices, to take up STEM subjects after GCSE, and to aspire to STEM-based higher education and careers. More widely, students with stronger family science connections showed more interest in school science and were more likely to appreciate the link between science and their everyday life.
- Parents were cited as the most influential sources when making GCSE choices and seeking guidance about careers.

Family science connections are linked to higher rates of STEM participation

Students with no family science connections are less likely to participate in a range of STEM activities



■ % of students with **no** family science connections who...

■ % of students with **many** family science connections who...

Science outside of school

Young people access science outside school in a variety of ways, with online and TV being the most common.

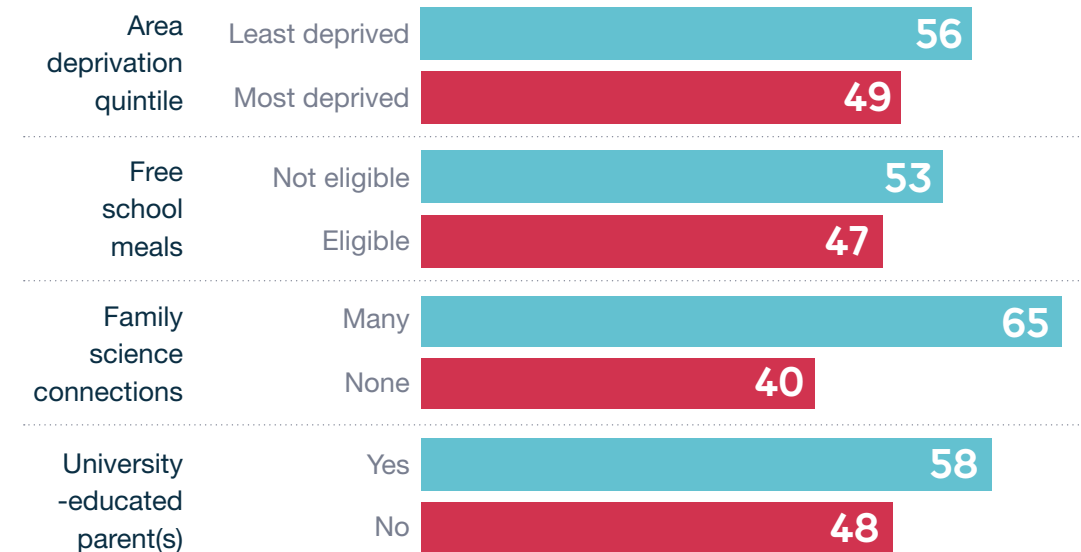
- Most students in years 7–13 (94%) had engaged with some form of science content outside school in the past year and 48% had done so in the past month. Students typically accessed science content through reading about it online (86% had done this in the last year), TV or streaming (75%), and books, newspapers or magazines (66%).
- Excluding zoos and aquariums, 37% of year 7–13 students had visited a science-related attraction or activity such as a science museum or festival in the past year. When zoos and aquariums are included, the rate was 51%. A third (32%) had participated in an extra-curricular school science event such as a talk from a STEM-based employer or a science or maths challenge or competition.

- 40% of those who had not visited a science attraction in the last year had accessed science via digital or media sources, which suggests an important role for these channels in widening access to and engagement in science.
- Some demographic groups of students were less likely to participate in most forms of informal science learning: those eligible for free school meals; those living in the most deprived areas; those with no family science connections; those without a university-educated parent; and those with a low science quiz score.

Informal science learning by family background

Students from more disadvantaged backgrounds are less likely to visit science-related museums and attractions

% of year 7–13 students who have visited science-related museums or attractions in the past year



The survey included a science quiz intended to measure young people's scientific knowledge.

Enjoyment of science at school

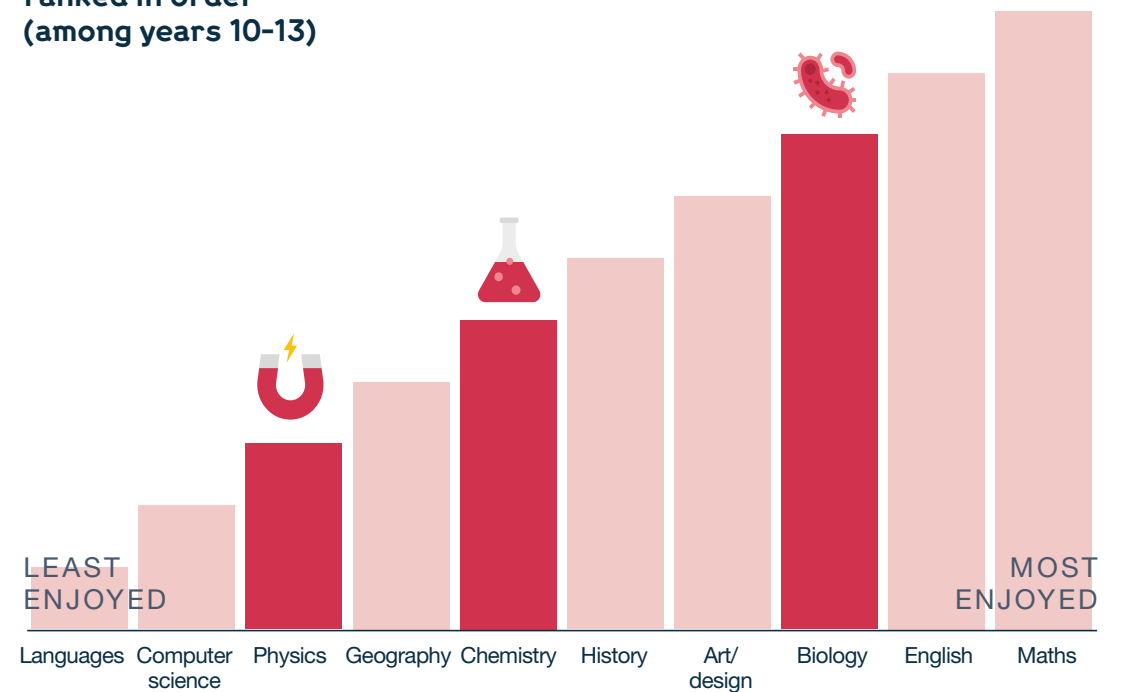
Attitudes to science as a whole mask differences in enjoyment of the three core science subjects.

- When asked to rank how they enjoyed different subjects, students ranked science subjects below maths and English, and above computer science and languages.
- In years 7–9, when science is often studied as a combined subject, it is ranked roughly midway (4th out of 8 subjects). In years 10–13, when sciences are studied separately, biology was the most enjoyed science subject (3rd out of 10), while physics was least enjoyed (8th out of 10). Chemistry was ranked in the middle (6th out of 10).

How much different subjects are enjoyed

Biology is the most enjoyed and physics is the least enjoyed science subject

Most enjoyed subjects ranked in order (among years 10-13)



Interest in science and science lessons

There was a sharp fall in interest in school science over the first three years of secondary school, especially between years 8 and 9.

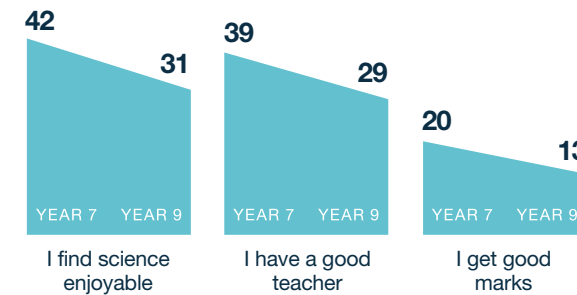
- The proportion who were very interested in science lessons declined from 26% in year 7 to 23% in year 8 and 14% in year 9. The proportion who said they were very or fairly interested declined more gently, from 83% in year 7 to 73% in year 8 to 68% in year 9.
- Over the same period, students increasingly rejected science as a future pathway: the proportion who said that they did not plan to study science after GCSE increased from 26% in year 7 to 41% in year 9.
- A range of factors may underpin this drop in engagement. Between years 7 and 9 there was evidence of reduced experience of practical work (which was the most motivating aspect of science lessons), and an increase in the proportion of students who thought of science as difficult and involving a lot to learn. Furthermore, between years 7 and 9 there was also a drop in perceived science ability and an increase in anxiety about science. Wider evidence also points to an increasing number of schools starting GCSE teaching earlier in year 9, which may also help explain this marked drop in engagement over the early years of secondary school.

- Students from more disadvantaged backgrounds (as measured by free school meals eligibility and area deprivation level) were no less interested in science.
- Across all students in years 7–13, the gender gap in interest in science was very small (22% of male students were interested, 18% of females).
- Female students mentioned more barriers to learning science than males did, and were especially likely to say that they had been put off by factors related to difficulty (49% of female students, 32% of males), quantity of work involved (43% of females, 27% of males) and achieving good grades (17% of females, 9% of males). Males were twice as likely as females to say that nothing had put them off learning science (22% vs 12%).
- A third (34%) of year 7–13 students said that having a good teacher was a motivation to learn science. When asked to select the most important characteristics of science teachers, students particularly valued teachers who explained things well (55%), made learning fun (41%, rising to 49% for year 7–9s), were enthusiastic or passionate (29%), and were supportive (29%).
- A smaller proportion of students in 2019 said they were encouraged to study science because they found it interesting or enjoyable (35%, down from 41% in 2016).

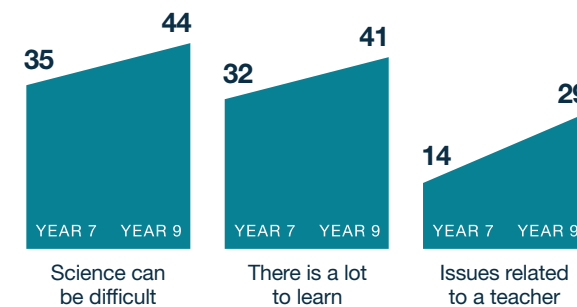
Interest in science lessons by school year

There is a large drop in interest between year 8 and year 9. A range of factors may explain this drop in interest.

What has encouraged young people to learn science (%)



What has put young people off learning science (%)



Self-perception of science ability

Students regard science as a difficult subject and, compared with other compulsory subjects, they are less likely to rate themselves as good at science and more likely to feel anxious about it in tests.

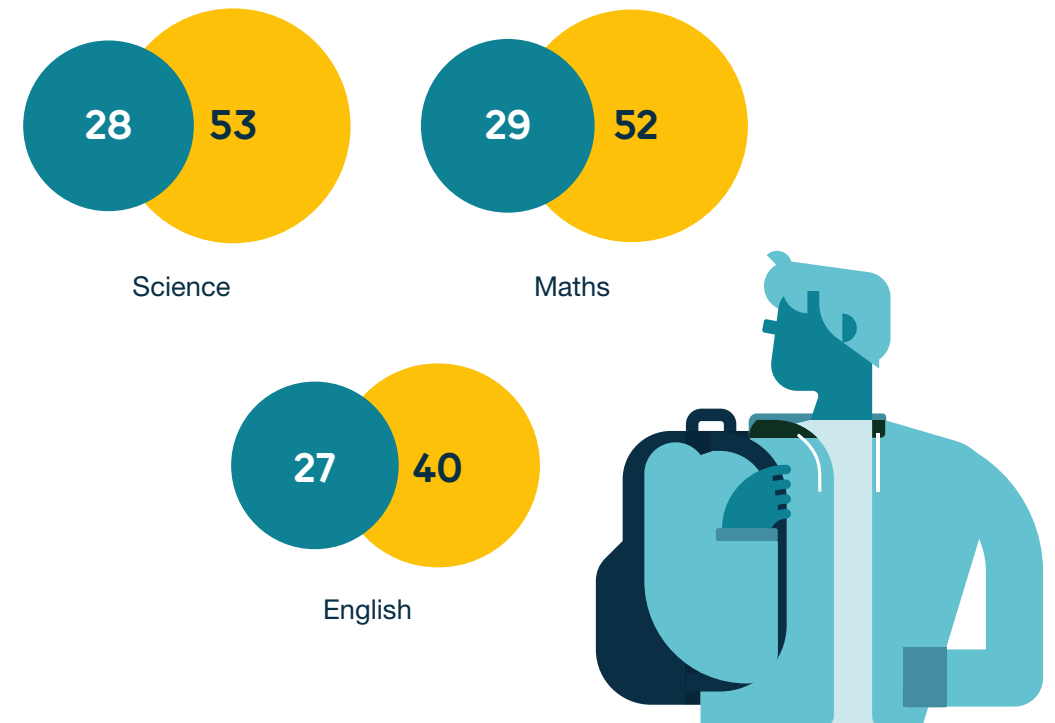
- The most common disincentives to learn science among students in years 7–13 were perceptions of difficulty (41%) and volume of work (35%).
- When asked to compare maths, English and science, students were most likely to rate themselves as good at maths (66% in years 7–9, 57% in years 10–13) and English (65%, 58%). They had lower self-belief in science: 56% felt they were good at science in years 7–9, and in years 10–13 this proportion ranged from 37% in physics to 49% in biology.
- Based on the proportion of year 7–11s who felt anxious about tests or exams most times, students felt more anxious in science (38%) than maths (35%) or English (29%).

- Female students were much less likely than males to rate themselves as good at maths, physics, chemistry and computer science. By contrast, there was no gender gap for biology and history, and for English the gender gap was reversed. Even after controlling for GCSE science attainment (re-basing results on all who had achieved at least two strong passes), the gender gap for perceived ability in physics and chemistry persisted in years 12–13.
- In years 10–11, 53% of female students felt anxious about science tests or exams most times compared with 28% of males. There were similar gender divides in years 7–9, for both science and maths.

Anxiety in school exams

Female students are more anxious than males about STEM subjects

% of year 10-11 students who feel anxious in tests or exams 'most times'



■ Male
■ Female

Growth mindset

Sciences were more likely than other compulsory subjects to be associated with a 'growth mindset', which holds the potential to encourage more young people to pursue science.

- Compared with maths and English, exam success in science was more likely to be seen as due to hard work. In science, 61% of year 7–13 students associated exam success with hard work and 19% with natural ability (20% thought both were equally important). This was a larger perceived role for hard work than in maths (54% hard work, 29% natural ability) or English (47% hard work, 29% natural ability). These results suggest that science may fit better than maths or English with the idea of a learning or 'growth' mindset, the belief that intelligence is not fixed or innate but rather can be developed through effort and hard work.

- This pattern of results for science subjects holds throughout all school years. By contrast, as students got older, they increasingly linked success in maths and English to natural ability.

Practical science

Experience of practical work is key to motivating students in science, especially among disadvantaged students and those least engaged.

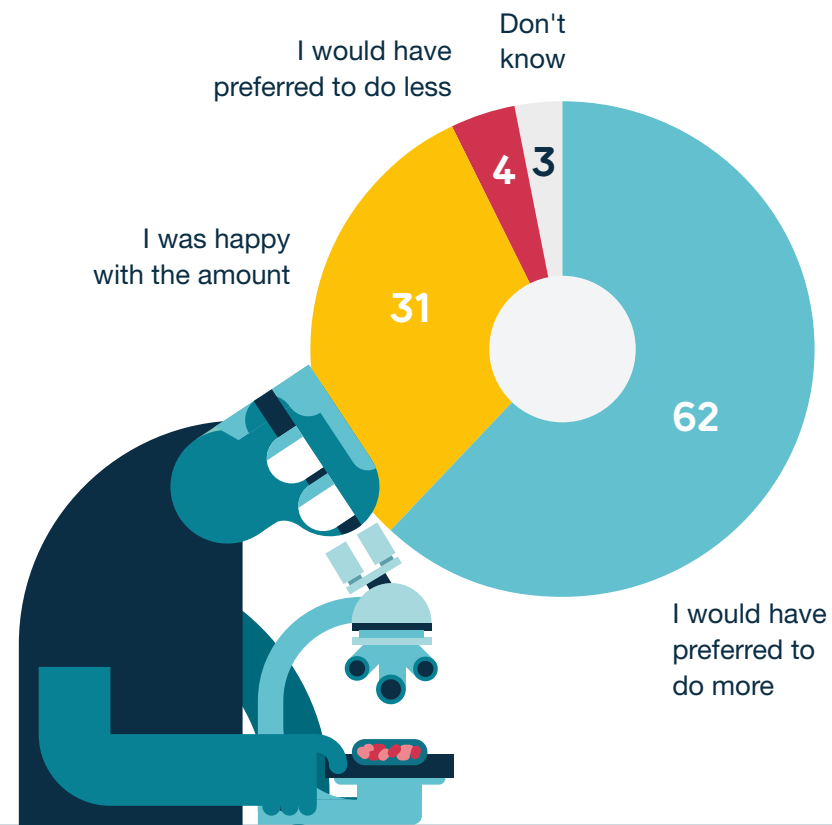
- Practical work was considered the most motivating aspect of science lessons at school, especially for students in years 7–9. When selecting from a list, 55% of year 7–9s and 32% of year 10–13s chose practical work as a motivation to learn science.
- However, hands-on practical work became less common as students progressed through school. In year 7, 63% reported doing hands-on practicals at least once a fortnight, but this proportion fell steeply by school year, and only 33% reported similar frequency of practicals in year 11.
- 65% of students in years 7–9 and 57% in years 10–13 wanted to do more practical work than they currently did, and this attitude was most common among students traditionally less engaged in science, such as more disadvantaged students, students with the lowest interest in science, students with lower science quiz scores (used as a proxy for science knowledge), and students taking double rather than triple science.

- The proportion of students in years 10–11 doing hands-on practical work at least once a fortnight has fallen since 2016 (from 44% to 37%), as has the proportion observing a teacher demonstration of a practical at least once a fortnight (from 47% to 38%).
- The decline in hands-on practical work between 2016 and 2019 was concentrated among students living in the most affluent areas. In 2016, year 10–11 students in the least deprived areas reported doing more practical work than those in the most deprived areas, but in 2019, both groups were equally likely to experience practical work.

Practical science (continued)

Most students want to do more practical work

Preference to do more practical work in years 7-11 (%)



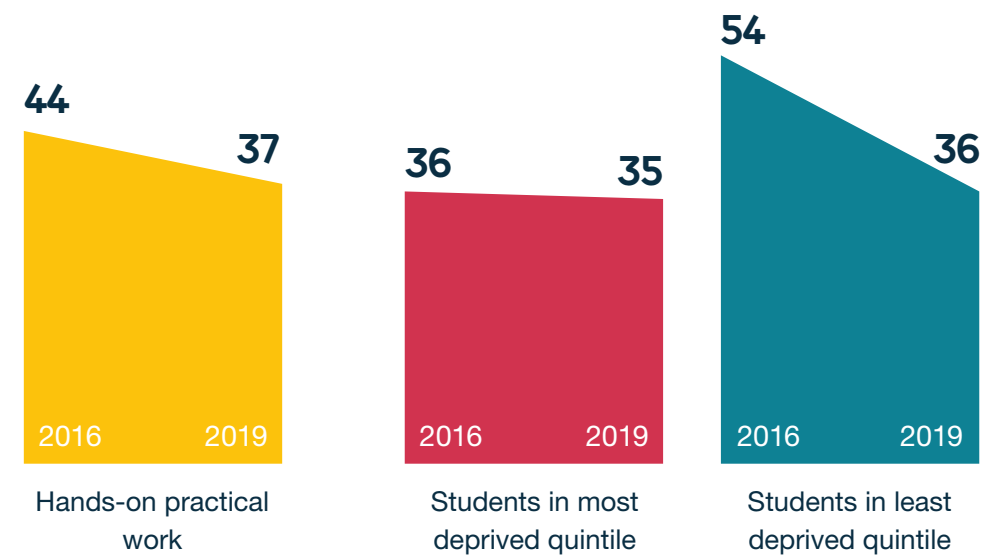
Changes since 2016

Students have less exposure to practical work in 2019 and this decline is more focused in affluent areas

% of students in years 10-11 who do hands-on practical work at least once a fortnight

All students in years 10-11

Area deprivation quintile



Computer science

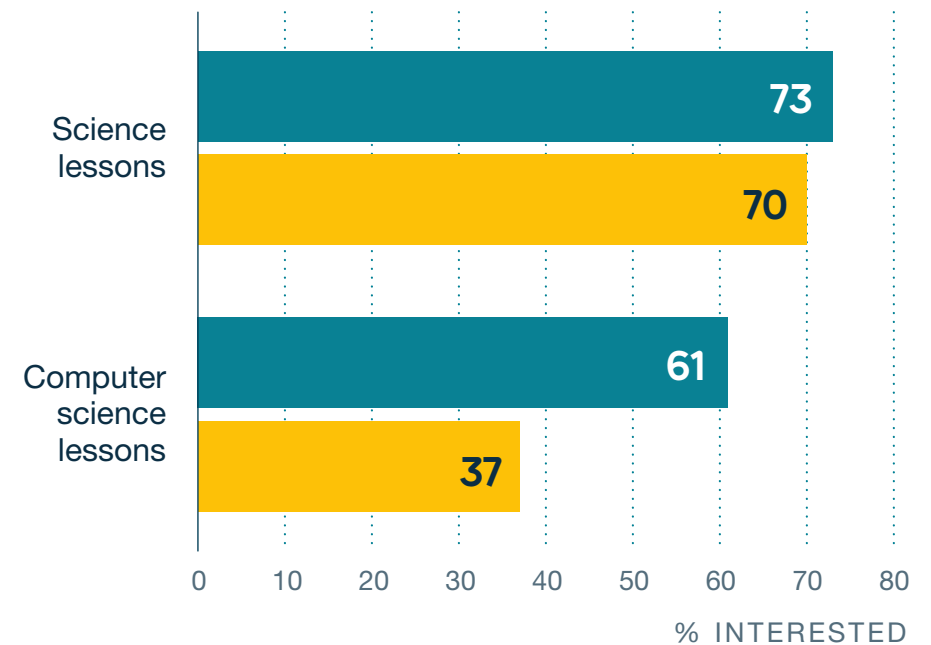
The pattern of engagement in computer science is different from that in science: interest levels are lower; the decline in interest sets in sooner; and there are wider gender and ethnicity gaps. However, there are indications that computer science is regarded as more accessible than science.

- 75% of year 7 students found computer science interesting (86% of male students vs 65% of females). Interest in computer science then fell steeply between years 7 and 8, and by year 9 had fallen even further for female students, resulting in a very large year 9 gender divide (65% of males were interested vs 32% of females).

- When asked to rank how much they enjoyed a range of subjects at school, across years 7–9, computer science was the most enjoyed subject among males and least enjoyed among females. Regression modelling confirms that, even after adjusting for a range of other factors, female students and students from a white ethnic background were much less likely to say they were interested in computer science than male students and students from an Asian background. The gender and ethnicity gaps were larger for interest in computer science than for interest in science in general.
- Students with a special educational need (SEN) were more likely than those without to show an interest in computer science. Furthermore, while 41% of year 7–13 students were put off science because of its perceived difficulty, only 27% said this about computer science, suggesting that computing is seen as more accessible than science.

Interest in science vs interest in computer science at school

The gender gap in interest in science at school is small, but is much wider for computer science (years 7-13)



Male
Female

Triple science

Most year 10–13 students said their school offered triple science as part of the school curriculum. However, not all of these students were given the opportunity to study it. Barriers appear to have been more related to the school being selective in who studies it, rather than not offering it at all. Personal factors such as confidence and lack of interest were barriers for many students, although some were discouraged by not meeting grade thresholds or by their teacher.

- A third (35%) of year 10–13 students said they had taken triple science (although some may have misclassified double science as triple; official DfE data suggests the true figure for these year group cohorts is 29%).
- While most students in years 10–13 taking a non-triple science course were content with this, 20% of them would have liked to study it if the option had been available to them: 4% said their school didn't offer it on the curriculum, while 16% said the option was not available to them personally.

- Among those who didn't study triple science, only 10% said that their school had not offered it. Instead, most (68%) gave a personal reason such as lack of confidence or interest, or concerns about volume of work; 43% cited a school selection barrier such as failing to meet the required grade, not being in the right set or discouragement from a teacher.
- 13% of year 10–13 students in 2019 said their school did not offer triple science, down from 19% in 2016. Of the students not taking triple science, the proportion who didn't study it because they thought it would be too much work increased from 21% in 2016 to 32% in 2019.

Opportunity to study triple science and obstacles to reaching STEM aspirations

Students from more disadvantaged backgrounds face more obstacles to a future in STEM

Students from more disadvantaged backgrounds are less likely to take up triple science

% who take up triple science

All year 10-13 students

35

Students living in the most deprived area quintile

26

Students eligible for free school meals

25

Students with no family science connections

26

Students without a university-educated parent

29

Science pathways in years 12–13

When making post-16 choices, students were more likely to opt for a non-STEM than a STEM pathway. STEM subjects were most likely to be studied as part of a mixed pathway.

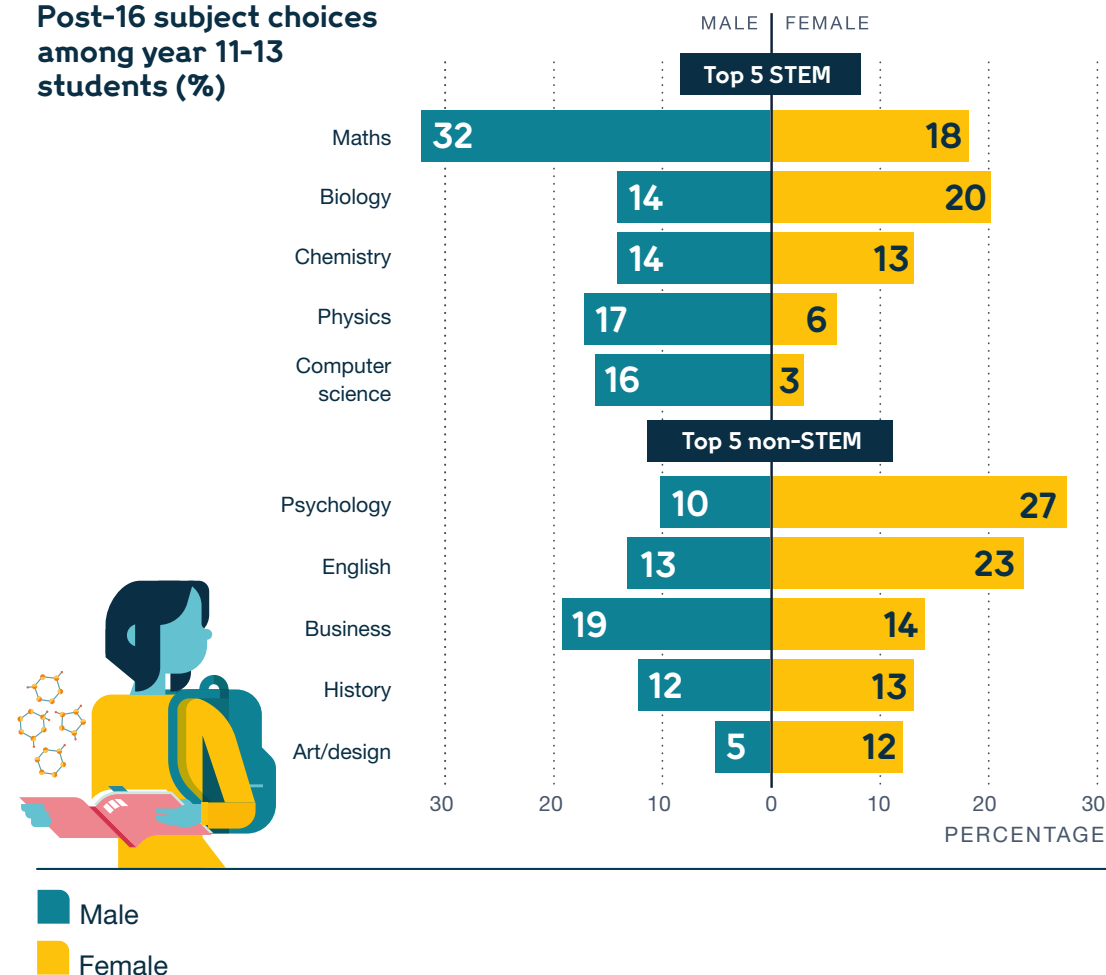
- Of all year 11–13 students who had made post-16 subject choices, 81% chose non-STEM and 53% chose STEM subjects (36% chose a mixture). The most popular STEM subject choices in order were maths, biology, chemistry, physics and computer science.
- A little under half (44%) of year 11–13 students who had made post-16 choices chose non-STEM subjects only, while 16% chose STEM subjects only. Therefore, most students taking STEM subjects did so as part of a mixed STEM/non-STEM pathway.
- Students from more disadvantaged backgrounds (as measured by free school meals eligibility and area deprivation level) were as likely as more advantaged students to aspire to a STEM pathway in post-16 subject choices and in a career. Among those considering higher education, students from less advantaged backgrounds were also as likely as other students to consider a STEM pathway (although from year 10 they were less likely to aspire to university in general).

- However, students from less advantaged backgrounds appear to face more obstacles to reaching these aspirations. They had lower levels of self-belief in their science ability than more advantaged students, were less likely to take up triple science, and were less likely to aspire to university. Students from less advantaged groups were also less likely to hold family science connections, to consult parents about GCSE choices or careers, and to take part in STEM work experience placements. However, it is very possible that such obstacles are not STEM-specific and also affect aspirations for non-STEM subjects and careers (this wasn't fully measured in the survey).
- The preference for non-STEM subjects was also apparent in aspirations for higher education and careers. Of all year 10–13s considering higher education, 45% were considering a non-STEM subject and 31% a STEM subject. And when year 10–13 students with some idea of a future career were asked about future aspirations, they were twice as likely to aspire to a non-STEM than a STEM career (68% vs 34%) based on a coding of verbatim responses.
- Among students in years 11–13 who had made post-16 choices, males were more likely to choose maths, physics and computer science, while females were more likely to choose biology (as well as many arts and social science subjects); chemistry was more balanced by gender.

Post-16 subject choices

Male students are more likely to choose science subjects (except biology) post-16

Post-16 subject choices among year 11–13 students (%)



Science as a career

Interest in a STEM career declined between year 7 and years 12–13. Experience of STEM-based work experience was rare.

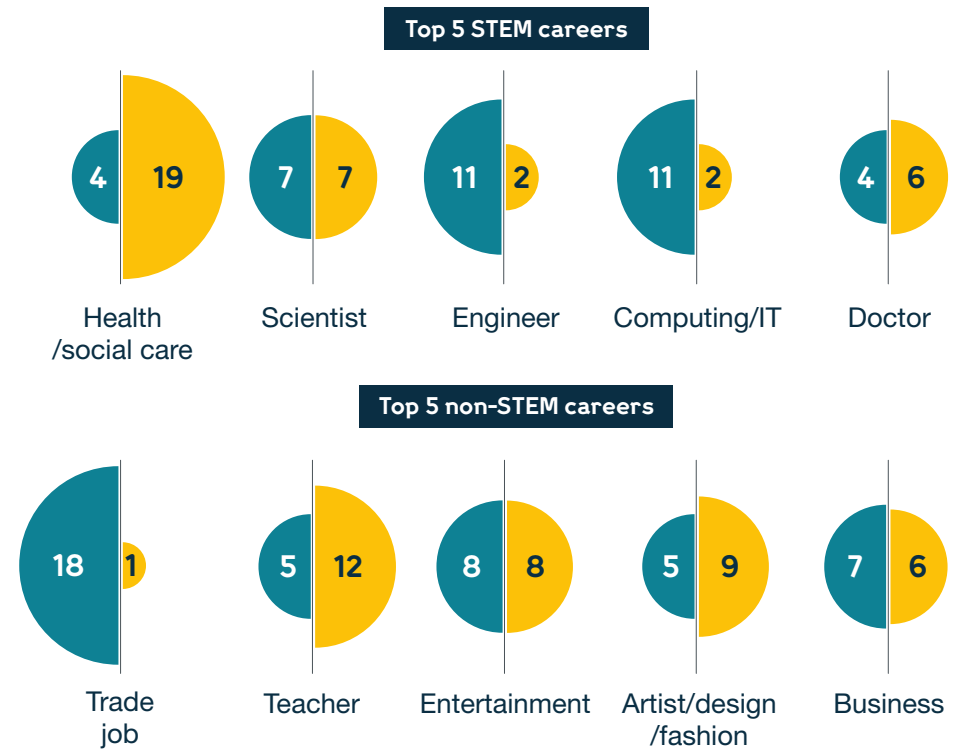
- 67% of year 7 and 66% of year 8 students were interested in a STEM career, though this gradually dropped thereafter to only 44% of students in years 12 and 13. Just over half (55%) of year 7–13s were interested in a STEM career.
- STEM-related career aspirations for students in year 10–13 varied by gender. Computer science and engineering were more popular among male students, while healthcare was more popular among female students.
- Motivations for pursuing a science career focused mainly on interest, pay and range of career options, while barriers mainly focused on lack of interest and having alternative plans.

- 67% of year 10–13 students had completed work experience, though only 14% had completed a STEM-based placement. A quarter (27%) reported that they had wanted to secure STEM-related work experience but had been unable to do so.
- Between 2016 and 2019 the proportion of year 10–13s who said that they were either very or fairly interested in a STEM career increased from 43% to 48%.
- Female students expressed a wider range of reasons for being disinclined towards a STEM career; they were more likely than males to be discouraged by a lack of enjoyment (49% of females, 34% of males), a preference for other subjects (41% vs 32%), or a lack of confidence either in their ability (34% vs 20%) or to get the required grades (21% vs 12%).

Career aspirations

There are big gender gaps in the appeal of careers in engineering, computing/IT and health/social care

Interests of year 10–13 students with some idea of future career (%)



Male
Female

Wellcome exists to improve health by helping great ideas to thrive.

We support researchers, we take on big health challenges, we campaign for better science, and we help everyone get involved with science and health research.

We are a politically and financially independent foundation.

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