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Young people's views on science education

Science Education Tracker
Executive Summary
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THE
ROYAL
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Science Education Tracker

Rebecca Hamlyn, Peter Matthews and Martin Shanahan

Kantar Public

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Foreword

Welcome to the report of the first Science Education Tracker. This new survey will build our understanding of the experiences, aspirations and intentions of young people across England with respect to science and related disciplines.

There are some reassuring findings in this representative study of over 4,000 young people. They express high levels of interest in science, science lessons and science careers. These findings reinforce those of Programme for International Student Assessment (2015) in which the UK was one of just seven countries occupying a sweet spot of above average attainment, engagement and career aspiration in science. This positioning is vital if we want young people to do well in science, apply it in their day-to-day lives and build our science related workforce.

Should we need reminding, this report confirms the central role that teachers play in the lives of young people: determining the nature of the science they are taught; providing career advice and enrichment; and encouraging them to learn. It is crucial that teachers' professionalism and skills are both celebrated and developed.

Science is an inherently practical subject – young people shouldn't just be learning scientific facts they should be learning how to experiment. The Science Education Tracker provides new insights into practical science in schools. It shows how motivating young people find practical work and that most of them want to do more. However, it also reveals alarming variations in frequency and type of practical science. We must address these inequalities.

Many students reported they had taken part in extra-curricular activities that encouraged them to learn science, such as attending talks by STEM Ambassadors, going to science fairs or doing long term projects. Schools also have a role to play in helping young people to organise work experience, especially those without family networks. Twice as many young people told us that they would have liked to do science related work experience than had been able to do so. There is plenty of scope to expand such opportunities.

Overall, the findings convey the complex relationships between various aspects of young people's relationships with science - their interest, desire to learn, confidence, attainment and aspirations - and the educational opportunities they have. These relationships vary with gender, ethnicity, school area and family background. Our learning here is that any interventions must be carefully tailored to their goals and the participants involved.

The Science Education Tracker will help us to plan Wellcome's activities and we hope that it is useful to those with an interest in improving science outcomes for young people. The research data are freely available at the UK Data Archive and we encourage researchers to exploit them further; we have barely scratched the surface.

Dr Hilary Leever

Head of Education and Learning

Wellcome Trust

Executive summary

Introduction

- This report presents findings from the 2016 Science Education Tracker (SET) survey, a survey of young people conducted by Kantar Public on behalf of Wellcome and supported by the Royal Society, the Department for Business, Energy and Industrial Strategy (BEIS) and the Department for Education (DfE).
- The SET survey is designed to provide evidence on a range of key indicators for science engagement, education and career aspirations among young people in England.
- The survey is based on a nationally representative sample of 4,081 young people in school years 10 to 13 (aged 14-18) attending state-funded schools in England.
- Fieldwork was conducted online between June 29th and August 31st 2016.

Chapter 1: Science outside the classroom

- Having strong family science networks was related to several science outcomes including visiting science-related attractions and future aspirations to study science. Young people from less affluent backgrounds were less likely to hold family science connections. A Family Science Connection Index (FSCI) was constructed to measure the strength of young people's family science networks.
- A fifth of young people (20%) had visited a science museum or planetarium in the previous 12 months. Attendance was higher amongst young people with the following characteristics: high science attainment, strong family science networks, living in more affluent neighbourhoods, and living in London or the North East.
- Mothers were important routes of access to science museums, accompanying young people in 38% of reported visits, while schools supported young people in 36% of cases. Parental support was highest within white families and where parents were university-educated. School-led access on the other hand was higher among Asian young people, those with lower science attainment and when neither parent had attended university.
- Seven in ten young people (68%) had watched, read or listened to science-related content in the last 12 months via TV, print and online channels. Consumption of science content was most common among young people in Year 10 (73%) thereafter declining by age to 64% of Year 13s.
- Half of young people (53%) said that they were very interested (13%) or fairly interested (40%) in hearing more from scientists about the research they are conducting.

- Three in ten young people (30%) had participated in an extra-curricular school science event, for example a science-related talk (20%). Two-fifths (41%) of those who had participated in extra-curricular science stated that these experiences had motivated them to study science, computer science, engineering or maths. BME males were especially likely to feel encouraged by these types of activities (61%).

Chapter 2: Science at school

- Biology was the most enjoyed science subject, ranked third out of the subjects asked, behind English and maths.
 - There were substantial gender differences in the enjoyment of subjects. For example, males ranked physics third out of seven subjects while females ranked the subject last.
- Young people considered exam success in science, maths and English to be a balance of natural ability and hard work. Success in science was, however, more related to hard work than success in English or maths.
- More than two-thirds of young people (68%) said they found science lessons at school very or fairly interesting.
 - Males were more likely than females to find science lessons interesting. This gender gap was only evident, however, among young people from white backgrounds.
- After 'finding science interesting', the most important factors encouraging young people to learn science were 'having a good teacher' and 'enjoying practical work'. In both cases, 35% of young people said this had encouraged them.
 - Conversely, the most common factor cited by young people as putting them off learning science was 'having a bad teacher', mentioned by one in three young people (33%).
- Females were more likely to have been put off learning science than males: 22% of males said nothing had discouraged them from learning science, compared with 11% of females.
 - In particular, females were much more likely to say they had been put off by finding science more difficult than other subjects (35%, compared with 22% of males), or because they have difficulty with the maths involved (26%, compared with 13% of males).

Chapter 3: Practical science

- A little under half (45%) of GCSE students reported doing hands-on practical work in science lessons at least once a fortnight, but three in ten (29%) reported doing it less than once a month or never.
- The majority of GCSE students (58%) said they wanted to do more practical work in science lessons. This was higher for single science students, three-quarters of whom said they wanted to do more practical work (76%).
- Young people often do not understand the purposes behind the practical work they do in science lessons: 22% said that they simply follow instructions without understanding the purpose of the work 'a lot of the time'.
- Young people at higher performing schools reported doing practical work more often, although greater frequency of practical work was not associated with higher scores on the science knowledge quiz. However, young people who reported doing more advanced practical work (such as designing and carrying out their own experiment) achieved higher scores on the science quiz than their peers who had not done this kind of work.
- Young people's experience of practical work varied substantially depending on the science GCSE course taken:
 - Single science students were less likely to have done more advanced practical work such as designing and carrying out their own experiment (62%, compared with 83% of triple science students).
 - Triple science students reported doing hands-on practical work more often (52% at least once a fortnight, compared with 37% of single science students) while single science students more frequently watched videos of practicals (44% at least once a fortnight, compared with 37% of triple science students).
 - Single science students were more likely to say they wanted to do more practical work (76%, compared with 49% of triple science students).
- Young people from more deprived areas did less practical work in GCSE science lessons than young people from less deprived areas.
 - 36% of GCSE students from the most deprived areas reported doing hands-on practical work at least once a month, compared with 54% of those from the least deprived areas.
- 69% of GCSE students from the most deprived areas reported designing and carrying out their own experiment, compared with 84% of those from the least deprived areas.

Chapter 4: Science at GCSE

- Three-quarters of young people (75%) said that they studied either triple science (37%) or double science (39%) at GCSE. While this *overall* rate matches official figures, there is evidence that some young people in the survey misclassified double science as triple science due to confusion in terminology.
- Based on the survey classification, young people living in the most deprived areas were much less likely to study triple science than those living in more affluent areas. Asian males were more likely than other ethnicity/gender groups to study triple science.
- Young people who studied triple science were more likely than those studying other science GCSE courses to study (or intend to study) science subjects at Years 12 and 13.
- Triple science students had more timetabled science hours than students studying other science courses: half of triple science students (54%) cite 6 or more weekly hours compared with 20% of double and 13% of single science students.
- Amongst those who didn't study it, barriers to studying triple science were classified into three types: 58% cited personal barriers such as lack of confidence or interest; 41% cited school selection barriers such as not achieving the grade required; while 23% cited school access barriers (i.e. their school didn't enter any students for the course). While most students who took a non-triple science pathway were content with this, 16% would have liked to study triple science if it had been available to them.
- Among students who didn't study triple science, 30% cited lack of confidence as a reason for not studying it. While females (36%) were more likely than males (24%) to cite this, there was evidence that this was due in part to an under-estimation of ability among female students.
- One in five students (18%) said that they had studied or were studying computer science at GCSE: 25% of males and 9% of females. Analysis by year group indicates a rise in computer science entries between 2014-15 and 2015-16 corresponding with a fall in ICT GCSE entries, a pattern which reflects national trends.
- Key barriers to studying computer science were lack of availability and interest. Females were especially likely to lack interest in the subject. Lack of access declined rapidly through age cohorts such that only 16% of Year 10 students in 2015-16 said that computer science was unavailable at their school. This reflects government policy to widen access to this subject.

Chapter 5: Science at Year 12 and beyond

- Intentions to continue in education are strong:
 - 57% of all young people were thinking of studying for a higher education qualification in any subject, with a further 29% undecided.
 - More than nine in ten young people in Years 10 and 11 (93%) were considering continuing studying in any subject after Year 11. Three-quarters (75%) were 'definitely' planning to continue their studies, with a further 18% undecided.
 - However, only 74% of young people in Years 12 and 13 were actually studying for a Level 3 qualification. This suggests that a sizeable proportion of the young people in Years 10 and 11 considering further study will not go on to study for a Level 3 qualification.
 - The largest gaps between aspirations of young people in Years 10/11 and actual behaviour of young people in Years 12/13 was among those eligible for free school meals in the last six years and those from the most deprived areas. For example, more than nine in ten (93%) young people in Years 10/11 in the most deprived areas said they were intending to study beyond Year 11, but only 60% of young people from similarly deprived areas were studying for Level 3 qualifications in Years 12/13.
- Males were less interested than females in continuing in education. However, males were more likely to be interested in studying maths or science subjects:
 - 69% of males were planning to continue their studies after Year 11 and 50% were thinking of studying for a higher education qualification, compared with 79% and 63% of females respectively.
 - 66% of males studying for a qualification in Year 12 or 13 were taking at least one maths or science subject, compared with 57% of females.
 - 55% of males thinking of studying for a higher education qualification were considering a Maths or Science subject, compared with 49% of females.
- Higher education subject choices were heavily gendered:
 - Males were more likely than females to be interested in studying maths, physics or computer science. Females on the other hand were more likely to be interested in biology, psychology or health related subjects such as medicine / dentistry.

Chapter 6: Science as a career

- A large majority (90%) of young people said they had received careers advice from at least one source, although a third of students (33%) said they had not received advice from their school or college.
- About two in five (43%) of young people were interested in a science-related career with 19% stating that they were 'very interested'.
 - Females (35%) were less interested in a science-related career than males (51%).
 - Young people from white backgrounds (39%) were also less likely to be interested in a science-related career than those from Asian (61%) or black backgrounds (61%). Young white women in particular were less inclined to pursue a science-related career (30%).
- Young people from lower income backgrounds, as defined by free school meal eligibility and area deprivation, were just as likely to aspire to a science-related career as those from higher income backgrounds. They were however less likely to agree that science-related careers are 'suitable for someone like me'.
- Young people with strong family science connections were more likely to be interested in a science-related career (59%) and to have done relevant work experience in this area (22%) than young people with weak family science connections (33% and 8% respectively).
- Perceptions of science-related careers were generally positive: 72% agreed that 'science careers are open to anyone who has the ability, regardless of their background.' One in ten agreed they are 'more suited to men than women.'
- Only 13% of young people have participated in a work experience placement in science, computer science, engineering or maths at some stage (from 8% among those in Year 10 to 15% among those in Year 13). This rises to 30% among those with a firm interest in a science-related career. Over a quarter of young people (27%) reported wanting to secure science-related work experience but being unable to do so.