



ASPIRES 2: RESEARCH AND POLICY BRIEFING

Recommendations

Science must be repositioned as a more enabling subject with far more open (and therefore less restrictive) entry practices at KS4 and KS5.

Students should be enabled to keep their options open and should not be streamed into routes that could restrict their later life choices.

We propose a revised common route for the sciences at KS4, which would be more equitable and productive for schools and society.

We call for a **joint select committee (Education and Science and Technology) inquiry** into the existing system, helping to inform what a new single science route should ideally look like.

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The government wants to help to empower future generations through STEM to ensure a dynamic, innovative economy. There are also wider policy concerns about broadening participation in post-GCSE science.

KS4-level science education in England is distinctive because of the noticeable stratification of award routes. 'Triple Science', resulting in three separate science GCSEs, has been championed by English government and industry since its introduction in 2008. This is in contrast to Double Science (or Combined Sciences since 2016).

However, our research¹ finds that selective practices around access to and participation in Triple Science perpetuate social inequalities and could be narrowing participation in post-16 STEM.

Although the Secretary of State has stated that there will be no further curriculum changes within the current government, our research is concerned with the longer term goal of

creating a more equitable and effective education system.

Background

Despite moves to increase participation in post-compulsory science education, women, working-class students, and particular minority ethnic groups remain underrepresented, especially in the fields of engineering and the physical sciences.

'Triple Science' began to be promoted in 2008 as an opportunity for higher attaining students to gain separate GCSEs in Chemistry, Biology and Physics. However, this stratification of science awards at GCSE is contributing to these inequalities.

This is partly due to the fact that the eligibility requirements for taking Triple Science have become much vaguer in practice, resulting in considerable variation between schools.

Who does Triple Science?

There is significant variation in the profile of students who study Triple Science.

Students eligible for free school meals are significantly less likely to be taking Triple Science, with the most socially disadvantaged children almost three times less likely to be taking Triple Science. Only 22% of students with low or very low cultural capital study Triple Science compared to 71% of students with very high cultural capital.

Research from the Sutton Trust² showed that 20% of higher-attaining pupils eligible for pupil premium are in a school that does not offer Triple Science, compared to just 12% of higher-attaining, more advantaged pupils. Only 53% of these students study Triple Science, in contrast to 69% of those not eligible for pupil premium.

Key findings:

The stratification of KS4 routes contributes to the promotion and sustainability of social inequalities.

- It creates and reinforces unequal cultures for different science routes
- Schools have inequitable abilities to offer Triple Science.
- It functions as a filter for STEM participation.

‘Only for the clever’?

Although officially the two subject routes only differ in the quantity of science that students study (counting as three or two GCSEs respectively), in practice Triple Science is often viewed as the high-status option. Students taking this award tend to identify as ‘clever/good at science’ and have more positive attitudes towards science and stronger science aspirations.

Conversely, students who take Double/Combined Sciences may see themselves or be seen by others as ‘not clever/bad at science’. The disadvantaged position of students doing Double Science is implied and often attributed to their own failings, lack of talent, inappropriate attitudes, and so on.

Working-class students are more likely to internalise messages about who is or who is not ‘good enough’ to study Triple Science.

Furthermore, in schools in more affluent areas, students talk about being made to do Double Science as a ‘punishment’ or a shameful, remedial action.

[The school] put him in Triple Science and then stopped it and said that they couldn’t cope with it, which really, really made me cross...But he didn’t choose it, he didn’t put down for Triple Science, the school put it - so they obviously thought he was clever enough to do it.” – Martha, parent

Making the ‘right’ choice

Most students do not have a choice of science route at GCSE. They are either explicitly told by their school or steered into making the ‘right’ choice. 61% of Triple students and 58% of Double Science students reported that they had no personal choice of which award to take and that their school had decided instead.

“I think I was sort of pressured to take it, because we had like different sets, so if you were in the top set you were like expected to take Triple Science.” – Caitlin, Year 13

Students taking Double Science justified their school’s choice by agreeing that they wouldn’t be able to ‘cope’ with the accelerated nature of the course. However, students voicing these concerns were more often than not from working-class backgrounds and not particularly low attaining.

Disadvantaged students are more likely to regret their ‘choice’ once they start to consider their aspirations and plans. They feel that certain science-related routes are potentially closed down to them, contributing to the reinforcement of social inequalities. 16% of students who hadn’t studied Triple Science said they would have chosen the route had it been available to them.⁴

“They chose the top people to do Triple Science and the rest of us had to do Double...I was kind of gutted in Year 9 when I didn’t get to pick Triple, because at that point that’s what was going to get me into kind of my science career... it was like ‘Oh, well that’s me not doing science anymore” - Georgia, Year 13

Unequal provision of Triple Science

Triple Science provision across schools is inequitable. Not only is the required level of

attainment for studying Triple Science inconsistent, but some schools can only offer the lessons outside of normal school hours. This makes it a far less attractive option for students, especially for those in less affluent communities.

Research from Findings from the RSA (2015)³ and Wellcome⁴ suggest that there is considerable variation between which types of state schools offer Triple Science, with students in deprived areas are also much less likely to attend schools that even offer Triple Science in the first place. In six areas, more than a third of schools did not have pupils taking Triple Science, including Medway, Kingston upon Hull and Knowsley. In North East Lincolnshire, half of secondary schools do not offer Triple Science. This is in contrast to schools in more affluent areas like Sussex where every school offers Triple Science.

“I think the school might be unfair in the way it’s like deciding whether people should do Double Science or Triple Science” – Colin, Year 13

Research by the EISER project (2008-2011)⁵ also shows that introducing multiple courses/pathways has the effect of pressuring schools to make the ‘right choice’ for students with no additional guidance or support.

Participation in Triple Science produces social privilege with Double Science being seen as less prestigious and for students who see science as ‘not for me’.

Triple Science – good or bad for STEM participation?

The close alignment of Triple Science with the STEM pipeline discourages Double Science students from considering post-compulsory science. Moreover, despite official advice, many schools do not consider Double Science as providing ample preparation for science A Levels.

“Thinking back, if she had taken Double Science, she then wouldn’t have been able to carry on and pursue her career at dentistry at all...If we’d have said ‘okay well just do double Science’, that would have been it really.”- Lucy, parent

Analysis from ASPIRES 2 and Wellcome shows that students taking Triple Science are significantly more likely to plan to take one or more science A levels than students taking Double science - a relationship which holds across different levels of attainment but which is particularly marked among high attaining students.

Subsequently, students not taking Triple Science are choosing fewer science subjects at A Level. Of the students taking a science at A Level, 83.7% had done Triple Science and only 14.6% had done Double Science. This feeds into elitist, narrow constructions of science as being for the ‘brainy’ few.

Some students allocated to Double Science and with considerable interest, aspiration and potential to continue into post-compulsory science have effectively had their science interests and aspirations crushed.

“I was quite gutted that I didn’t get Triple Science, but obviously I’m not as good in lessons...I was planning on doing Triple Science and then obviously going on and doing a science career, but I didn’t get Triple Science, I didn’t get picked for it.” – Georgia, Year 13

Our methodology:

ASPIRES 2 is a 5 year study funded by the ESRC. It is the second part of the ASPIRES project, investigating the science and career aspirations of children age 10-19.

Data for ASPIRES 2 was collected through:

- a national survey of 13,421 students aged 15/16 who were recruited from 340 secondary schools in England
- interviews with 70 students aged 15/16 and 62 parents.

Conclusions

Triple Science students are much more likely to come from socially advantaged backgrounds, leading to inequitable participation in science education at KS4 and KS5. This is both in terms of selective entry and unequal provision of Triple Science across schools.

This stratification means students with differing levels of social, cultural and economic capital will experience very different potential science 'choices' at GCSE.

Although policy is aiming to tackle the under-representation of girls and working class and particular minority ethnic students, the stratification of students in GCSE science is highly problematic in terms of social class and ethnicity.

As well as being unhelpful for promoting social equality, the streaming of students into different science routes at KS4 is counterproductive for the government's ambitions to widen STEM participation in England.

Triple Science was, in no small part, introduced to service the STEM pipeline. Our findings suggest that it may actually serve to narrow the potential pool of future A Level science students.

We propose a revised common route for the sciences at KS4 and we call for a joint select committee (Education and Science and Technology) inquiry into the current system, helping to inform what this new single route would ideally look like.

This new single route would not only be more equitable for schools, but will help to improve social mobility and ensure that we have a better prepared workforce in line with the government's industrial strategy and an increasingly technology-driven society.

¹ Louise Archer, Julie Moote, Becky Francis, Jennifer DeWitt & Lucy Yeomans (2016) Stratifying science: a Bourdieusian analysis of student views and experiences of school selective practices in relation to 'Triple Science' at KS4 in England, *Research Papers in Education*, 32:3, 296-315, DOI: 10.1080/02671522.2016.1219382

² The Sutton Trust (2015) *Research Brief: Missing Talent*. [pdf] <<https://www.suttontrust.com/wp-content/uploads/2015/06/Missing-Talent-final-june.pdf>>

³ RSA and Open Public Services Network (2015) *Lack of options: how a pupil's academic choices are affected by where they live* [pdf] London: RSA. Available at: <<https://www.thersa.org/globalassets/pdfs/opsn/lack-of-options-opsn-report.pdf>>

⁴ <https://wellcome.ac.uk/sites/default/files/science-education-tracker-summary-feb17.pdf>

⁵ Jim Ryder (2018) *Enactment and Impact of Science Education Reform* [online] Available at: <http://www.education.leeds.ac.uk/research/projproj/enactment-and-impact-of-science-education-reform-eiser>

SCORE (n.d.) *The sciences at key stage 4: time for a re-think?* [pdf] London: SCORE. Available at: <http://www.score-education.org/media/17187/des3620_score_sciences%20at%20ks4%20final.pdf>