



Department
for Education

Attitudes towards STEM subjects by gender at KS4

Evidence from LSYPE2

Research brief

February 2019

Department for Education

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Summary

This research brief examines young people's attitudes towards STEM subjects when they were age 15/16 in Key Stage 4 (KS4). It is based on data from the third wave of the second Longitudinal Study of Young People in England (LSYPE2).

In 2015, 10,010 young people in Year 11 were interviewed for LSYPE2. This was an important year for the young people, with the vast majority sitting their GCSEs. Here, their responses to a range of questions about STEM subjects are reported. The subjects that have been classified as 'STEM' in this brief are mathematics, science and IT/technology. Engineering was also included when looking at which A level subjects pupils were planning to study.

Main findings

There were significant gendered differences in attitudes towards STEM and non-STEM subjects among KS4 pupils.

- Proportionately, female pupils were less likely to rank a STEM-related subject first for enjoyment: 32% compared to 59% of males.
- Females were also less likely to consider themselves to be best at a STEM subject: 33% compared to 60% of males.
- When asked about which subjects were most likely to lead to a future job, 69% of male pupils named a STEM subject compared to 51% of females.
 - More males (36%) than females (23%) felt that mathematics was most likely to lead to a job in the future; the most common answer for females was English.
- Like male pupils, the majority of females thought that STEM subjects were most likely to lead to higher paid jobs (77% compared to 81%).
 - Science was thought to yield the highest salary by both genders: 31% of males, 39% of females.
- Males were more likely to plan to take a STEM subject at A level, with the exception of biology: 26% of males compared to 34% of females.
 - The largest difference in planned take-up of a STEM subjects at A level was for physics (30% male, 8% female) and IT (16% compared to 3%).

Introduction

Aims

This report examines pupils' responses to survey questions specifically designed to look at attitudes towards STEM subjects. The purpose of this is to identify whether there are significant differences between female and male pupils at KS4.

Background

The Longitudinal Study of Young People in England 2

LSYPE2 is a large study of young people, managed by the Department for Education (DfE). It is also known as the 'Our Future' study. LSYPE2 started in 2013 and is following young people from the age of 13/14 to 19/20.

This report is based on questions asked during the third wave of the study in 2015. Just over 10,000 young people were interviewed in Year 11 (age 15/16) when most will have been completing their GCSEs.

The general aims of LSYPE2 are:

- to follow a sample of young people through the final years of compulsory education
- to follow their transition from compulsory education to other forms of training, employment and other activities
- to collect information about their career paths and the factors affecting them
- to provide a strategic evidence base about the lives and experiences of young people.

STEM

STEM refers to Science, Technology, Engineering and Mathematics. The STEM subjects referred to in the survey are those most commonly taken at KS4 level and would reflect the experiences of the vast majority of the young people interviewed.

There are four questions specifically designed to look at attitude towards STEM subjects in LSYPE2 wave three. Each of them asks pupils to rank the 7 subjects below on a scale of 1 to 7, where 1 is the highest and 7 the lowest.

1. At school, which of these areas of study do/did you enjoy the most?
2. And which of these areas of study do you think you are best at?
3. Thinking about jobs in general, which of these areas of study do you think is most likely to lead to a job in the future?
4. And again thinking about jobs in general, which of these areas of study do you think would gain the highest average salary in the workplace?

For each question, response options were:

- *Science*
- *Maths*
- *IT/Technology¹*
- *English*
- *Foreign languages*
- *Arts (for example Art, Music, Drama)*
- *Humanities (for example History, Geography, Sociology)*

Methodology

Sampling

The young people in LSYPE2 were sampled through a two-stage process. Schools were sampled first, followed by the pupils within those schools. The sample includes young people in local authority (LA) maintained schools, academies and independent schools, but for practical reasons excludes small schools and overseas students. It includes special schools as well as mainstream provision. This sample was designed to ensure the widest feasible perspective on young people's experiences.

¹ Information Technology (IT) was used as a response option to maintain consistency with previous waves. IT was replaced by the new subject of Computing in the National Curriculum in 2014.

Attrition

Response rates for wave 3 were high at 90%. The data analysed for this report are weighted to compensate for the impact of sample attrition between waves.

Item non-response

All proportions in this report are based on the responses of those who selected one of the subject options listed above for each question. This means that young people who decide not to answer a question, or said that they didn't know the answer were excluded from the analyses. However, these data accounted for a small minority of the overall sample (typically 3% or 4%).

Questions about A level subject choice were only asked of those intending to study at this level. This has resulted in lower base sizes for this section.

Statistical testing

All differences that are reported below are statistically significant at the 5% significance level.²

² A two-proportion z-test, adjusted for non-random sampling when comparing independent proportions (within wave comparisons of different groups, e.g. males vs females) was used to check whether any differences in proportions were statistically significant.

Findings

In the sections below, we compare the proportions of female and male pupils who ranked subjects as first in relation to: enjoyment; being best at the subject; thinking the subject would lead to a job; and thinking the subject would lead to a higher salary. We then examine pupils' intentions to study STEM subjects at A level.

Subject Enjoyment

At school, which of these areas of study do/did you enjoy the most?

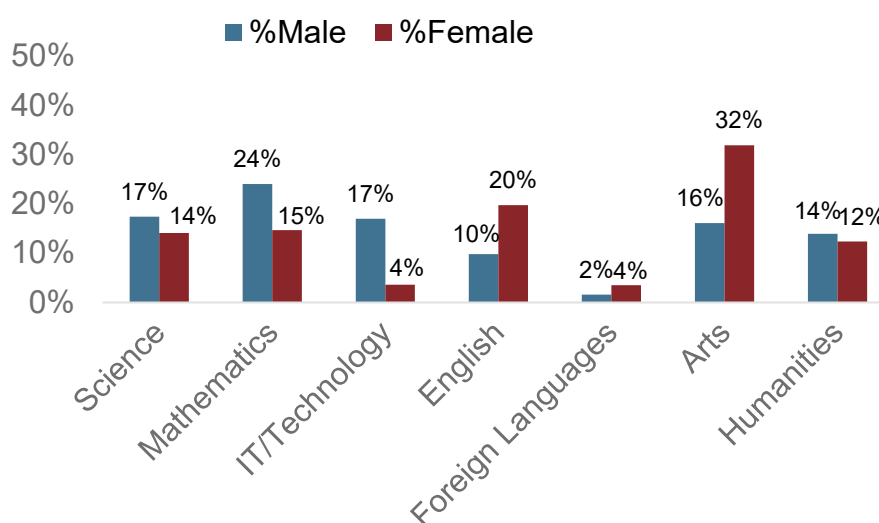
The most popular subject for female students was Arts with 32% saying it was the subject that they personally enjoyed the most. For male students, it was Mathematics (24%).

Overall, the proportion of male pupils who ranked STEM subjects first for enjoyment was almost twice as large as for female pupils, 59% compared to 32%. Within this, the largest difference in subject enjoyment was for IT where only 4% of females ranked it first, compared to 17% of males. The smallest difference was for science, 14% compared to 17% for males.

Among non-STEM subjects, the percentage of female pupils who ranked Arts first was double that of males, 32% compared to 16%. This was also the case for English, 10% for males compared to 20% of females.

However, it was not the case that female pupils consistently ranked non-STEM subjects more highly: a slightly higher percentage of males ranked humanities as their most enjoyed subject (14%) compared to females (12%).

Figure 1. Subjects that pupils ranked first for enjoyment



Source: Longitudinal Study of Young People in England: cohort 2, wave 3
Unweighted base = 9694

Best Subject

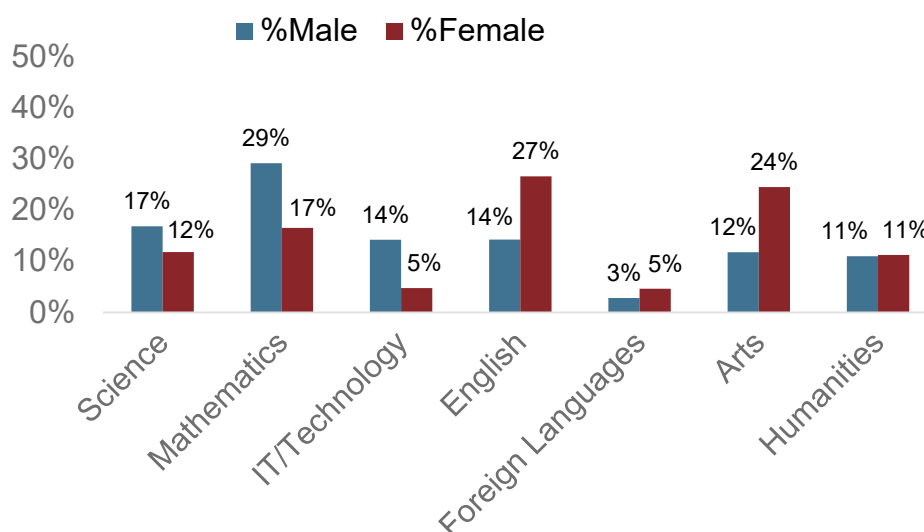
And which of these areas of study do you think you are best at?

The subject that female pupils most commonly felt that they were best at was English, with 27% ranking it first. For male students, it was mathematics (29%). Overall, 60% of male students thought their best subject was a STEM subject, this was nearly double the proportion of female pupils providing this answer (33%). In contrast, actual GCSE results show that females slightly outperform males in maths and science, with 68% of girls achieving grades A*-C compared to 65% of boys.³

As with the earlier question about subject enjoyment, the largest difference for best STEM subject was found in IT (14% of males, 5% females) and science was the STEM subject with the smallest difference (17% compared to 12%).

Large differences were also found in non-STEM subjects. The proportion of females who thought that their best subject was English or Arts was almost double that of male pupils.

Figure 2. Subject that pupils felt that they personally were best at



Source: Longitudinal Study of Young People in England: cohort 2, wave 3
Unweighted base = 9,657

³ National Statistics: [Revised GCSE and equivalent results in England, 2014 to 2015](#).

Future job prospects

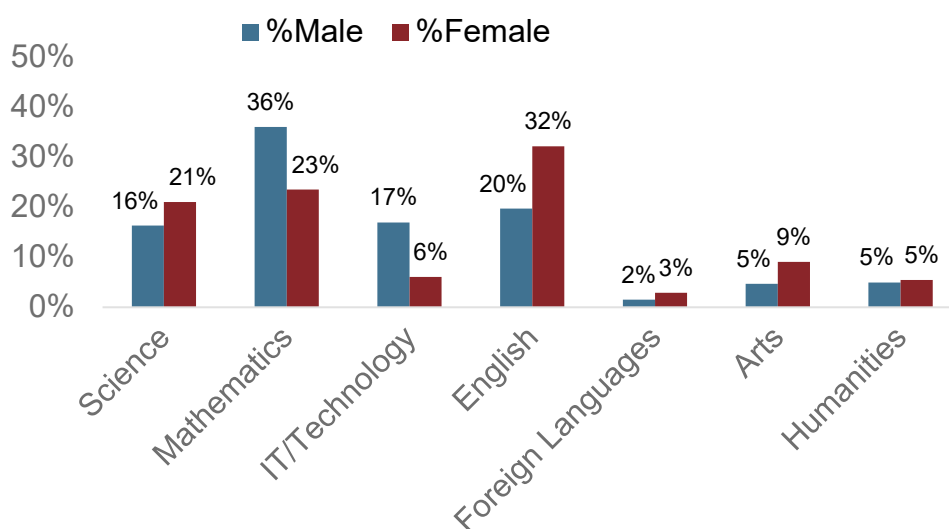
Thinking about jobs in general, which of these areas of study do you think is most likely to lead to a job in the future?

There was a marked difference in which subjects male and female students thought would generally be most likely to lead to a job in the future. Among female students, English was the most popular answer as 32% ranked it most likely. For male students, mathematics was the most common answer (36%).

The majority of males (69%) named a STEM subject area as most likely to lead to a job in the future compared just over half (51%) of females. IT showed the largest gender difference and was low for both genders overall (17% of males and 6% of females).

Even though high percentages of female students enjoyed Arts and thought it was their best subject, only 9% thought it was the most likely to lead to a job.

Figure 3. Subjects that pupils thought were most likely to lead to a job



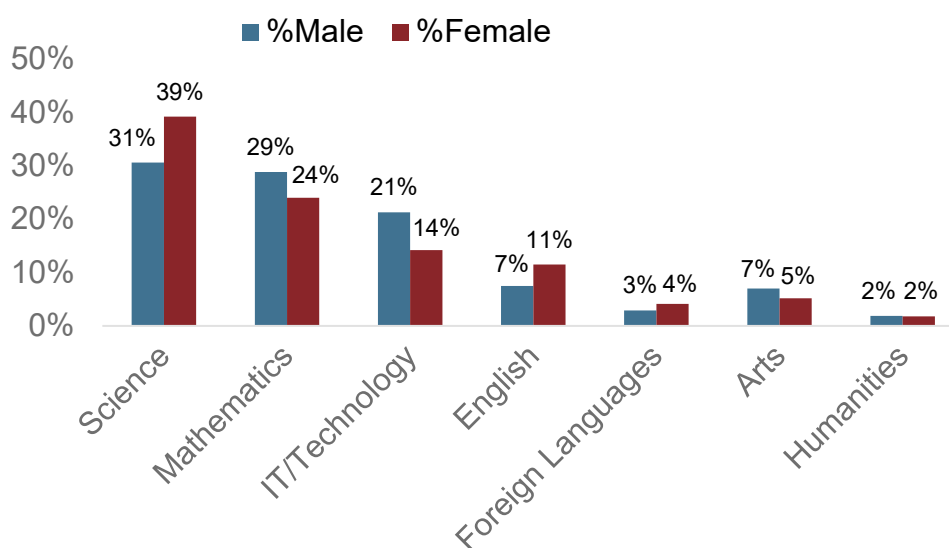
Source: Longitudinal Study of Young People in England: cohort 2, wave 3
Unweighted base = 9,475

Highest Salary

And again thinking about jobs in general, which of these areas of study do you think would gain the highest average salary in the workplace?

When young people were asked about the subject area they think is most likely to gain them the highest salary, the most popular choice among both females (39%) and males (31%) was science. Despite being the subject most female students thought would be most likely to lead to a job in the future, English was not considered to lead to high salaries by either gender.

Figure 4. Subject that pupils thought could yield highest salary.



Source: Longitudinal Study of Young People in England: cohort 2, wave 3
Unweighted base = 9,316

Looking at STEM subjects together, 81% of male students named a STEM subject as leading to the highest salary, compared to 77% of females. So while females perceived STEM subjects to be more profitable, they believed non-STEM subjects were more likely to lead to a job in the future. This suggests that female pupils may feel STEM subjects, though highly paid, are not 'for them' or that they see other types of value in non-STEM subjects and occupations.

Further research could test whether these perceptions are accurate by drawing on objective studies that show statistical associations between different subjects, courses and salaries. Additional research could also explore the motivation for males and females when they choose certain subjects and courses, particularly why fewer female students choose STEM subjects given the majority believe that they lead to higher paid jobs.

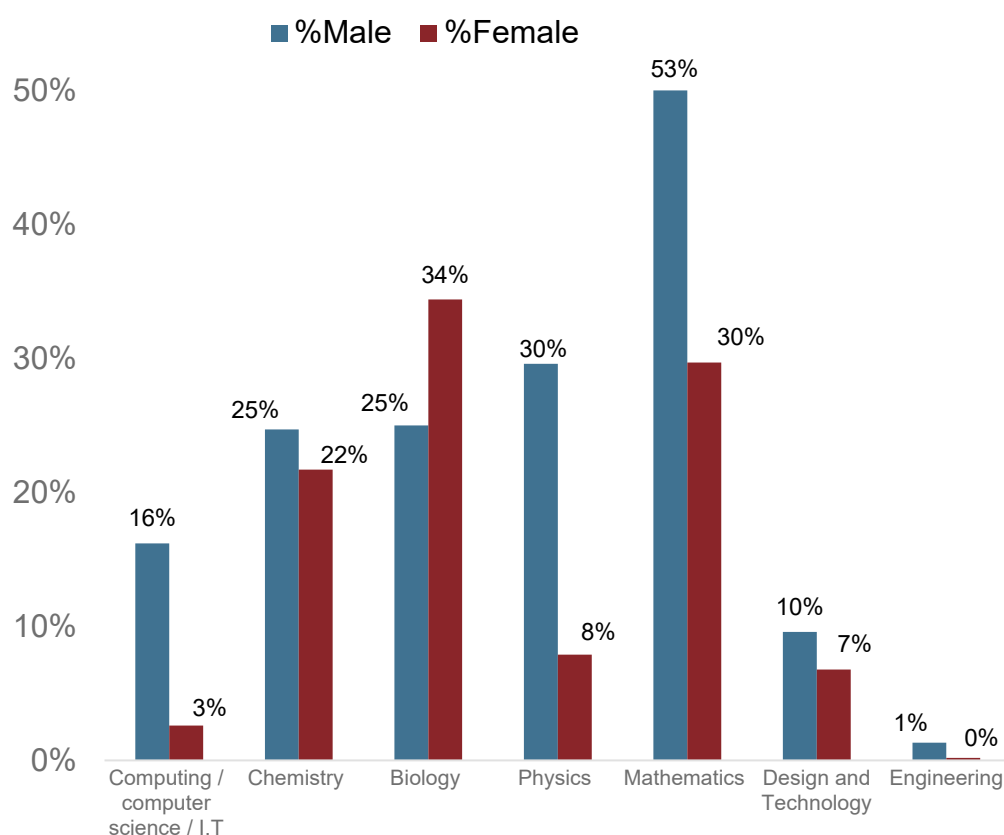
Plans to study STEM subjects at A level

And which [A level] subjects are you planning to study?

The majority of this cohort took their GCSEs in 2014/2015 and finished age 16-18 study in 2016/17. Here, we look at what pupils' intentions were with regards to studying STEM subjects at A level, in the year they were taking their GCSEs.

Half of the sample wanted to do A levels and said that they had decided what subjects they would like to study. This group was then asked to select which subjects they were planning to study from a list.

Figure 5. STEM subjects that pupils are planning to study at A level

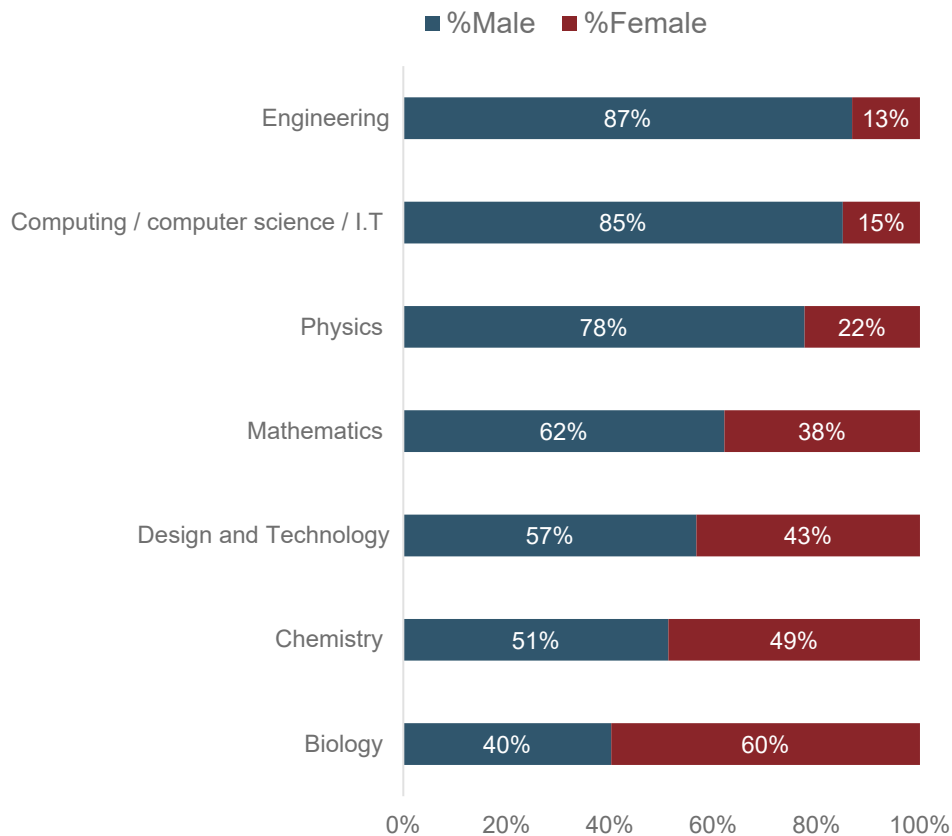


Source: Longitudinal Study of Young People in England: cohort 2, wave 3
Unweighted base = 5,546

The largest difference in planned take up of STEM subjects was clearly for physics (30% male, 8% female) and IT (16% compared to 3%). There was also a stark difference in the proportion planning to take A levels in mathematics (53% compared to 30%).

Another way of looking at this data is by the gender split for each A level subject that pupils were planning to study (as shown in figure 6 below).

Figure 6. STEM A level subjects that young people plan to study by gender



Source: Longitudinal Study of Young People in England: cohort, wave 3
Unweighted base = 5,462

Among STEM subjects, females had the lowest representation in engineering (14% of those saying they would study this at A level), computing (15%) and physics (22%). Biology had the largest proportion of females at 60%. Chemistry was the most gender balanced subject with 51% males and 49% females.

In addition, pupils were asked a separate question about whether they have chosen the A level subjects that they plan to study in order to apply to university. Here, 72% of females answered that they had, compared to 61% of males.

Conclusions

Female Key Stage 4 pupils perceived that studying STEM subjects was potentially a more lucrative option in terms of employment. However, when compared to male pupils, they enjoyed other subjects (e.g. Arts and English) more. Female pupils also felt that their best subjects were non-STEM subjects when compared to males, though they outperformed male students in both STEM and non-STEM subjects. In addition, female pupils were less likely to think STEM subjects lead to employment when compared to males. These factors may help explain why female pupils were more inclined to study non-STEM subjects at A level.

This research brief highlights some of the key issues behind gender and STEM subject choice that the Department for Education is currently working to address. For example, the Advanced Maths Support Programme aims to increase participation in maths A level and the Stimulating Physics Network includes an integrated gender balance strand to increase physics A level entries among girls.



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Reference: DFE-RB891

ISBN: 978-1-78105-997-5

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