Gender, socioeconomic disadvantage, and ethnicity shown to affect science attainment and progression

STEM Learning's Science Education in England[1] explores the effect of gender, socioeconomic disadvantage and ethnicity on student attainment and progression in science. The report utilises data from the National Pupil Database and shows complex patterns of differential attainment correlated with gender and ethnic background. However, after taking these into account, it is clear that socioeconomic disadvantage has a substantial negative impact on STEM attainment and progression – this is true for both male and female students and for every major ethnic group.

Gender and science attainment

Gender gaps in STEM have received considerable attention – largely focused on the lack of female students progressing to A level physics - and subsequently to physics and engineering in higher education.

STEM Learning's work explores the gender gaps at GCSE, and finds that there is **little difference in the proportion of male and female students entering and passing separate science GCSEs** (i.e. 'Triple Science'). However, when looking at the rate at which students achieve a 'high pass' (grades 9-7), the data shows a **higher proportion of male students achieving in physics, while higher proportions of female students achieve a high pass in biology**. The gaps in physics and biology are substantial (over 1% of the cohort) but chemistry results are much closer.

These gender gaps in GCSE sciences are crucial: students achieving high pass grades will be more confident and schools are more likely to allow them to progress to A levels in these subjects. STEM Learning's analysis of attainment in STEM A levels confirms that **a greater proportion of male students progress to take physics, while more female students take biology**. Interestingly, there is little difference in pass rates between male and female students for those who do enter science A levels, although a greater proportion of male students achieve a high pass in chemistry, more female students achieve a high pass in biology and physics.

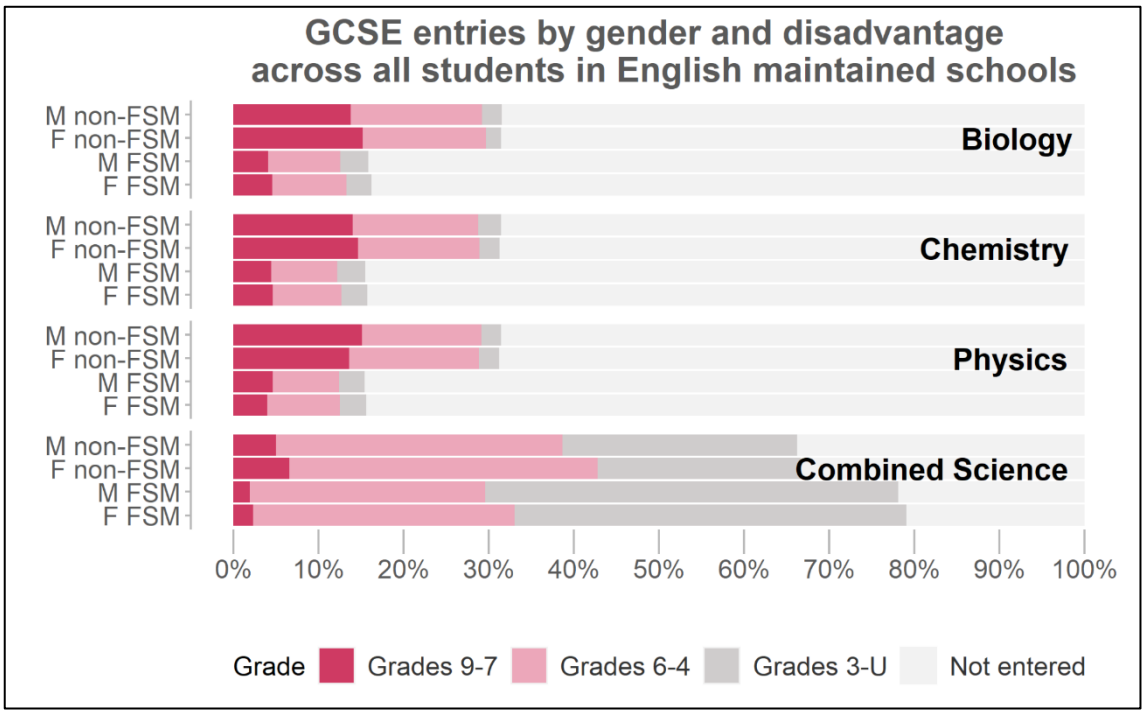
Socioeconomic disadvantage

The impact of disadvantage is reflected in the type of science GCSEs taken by students. Every GCSE student in England should take at least two GCSEs in science. Around a quarter of students take Triple Science - separate GCSEs in physics, chemistry and biology. However, 69% of students take 'combined science', a qualification that counts as two GCSEs. Similar to Triple Science, combined science covers all three sciences, but students study less of each.

Our analysis shows a clear **negative correlation between socioeconomic disadvantage and less intensive engagement with GCSE science**. 80% of students from disadvantaged backgrounds take combined science compared to 66% of their peers. In some cases, this will reflect the fact that triple science is not on

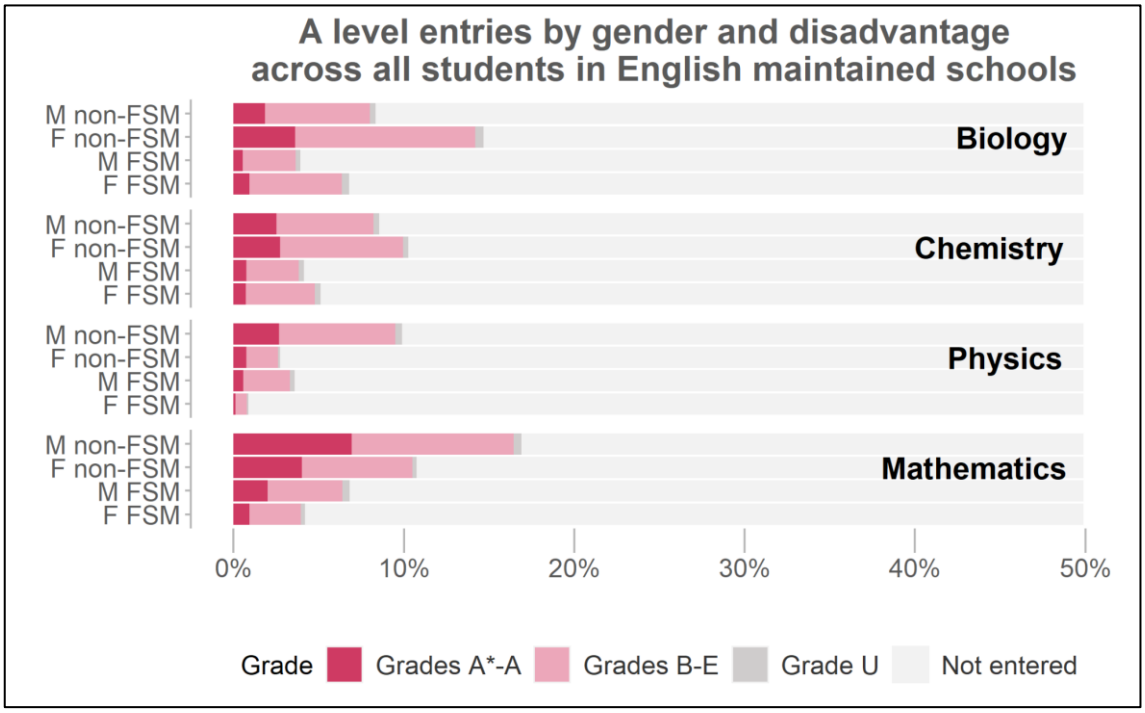
[1] https://www.stem.org.uk/impact-and-evaluation/data

offer at their school - in 2019, 269 schools entered no students for GCSE triple science. On average, 38% of students at these schools were from disadvantaged backgrounds – compared to an average of 12% students at schools that entered at least three quarters of their students for triple science.



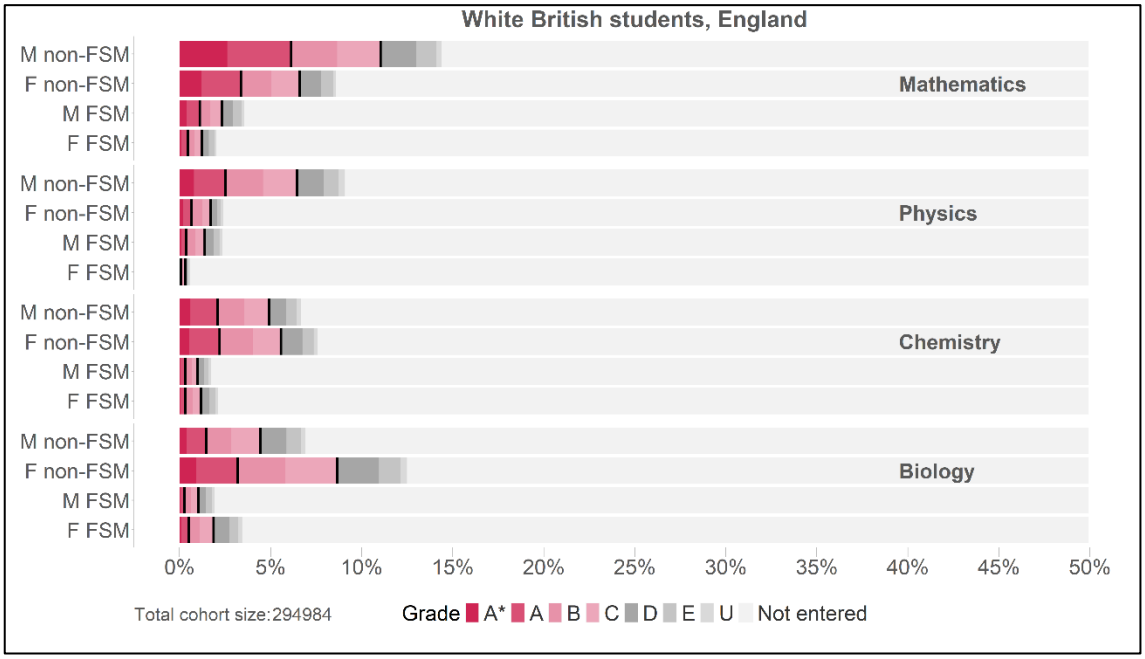
Furthermore, **students from disadvantaged backgrounds also perform less well in their science GCSEs** – whether they take combined science or triple science, they are less likely to pass and less likely to attain a high grade.

The disadvantage gap grows even wider at A level regardless of gender. **Students from non-disadvantaged backgrounds are around twice as likely to take science or mathematics A levels** compared with students from disadvantaged backgrounds. Moreover, there is a clear attainment gap between these two groups, with **students from non-disadvantaged backgrounds more likely to achieve a pass (A*-E) and a high grade (A*-A)**.

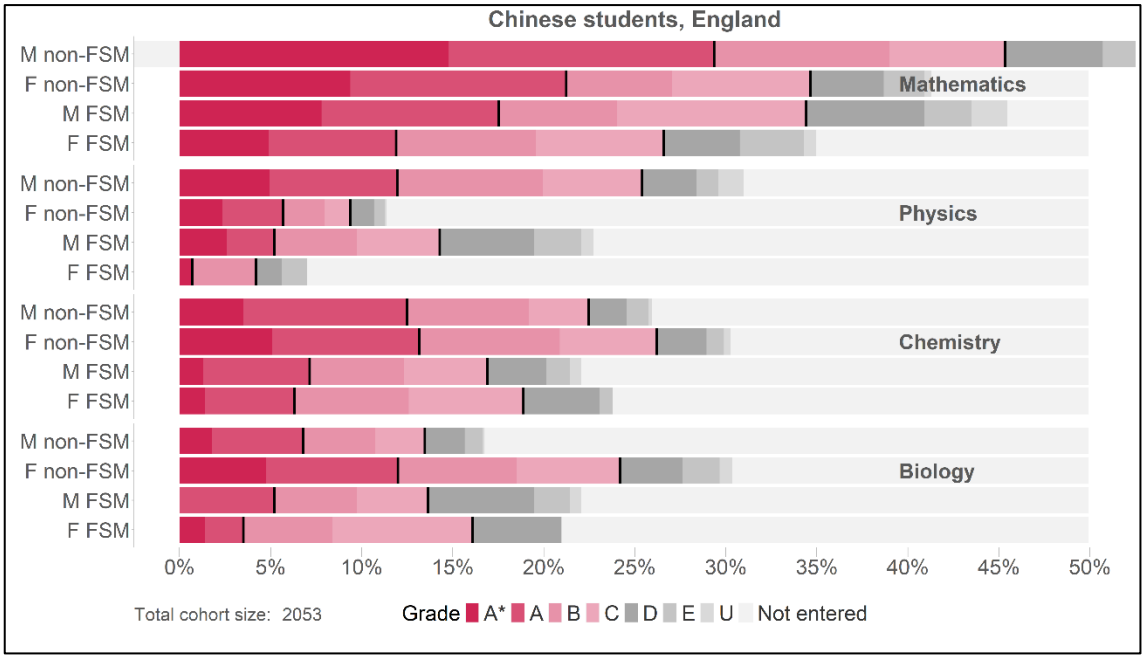


Ethnicity and science attainment in schools

There are **substantial variations in the pattern of science attainment across different ethnic groups**. For example, the data shows that around 30% of students from the Chinese ethnic group progress to science A levels, compared to less than 10% of students from a White British background, and less than 5% of students from a Black Caribbean background.



The analysis also separates disadvantaged and non-disadvantaged, male and female students. Similar patterns of lower entry and attainment for disadvantaged students can be seen across ethnicities, however the interaction with gender is more complex. For example, a higher proportion of non-disadvantaged male students from the Chinese ethnic group enter GCSE Triple Science compared to their female counterparts; while the pattern reverses for students from disadvantaged backgrounds - a higher proportion of female students enter. Differing patterns are seen for students from White British backgrounds (where entries to GCSE Triple Science are equal across genders), and students from Black Caribbean backgrounds (where female students are more likely to enter GCSE Triple Science, regardless of disadvantage).



Conclusion

STEM Learning's Science Education in England analysis highlights some of the complexities in understanding how young people achieve and progress in science - including how gender, disadvantage and ethnicity interact with performance and progression.

The work substantially increases our understanding of the challenges faced in science education, including how many of the issues manifesting at A level are apparent at GCSE or earlier. Organisations supporting young people to achieve and progress in their science education should familiarise themselves with the complex interplay between gender, disadvantage and ethnicity to ensure young people are supported in the most effective and appropriate ways.

For the full report, including a full list of charts, visit http://www.stem.org.uk/impact-and-evaluation/data

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