

## ***Increasing Girls' Participation in A level Mathematics and Further Mathematics Update March 2015***

**The number of students taking A levels in Mathematics and Further Mathematics in the UK has risen considerably over the last ten years: but are we too complacent about recruiting girls?**

Year	AS Mathematics entries	AS Further Mathematics entries	A level Mathematics entries	A level Further Mathematics entries
2004	62 098	3 980	52 788	5 720
2014	162 007	24 402	89 467	14 584

***In 2014, Mathematics was the most popular subject at both AS and A level.***

In 2014, Mathematics was the fourth most popular A level amongst girls, behind English, Psychology and Biology whilst it was the most popular subject taken by boys. The participation rates at AS level were similar with Mathematics the third most popular for girls, after English and Psychology, but the most popular subject taken by boys.

The proportion of students taking Mathematics (AS/A level) who are girls is around 40% and girls only make up around 30% of the AS/A level Further Mathematics cohorts.

The Further Mathematics Support Programme aims to promote participation in advanced level mathematics to all students who would benefit from taking the qualifications, especially girls. Our October 2014 briefing document (available from [www.furthermaths.org.uk/encouraging-girls-maths](http://www.furthermaths.org.uk/encouraging-girls-maths)) summarised the key findings from the FMSP/loE Literature Review. This document provides an update on our work by outlining the interim findings from the recent gender case studies, which aim to identify and share good practice in promoting participation in advanced level mathematics by girls.

***More girls are studying maths and sciences than ever before and [research] shows this can benefit their earnings by as much as a third.***

Nicky Morgan, March 2015

The **Mathematics Hubs**, operational since September 2014 have a remit to drive up the quality of teaching and learning in mathematics through the sharing of good practice across local areas and nationally. Via their Post-16 Participation Working Groups, one of the Maths Hubs' priority areas is a focus on strategies for increasing participation in AS/A level Mathematics and Further Mathematics, especially for girls. For information on each local Maths Hub, see: [www.ncetm.org.uk/resources/46070](http://www.ncetm.org.uk/resources/46070).



***“Science and maths makes you more prepared for life and for business”***

***Dr Melanie Windridge  
YourLife Campaign***

*We need to be careful about presenting mathematics as only for those getting the highest grades, because this reinforces a pattern in girls' participation where girls with GCSE grades A and B are even less well represented at A level than girls with A\*s.*

FMSP/IOE Literature Review



In May 2014, it was announced that future **school performance tables** will include data on the proportion of A level students who take science and mathematics A levels. The data listed includes participation rates by individual school, institution type, and by region, for boys and girls, in mathematics, further mathematics, physics, chemistry and biological sciences. The table below summarises the data for A-level Mathematics and Further Mathematics for the year 2013-14 (taken from [www.gov.uk/government/statistics/a-level-and-other-level-3-results-2013-to-2014-revised](http://www.gov.uk/government/statistics/a-level-and-other-level-3-results-2013-to-2014-revised)).

Data for the academic year 2012-13 can be found at: [www.gov.uk/government/statistics/a-level-and-other-level-3-results-england-2012-to-2013-revised](http://www.gov.uk/government/statistics/a-level-and-other-level-3-results-england-2012-to-2013-revised).

Region (2013-14)	% taking A level Maths	% taking FM A level	% taking A level Maths (boys)	% taking FM A level (boys)	% taking A level Maths (girls)	% taking FM A level (girls)
South East	27.6	4.8	37.8	7.7	19.1	2.3
North West	24.6	3.2	33.7	5.3	17.6	1.6
East of England	26.0	4.3	36.7	7.3	17.3	1.8
Outer London	33.5	5.1	44.1	8.0	24.7	2.7
West Midlands	25.6	3.3	35.8	5.7	17.7	1.5
South West	25.2	4.3	35.9	7.3	16.6	1.8
Yorkshire and Humber	22.7	3.1	32.9	5.4	15.0	1.5
East Midlands	25.7	4.0	35.4	6.6	18.2	1.9
Inner London	27.9	3.8	39.3	6.7	19.8	1.8
North East	22.0	3.5	31.6	6.4	15.0	1.4
England*	26.4	4.0	36.6	6.7	18.3	1.9

\* state funded sector schools only.

For all schools and colleges in 2013-14 the proportions entered for Mathematics and Further Mathematics were 28.4% and 4.8% respectively. For 2012-13 the proportions were 28.1% and 4.7% respectively.

**Key findings** that can be drawn from these data are:

- The participation rates for 2013-14 were very similar to those in 2012-13, with the overall proportion taking A level Further Mathematics increasing from 3.8% to 4%. The increases for boys and girls were 0.3% and 0.1% respectively. Across all regions, boys were around 3.5 times more likely to take A level Further Mathematics as girls.
- For A level Mathematics, participation increased by 0.4% overall, but this masked a 1.1% increase for boys compared with a 0.1% fall in participation by girls. Across all regions, boys were around twice as likely to take A level Mathematics as girls.
- By region, participation generally for both genders and years was highest for Mathematics and Further Mathematics in the South East and Outer London. In contrast the lowest participation rates in both years and for both genders tended to be in the North East and Yorkshire and Humber, where only 15% of girls taking A levels chose Mathematics. Boys in the North East were 4.6 times more likely to take Further Mathematics than girls in 2013-14, the largest gender discrepancy of any region.

## Successful strategies for girls and mathematics: Case Studies

From October 2014, the UCL Institute of Education is working with the FMSP looking at five **case studies** of schools and colleges that are making an impact on improving girls' participation in advanced level mathematics.

Through analysis of data, teacher and student focus groups and lesson observations, researchers have examined strategies that have contributed to effective change in take-up of A level Mathematics and Further Mathematics.

*Careers advice in the school starts early and promotes mathematics as keeping options open, with a particular emphasis on the broad career relevance of mathematics with statistics*

Shenley Brook End Academy, FMSP/IoE Case Studies

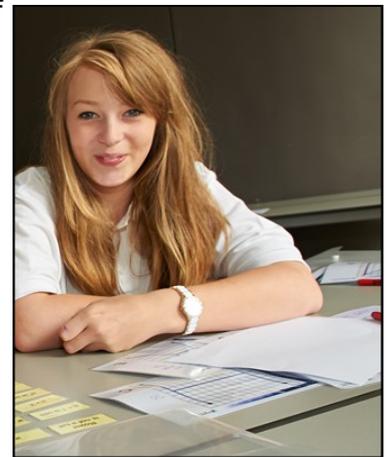
- The support of **senior leaders** is seen as crucial in guiding the development of a clear whole-school culture which promotes participation in post-16 mathematics by girls and supporting an appropriate curriculum within the mathematics department. For example, three of the case study schools prepare students for the AQA Level 2 Certificate in Further Mathematics, which offers students an insight into what is involved in A level Mathematics. This is beneficial to girls who report that they feel more confident in progressing to A level having been exposed to more challenging mathematics during Key Stage 4.
- **Careers advice** starts early and illustrates the utility of mathematics across a range of disciplines. At Shenley Brook End Academy, students have researched university courses by Year 11 and identified that mathematics was necessary for a range of careers including the forces and sports science. At Beauchamp College, mathematics is valued as a currency that keeps options open and is a gateway to specific careers, including optometry, medicine, food nutrition, youth work, forensic science and physics. Wall displays (above) highlight the importance of mathematics. At the Further Education College, personal careers advice for new and prospective students emphasises pathways in which mathematics is an essential companion or a central subject.



*Students are emotionally and cognitively prepared for A level by a Key Stage 4 curriculum that builds up challenge gradually, in highly structured ways.*

School D, FMSP/IoE Case Studies

- The role of **mathematics teachers** in supporting girls and getting to know them individually is valued by female students. They like teaching strategies that provide opportunities for checking understanding with friends and quiet conversations with the teacher. Teachers in the three mixed schools described the importance of directing questions to girls in class. In several of the schools, the mathematics department's 'open door' policy was seen as crucial in building girls' confidence.
- In the case study schools, girls' participation is seen to be assisted by strong **family appreciation** of the value of mathematics and the role of hard work. Family support for the study of mathematics was particularly high in non White British ethnic groups. Students in the Further Education College were dismissive of negative cultural messages amongst some young people, such as it being 'smart to dumb down'.
- Recruitment specifically to AS or A level Further Mathematics emphasised **intrinsic motivation** and students were encouraged to consider whether they enjoyed working independently on a lot of mathematical problems. The messages about participation in Further Mathematics focused on motivation rather than simply focusing on the cleverest group of students in the year group.
- All of the case study schools / colleges offer A level Mathematics options that include **statistics** in Year 12. This was promoted as beneficial because of the social science applications, which may be particularly attractive to girls.



*There are particular teachers in the school who act as personal champions for the group of top set girls and their future participation in mathematics.*

School B, FMSP/IoE Case Studies

*The case study schools had not been involved in specific initiatives to attract girls to study mathematics; instead there was a strong culture of encouraging girls to aspire to take mathematics at A level.* FMSP/IOE Case Studies

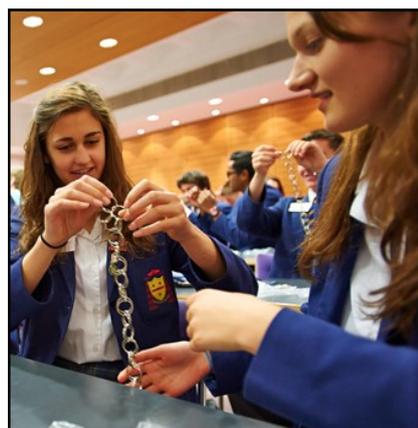
The interim report of the FMSP/IOE Case Studies (January 2015) offers the following recommendations for teachers of key stage 4 and sixth-form students, heads of mathematics departments and senior leaders.

### Recommendations:

- Start from Years 9 and 10 to develop a school-wide culture in which girls aspire to study mathematics to A level.
- Be active in promoting mathematics as a subject that has wide applicability which opens doors to a wide variety of degree courses and careers.
- Include the study of statistics in Year 12 and promote this as beneficial because of the social science applications.
- Ensure comprehensive and accurate careers guidance is in place so that girls are not deterred from studying mathematics when considering a career in medicine and allied fields. For example, in 2011, the most popular combination of A levels for students progressing to medicine and dentistry and to subjects allied to medicine was Mathematics, Biology and Chemistry<sup>1</sup>.



- Introduce more mathematics topics and qualifications alongside GCSE for students expected to get a grade B or above. Girls value the opportunity to evaluate their interest in the topics they might meet at A level and how they might cope with the demanding material.
- Support parents and carers in developing appreciation of the value of A level Mathematics and Further Mathematics as this is influential on girls' participation.



- Ensure teachers make themselves available for support and discussion outside lessons—girls report that they like teachers who know them individually and the opportunity to check their understanding through a quiet discussion rather than publicly in class.

<sup>1</sup> Vidal Rodeiro & Sutch, (2013) Popularity of A level subjects among UK University Students, Cambridge Assessment

*Further Mathematics provision is stable in each school, supported by senior staff, with a protected place in the timetable even in years when numbers are small.* FMSP/IOE Case Studies



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The **Further Mathematics Support Programme (FMSP)** is a government-funded initiative supported by the Department for Education and managed by MEI. The FMSP supports schools and colleges at Key Stage 4 and post-16 level to increase teacher expertise and student participation in AS/A level Mathematics and Further Mathematics. In addition, the FMSP is a national partner to the Maths Hubs programme.

FMSP produce dedicated website content encouraging and supporting girls in participating in Mathematics and Further Mathematics A levels and organise *Celebrating Women in Mathematics* events with female speakers from industry and Higher Education and a range of exciting and engaging activities and workshops. The FMSP works with UCL IOE to research and disseminate good practice relating to increasing girls' participation in advanced mathematics.

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