

Supplementary written evidence from Lynne McClure OBE, Academy of the Mathematical Sciences' Education Workstream (MTS0002)

1. Thank you for the opportunity to give oral evidence on the 04 March 2025, and for the request for follow-up notes.
2. This short summary gives more detail on some of the key themes raised during the hearing on the topic of maths education. It does not duplicate my oral evidence and should be read in conjunction with it.
3. I would be happy to provide any further details to the Committee should that be of interest at any time, as would any of my colleagues at the Academy for the Mathematical Sciences.

Introduction and context

4. The Academy for the Mathematical Sciences (henceforth "The Academy") exists to provide an authoritative, persuasive, and influential voice for the whole of the mathematical sciences community, bringing together academia, education, business, industry, and government. We work across all four nations providing crucial connectivity for harnessing the power of the discipline to address national and global challenges. Further details about the Academy are given in Paragraphs 26 to 31 below.
5. I offer the evidence presented below in my capacity as Chair of the Academy's Education Workstream. This group includes representation from stakeholders and providers of mathematics education across the UK at all stages and levels.
6. This written submission seeks to:
 - a. Describe the integrated ecosystem that surrounds maths education in this country (at both school and college level, and university / tertiary level) and therefore
 - b. Demonstrate how negative action taken in any one area, while perhaps understandable and explicable on its own terms, often under-appreciates the knock-on impact to other aspects of this ecosystem.

I contend that, in a number of specific areas, the government has taken deleterious action on this ecosystem. These actions will have significant and adverse knock-on consequences that I believe are under-appreciated by Ministers and policymakers.

7. This submission describes recent government action around:
 - a. the Advanced Maths Support Programme (AMSP)
 - b. the future of the University Maths Schools programme
 - c. the perennial shortage of trained mathematics teachers in state schools
 - d. the closure or shrinking of mathematics departments in UK Universities, and
 - e. the funding of the Academy for the Mathematical Sciences itself.

8. I urge the committee to pay close attention to the future of GCSE resits in mathematics, as considered in the Curriculum and Assessment Review, an issue raised during the hearing, and one to which my submission now returns.

The impact of maths on the economy and society

9. A 2024 Academy for the Mathematical Sciences report¹ found that the mathematical sciences contributed an extraordinary £495 billion to the UK economy in 2023 (20% of total UK Gross Value Added or GVA) and that 4.2 million people were working in jobs that use tools and techniques derived from research in the mathematical sciences (13% of all UK employment). Further, the economic productivity (as measured by GVA per worker) and salaries of those workers were significantly higher than the UK average. This analysis updated Deloitte's 2013 findings² that the mathematical sciences contributed £208 billion GVA (16% of total UK GVA) and 10% of all employment in 2010. We can confidently expect that this upward trend will continue - in the age of AI as an all purpose technology, both individuals and businesses will need to be more mathematically competent and engaged with maths in the immediate future.

¹ <https://www.acadmathsci.org.uk/wp-content/uploads/2024/10/AcadMathSci-22Oct2024-Economic-Contribution-MathSci.pdf>

² <https://www.ukri.org/wp-content/uploads/2022/07/EPSRC-050722-MeasuringEconomicBenefitsMathematicalScienceResearchUK.pdf>

10. Maths also has a broader societal impact—whether through the advantages conferred by the social and public policy that mathematical expertise underpins (from pandemic preparedness, and flood defences, to optimising processes that reduce queueing times in hospitals and airports, to calculating the green space required in new developments), or through the benefits that accrue to individuals who are mathematically competent. These include higher life-satisfaction, better mental well-being, and greater self-esteem in addition to an enhanced ability to make informed decisions and judgements—all essential for being a constructive and engaged citizen in the 21st Century.^{3,4}
11. It is therefore disappointing—for both economic and social reasons—to see a number of measures which the government and other actors have taken forward in recent months, which will almost certainly harm the future pipeline of mathematical talent in this country.

The Advanced Maths Skills Programme (AMSP)

12. The Advanced Mathematics Support Programme (AMSP) is a government-funded initiative, led and delivered by Mathematics in Education Innovation (MEI), whose Chief Executive, Charlie Stripp MBE, gave oral evidence alongside me to this committee. It aims to increase participation in Core Maths, AS/A level Mathematics and Further Mathematics, and to support improvement in the teaching of these Level 3 maths qualifications. The programme provides national support for teachers and students in state-funded schools and colleges in England with the aim of increasing opportunities for all students to study maths post-16, regardless of their location, gender, ethnicity, or background.
13. On 29th January, AMSP stated that "*Due to financial challenges faced by the government, the DfE has made the difficult decision to reduce funding for the Advanced Mathematics Support Programme (AMSP) from 1 April. We will continue to provide high quality*

³ <https://assets.publishing.service.gov.uk/media/5a7b92c8ed915d1311060218/bis-13-1212A-investigating-benefits-english-maths.pdf>

⁴ <https://www.oecd.org/en/topics/sub-issues/mathematics-literacy.html>

professional development for teachers and other excellent support for schools and colleges, but the reduction in funding means that from 1 April we will reduce the number and type of events available through the AMSP.”⁵

14. A key element of the AMSP offer is its targeted support for students in areas of disadvantage and in schools with limited access to specialist mathematics teaching. The reduction in funding that took effect on 1 April this year has had a direct impact on support for students currently studying Further Maths A Level—particularly those aspiring to apply for mathematics courses at universities with the highest entry grade requirements. Many of these institutions require additional evidence of attainment (such as success in STEP, TMUA, or other university examinations) for which AMSP has provided vital preparation. While some short-term philanthropic funding has been secured to sustain this aspect of the programme for one further year⁶, supporting over 4,000 students, the overall consequence of the funding cut is a significant reduction in AMSP’s capability and reach. As a result, students and schools most in need have been left effectively “high and dry” by this mid-year decision. **This is an unacceptable position for any system that seeks to uphold equity in access to the most competitive university mathematics courses.**

Maths schools

15. University maths schools are specialist 16-18 schools for teaching A-Level Mathematics and Further Mathematics (and associated subjects) to high-attaining young people. They are always run in partnership with a university and draw from the very best of tertiary level teaching and research. The first maths schools opened in 2014 and the network has since grown to 11 schools across the country, 8 of which are already open and thriving.
16. Maths schools provide exceptionally high-quality teaching, and demonstrably improve student outcomes. In 2020, 22% of maths school students achieved places at Oxford or Cambridge. Further, as of

⁵ <https://mei.org.uk/changes-to-the-advanced-mathematics-support-programme/>

⁶ <https://schoolsweek.co.uk/government-must-check-its-sums-on-maths-investment/>

2023, every maths school that has been inspected has been graded Outstanding in all areas. The average value-added from GCSE to A-Level grades by maths schools is +0.87, higher than at any other A-Level provider in England. Based on 2024 A Level results, maths schools are in the top 0.5% of A Level providers for added value (at +0.6 grades per entry) and this is even higher for disadvantaged students, averaging +1.0 grade per entry, and King's Maths School in London is consistently the highest performing school or college in the country in terms of A Level results.

17. Maths schools also address inequity in high level mathematics study. They work in partnerships with universities to break down barriers to high skilled STEM careers. They increase diversity and inclusion: 12.1% of maths school students are eligible for Free School Meals, compared to just 4.6% of the national A Level Further Maths cohort. They specifically support girls and those with additional needs, and through their outreach impact on the local maths ecosystem.
18. The planned cohort size for all agreed maths schools was to have increased to 1,100 by 2026. But two previously approved maths schools—due to open in Durham and in Nottingham—have been paused by the government. Without the capital investment from the government, these new schools cannot open, meaning that two of the UK's **lowest-performing regions** for maths post-16 will not have the specialist provision necessary to identify and develop the next generation of talented mathematicians from within their region. **This decision risks harming school-university collaborations and the wider push around free access to maths excellence for all young people.**

The maths teacher pipeline

19. Current research undertaken by the National Foundation for Educational Research (NFER) exposes the huge under recruitment of mathematics teachers. Supply is at its lowest level since 2016/17 and has been below target since 2012. In 2023-24 only 63% of the target was realised.

20. Secondary school students achieve noticeably higher results when taught maths by teachers with a university degree majoring in maths rather than those taught by “out-of-field” teachers.⁷ However, 52% of secondary maths lessons are taught by a teacher without a degree-level qualification in maths.⁸
21. This situation is going to be exacerbated by the removal of Multi-Academy Trusts’ (MATs) ability through the forthcoming Children’s Wellbeing Bill to offer flexibility and other incentives, e.g. pay, or the ability to recruit teachers from industry without formal Qualified Teacher Status (QTS)—and **this will disproportionately affect disadvantaged schools which historically have difficulty in recruiting teachers.**
22. There are a number of key players in the field, including the Academy for the Mathematical Sciences and the Nottingham Observatory for Mathematical Education⁹ who could work with the government to explore new and bold evidence-based strategies for recruiting and retaining mathematics teachers.

Maths department closures - and the link to teacher training

23. In terms of student numbers, maths has now been the most popular A-Level for over a decade. In 2024, for the first time, more than 100,000 students took A-Level Maths. Moreover, the number of students that took A-Level Further Maths jumped by 20%. But at undergraduate level, overall entry rates have declined in recent years (falling from 37,735 in 19/20 to 34,340 in 22/23).
24. This decline—at a time when, by contrast, undergraduate entries to computer science have grown by 20%, and postgraduate entries have doubled—is clearly concerning. But in fact, the headline figures mask a deeper problem. Data shows that undergraduate numbers have increased at many larger, typically high-tariff mathematics departments, further exacerbating declines at smaller, often lower-

⁷ <https://theconversation.com/englands-maths-teacher-recruitment-problem-is-set-to-worsen-246351>

⁸ https://21ee65c1-6f70-4267-8143-cf318b1a3814.usrfiles.com/ugd/21ee65_26344990ccff44afa78c0a10f09adb2c.pdf

⁹ <https://www.nottingham.ac.uk/observatory/observatory-for-mathematical-education.aspx>

tariff institutions. In some cases—including Oxford Brookes, Brighton, and Cardiff—this has led to departments being closed or significantly restructured.

25. Decisions on course provision are for universities themselves to manage—and are driven in part by student demand, both domestic and international. But closure of departments or reduction in places has a significant impact on the overall maths people pipeline—at a time when the economy is already experiencing significant skills shortages, especially in STEM roles.^{10, 11}

26. The Committee should be aware that this marked fall in undergraduate numbers at lower tariff universities, and the closure of such departments, has a significant and direct negative impact on the flow of graduates entering teacher training in maths. Recent research¹² by Professor Paul Wakeling at University of York shows that only an average of 2% of “Golden Triangle” maths graduates and 6.5% of maths graduates from other Russell Group universities entered Initial Teacher Training (ITT) between 2017/18 and 2020/21, compared to 23% of graduates at post-92 universities. In other words, **the decrease in the number of maths graduates from lower tariff universities has an outsized effect on the pool of would-be maths teachers.**

Funding for the Academy for the Mathematical Sciences

27. The 2018 Bond Review¹³ highlighted concerns about sector fragmentation and identified the “critically important” need for a national voice for the mathematical sciences in the UK. Its key recommendation was the creation of a single body that would provide a national voice for the mathematical sciences. In response, the five learned societies launched the project to create the Academy for the

¹⁰ https://assets.publishing.service.gov.uk/media/5a82d0b340f0b62305b947f0/AS_review_report.pdf

¹¹ <https://www.sciencecampaign.org.uk/app/uploads/2023/06/CaSE-The-Skills-Opportunity-Report-June-2023.pdf>

¹² https://21ee65c1-6f70-4267-8143-cf318b1a3814.usrfiles.com/ugd/d28465_2fba675a022b401697f396b393047746.pdf

¹³ <https://www.ukri.org/publications/the-era-of-mathematics/>

Mathematical Sciences, a community-backed initiative with the mission to benefit society through the power of the mathematical sciences.

28. Following extensive community consultation, in 2022 an Executive Committee was appointed to establish the Academy. Supported by an 80-strong Advisory Board of volunteers, these field leaders from academia, education, business, industry, and government have built an institution that provides an authoritative and persuasive voice for the whole of the mathematical sciences. The Academy works with learned societies, organisations, and people in the community who develop, teach, research, communicate, and use mathematics and the mathematical sciences. Its remit spans the full spectrum from education to business, industry and government. Its unique convening power is essential for bringing disparate groups together to address societal problems and needs. The Academy obtained Charitable Incorporated Organisation (CIO) status in 2023.
29. The Academy now sits alongside the other National Academies (Royal Society, British Academy, Academy of Medical Sciences, Royal Academy of Engineering), providing the government with a single point of contact for convening and accessing expert views including through responses to, e.g., the Curriculum and Assessment Review and the Treasury's Spending Review.
30. Despite working within a minimal budget, the Academy's impact to date has been significant including: the Policy Unit's analysis, already widely cited, of the economic contribution of the mathematical sciences to the UK; the Maths Can Take You Anywhere campaign, adopted by Google in its London AI Hub¹⁴; the Maths Manifesto which identified improving mathematical literacy, increasing investment in research and commercialisation, bringing further insight to public policy and industry, and improving attitudes towards mathematics in society as key priorities; and the surveys around support for early career mathematical scientists and widening access initiatives delivered by UK HEI mathematical science departments.

¹⁴ <https://www.acadmathsci.org.uk/2024/11/28/maths-can-take-you-anywhere/>

31. However, this impact is not sustainable without long-term financial security. The team of 80+ volunteers currently working for the Academy cannot be expected to maintain their current levels of commitment of time and effort over the long term. Moreover, short-term contracts will make it difficult to recruit top talent or indeed to retain the excellent staff already appointed, including the Academy CEO, Dr Christie Marr, a former maths teacher and from 2012 to 2022 (when she was seconded to the Academy) the Deputy Director of the Isaac Newton Institute, the UK's flagship national and international visitor research institute.
32. In 2024, at the invitation of DSIT, the Academy created a detailed competitive funding proposal for £6m over 3 years. **The cancellation of this competition by the current government threatens the cohesive vision for the mathematical sciences that has been developed and sustained with the mandate of the whole mathematical sciences community by the Academy project, and puts at risk the potential of the mathematical sciences to support the government in delivering on its missions including through its AI Action Plan.**

GCSE maths resits, and the Curriculum and Assessment Review

33. **The current national curriculum for mathematics is intended to prepare students for their future - both for citizenship and employment or further study. However the terminal examination at 16, the GCSE, does not currently fulfil or test those aims adequately.**
34. Around 40% of each year's cohort of students will not achieve a GCSE Grade 4 (standard pass), which means they will struggle both in everyday life, and in future employment or study. Currently they are condemned to retake, multiple times if necessary, until they do. **Multiple resits are inappropriate and soul destroying for all except those very close to achieving a grade 4, with pass rates as low as 23% in 2024.**¹⁵

¹⁵<https://www.bbc.co.uk/news/education-67937273>

35. We need a qualification which ensures that a useful level of numeracy is achieved by all students, and with more advanced study in mathematics built on that foundation.
36. **Offering a criterion referenced KS3 'Essentials' qualification, which would be valuable in itself, and could be taken in KS3 or 4 which would both give a more secure foundation for GCSE leading to better pass rates, and do away with multiple retakes.** This could be done by introducing a stepping stone approach - a KS3 curriculum which focuses on the essential ideas of, for example, proportional/multiplicative reasoning and which leads to a qualification which can be built upon to achieve GCSE either within KS4 or post 16.

Summary

Mathematical science is crucial for unlocking human potential: it fosters critical thinking, problem-solving, and innovation, forming the foundation for advancements in technology, science, and beyond. In order to boost the economy and enhance quality of life for individuals and across society, it is imperative that we take steps to improve population numeracy and to support high end mathematical science research. We must ensure that recent decisions that counter these aims are challenged and overturned.

- The Advanced Mathematics Support Programme (AMSP).
The Government should reinstate its funding of AMSP in order to uphold equity in access to the most competitive university mathematics courses.
- Maths Schools.
The Government should commit to on-going core funding for Maths Schools and should "un-pause" its decisions on opening new schools for Durham and Nottingham. To do otherwise risks damaging efforts to ensuring more equitable access to mathematical science study at the highest levels in two of the UK's most under-performing regions.
- The maths teacher pipeline.
The teacher pipeline remains an area of major concern. In order to avoid disproportionately affecting disadvantaged schools which

historically have difficulty in recruiting teachers, the Government should work with key players in the field including the Academy for the Mathematical Sciences and the Nottingham Observatory for Mathematical Education to explore new and bold evidence-based strategies for recruiting and retaining mathematics teachers.

- Maths department closures - and the link to teacher training
The decrease in the number of maths graduates from lower tariff universities has an outsized effect on the pool of would-be maths teachers. The Government should work with the Academy for the Mathematical Sciences, the Campaign for the Mathematical Sciences, and Universities to design and support programmes to increase numbers applying to study the mathematical sciences right across the university sector.
- Funding for the Academy for the Mathematical Sciences
The cancellation of £6m funding for a National Academy focussed on Mathematical Sciences threatens the cohesive vision across the community built up over several years, and puts at risk the potential of the mathematical sciences to support the government in delivering on its missions including through its AI Action Plan. The Academy for the Mathematical Sciences should be given baseline funding alongside its peer National Academies.
- GCSE maths resits, and the Curriculum and Assessment Review
The current mathematics GCSE is not fit for purpose and the requirement to resit is inappropriate and soul destroying for the majority of the 40% of students who fail to achieve a Grade 4 pass on first attempt. The government should accept the recommendations presented to the Curriculum and Assessment Review to introduce a criterion referenced KS3 'Maths Essentials' qualification, as a precursor to GCSE.