

The chronic shortage of secondary and post-16 maths teachers, its impact and how it might be addressed

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What's the problem?

Excellent teaching is the key to students achieving a good education. The Education and Endowment Foundation is clear on this¹:

'the best available evidence indicates that great teaching is the most important lever schools have to improve outcomes for their pupils'

In 2024, I led MEI's work to develop a discussion paper, 'Recruiting, developing, and retaining the mathematics teaching workforce in England'², published last July. The intention was to stimulate thinking on how the chronic shortage of secondary school and post-16 maths teachers might be addressed.

Recruitment targets for secondary maths teachers have been missed for many years. One outcome of this is that many secondary school students, especially in Key Stage 3, are being taught maths by inexperienced maths teachers, or teachers who have not been trained as maths teachers ('out of field' teachers). Unfortunately, schools in disadvantaged areas are most affected by the maths teacher shortage³.

Against this background of chronic secondary maths teacher shortage, the importance of maths education is recognised more than ever, both for the economy and for individual success⁴. This is reflected in the record numbers of students choosing to study maths at A level, with 107k and 18k gaining qualifications in A level Mathematics and A level Further Mathematics respectively in 2024⁵.

Despite record A level Maths numbers, we still have low uptake of maths beyond GCSE level relative to other developed countries⁶. A level Maths and Further Maths qualifications

are designed for students intending to follow STEM pathways in higher education and employment. Core Maths qualifications, introduced in 2016, have been specifically designed for post-16 students with a grade 4 or above in GCSE Maths who aspire to less mathematical pathways, such as humanities and social sciences. To support their education and future careers⁷, these young people need a practical understanding of how to use relatively simple maths to model and solve real-world problems and analyse quantitative information⁸.

The potential Core Maths cohort is around 300,000 students each year. There is considerable support for Core Maths – as the British Academy and Royal Society jointly stated in 2022⁹:

'Core Maths has a key role to play in achieving the ambition for a 'high skills, high wage' workforce and a thriving economy. These qualifications have been designed specifically to meet this national need.'

There is also a government funding 'Core Maths premium'¹⁰, announced in 2024, to encourage more schools and colleges to offer Core Maths qualifications.

The importance and potential of Core Maths is further highlighted in the Royal Society's 2024 'Mathematical Futures' report¹¹ that sets out a vision for how maths and data education should be developed to meet the future needs of our society. Despite the recognised educational value of Core Maths, and the funding premium, teacher shortage means numbers are still greatly below the potential number, at around 13,000 in 2024¹².

Because mathematical proficiency is so important in work and life, students who do not achieve a grade 4 or above in GCSE Maths by age 16 are required to continue to study maths post-16. This is around 30% of young people each year¹³, with roughly three quarters of them being taught maths post-16 in FE colleges¹⁴. This requires significant teaching capacity, and colleges struggle to recruit sufficient teachers to meet the needs of these students.

The key barrier to expansion of post-16 maths education is the shortage of maths teachers.

The maths teacher shortage is therefore contributing to social inequity and limiting national economic prosperity.



To address the problem it will be necessary both to retain current maths teachers in the profession and to recruit new ones. It's great that the new government has set ambitious targets to recruit more teachers but, so far, it's not clear what their strategies will be. Specific strategies will be necessary to recruit more people into maths teaching.

Why being a secondary/post-16 maths teacher is a brilliant job

If you enjoy maths and are well-qualified mathematically (e.g. you have an A level in maths and a STEM degree), there are many attractive employment options available to you. If you also want to

- pursue a challenging and worthwhile career
- continually learn and develop throughout your career
- see the impact of your work every day
- work directly with young people
- never be bored at work
- make a life-changing difference to young people
- make a valuable contribution to wider society,

then I think a career as a maths teacher is hard to beat.

The bullet points above apply to teaching generally, but as someone who has a passion for maths teaching, I think that teaching maths can be uniquely satisfying. Witnessing students have 'lightbulb' moments

when they understand a concept for the first time, or connect different mathematical ideas, or first appreciate the beauty of a piece of mathematics, is unbeatable.

A key aim of school and college education is to open-up opportunities to all young people, whatever their background. Research evidence suggests that succeeding in maths qualifications at GCSE and at A level has a significant impact on future wellbeing and earnings^{15,16}, so effective maths teachers make an important and valuable contribution to building a fairer society.

If being a maths teacher is such a great job, why is there a chronic shortage of secondary and post-16 maths teachers?

Those qualified to be secondary and post-16 maths teachers are qualified for many other rewarding career opportunities (which is why maths education is so important!). Teaching is relatively poorly paid compared to other roles requiring similar knowledge and skills, so pay is likely to be a stronger factor for maths teaching than for many other subjects.

However, research suggests that, for teachers in general, other factors may be at least as important for both recruitment and retention¹⁷. These include: workload, working conditions, progression opportunities, pupil behaviour and social status.

Teacher supply is an international issue. A 2023 OECD report on teachers' salaries¹⁸ concluded:

'... salary levels are just one of the many factors contributing to the attractiveness of the profession. In addition to raising salaries, decision makers should also take steps to raise the status of the profession in society, and offer teachers more opportunities for professional development and mobility to ensure that the profession remains intellectually stimulating throughout their careers.'

Teaching in areas of high disadvantage is, inevitably, more challenging and may therefore seem less attractive, which exacerbates the shortage of maths teachers in schools in those areas.

A further concern I have is that the chronic shortage of maths teachers may have a negative impact on maths teacher retention. From my work with the National Centre for Excellence in the Teaching of Mathematics (NCETM)¹⁹, the Maths Hubs and the Advanced Maths Support Programme (AMSP)²⁰, I know that the shortage adds to maths teacher workload and can prevent them from engaging with CPD opportunities they would like to access. The shortage makes the job more difficult, and if the job becomes more difficult, more may seek to leave it.

Ideas for potential solutions?

Ideally, I would not favour paying maths teachers more than teachers of other subjects where there is less shortage. However, we live in a market economy and crude economics says that when supply of a skill is short and demand is high, to meet demand, wages must increase. It may therefore be necessary to pay maths teachers, and teachers of other shortage subjects more. For areas of disadvantage, where teacher shortages are exacerbated, higher pay to attract more applicants seems justified.

Recruitment

A recent blog post about teacher recruitment²¹ from Jack Worth, the School Workforce Lead at NFER,



cites research that suggests that 'Generation Z', the age group from which current graduates are drawn, are:

'more likely to desire careers that are pro-social (i.e. about helping others or contributing to society) than previous generations. Given the current teacher recruitment challenges, it is therefore somewhat reassuring that pro-social career intentions have historically been associated with being more likely to become a teacher.'

He goes on to say:

'There may be a wide pool of potential teachers in the current pool of new graduates who would be attracted to a teaching career if it was more competitive with other jobs in terms of, for example, pay and flexibility.'

The same blog post makes some important points relevant to the recruitment of maths teachers:

- Although the overall cohort size of young adults is reducing, the increase in participation in higher education means the pool of graduates is increasing, especially in STEM subjects.
- The modal degree subject for secondary maths teacher trainees is maths, but the majority of maths teacher trainees did not do maths degrees. Graduates from a wide variety of degree courses, especially engineering and business, choose to become maths teachers, so recruitment should be focused on a wider group of undergraduates.

I think secondary maths teachers themselves, particularly A level Maths teachers, have a role to play in supporting maths teacher recruitment. If a student clearly enjoys maths, and is seeking a pro-

social career, maths teaching could be an excellent career for them, for the reasons cited above, and their teachers should recommend it. I'm not suggesting maths teaching should be promoted more strongly than other careers involving maths, but it should certainly be presented as a positive and worthwhile option.

Teachers of other subjects becoming maths teachers

Another source of secondary maths teachers is teachers of other subjects who choose either to switch to teaching maths completely or teach maths for part of their time – 'out of field' maths teachers. With appropriate training these teachers can make a valuable contribution to maths teaching. The NCETM has developed a highly regarded 'Specialist Knowledge for Teaching Mathematics Programme'²², offered through the Maths Hubs²³, that is designed to help such teachers develop the knowledge and skills they need. More substantial programmes/long-term support are needed to develop these teachers as expert maths teachers.

It is notable that maths teachers in jurisdictions that perform highly in international comparisons of maths education have both a deep understanding of the maths they are teaching, and a deep understanding of how to teach maths at that level. Teaching for deep understanding, consistent with the NCETM 'Essence of Teaching for Mastery' pedagogy²⁴, supports students to develop a secure, connected understanding of maths. As I discussed in my previous Mathematical Angles article on attitudes to maths²⁵, this enables students to develop positive attitudes to learning maths, rather than viewing maths as an ever-growing set of rules and techniques to remember.

Specialist KS3/GCSE Maths Foundation teachers?

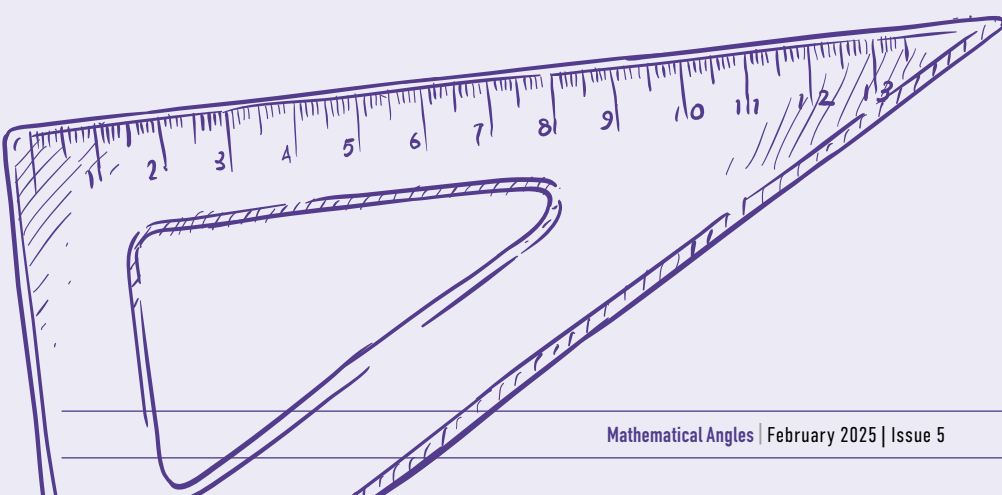
Developing Key Stage 3/ post-16 GCSE Maths resit specialist maths teacher roles could broaden the recruitment pool of potential maths teachers. Teacher training that focused on developing both deep subject knowledge and expert pedagogical knowledge for Key Stage 3 maths could also help raise secondary maths teaching standards. Key Stage 3 is a crucial period in students' mathematical development:

*'A good understanding of the maths at Key Stage 3 would enable a student to achieve a grade 4 or 5 on the foundation tier of GCSE Mathematics, even if they did not extend their knowledge and understanding beyond the Key Stage 3 curriculum during Key Stage 4.'*²⁶

We know that Key Stage 3 and post-16 GCSE Maths resit are key areas of maths teacher shortage. A focus on recruiting and developing specialist Key Stage 3/GCSE Foundation maths teachers could help to ease these shortages. This could be part of a pathway of ongoing CPD that could enable out of field teachers to develop expertise in teaching maths at different levels.

Core Maths

Post-16, teachers of other disciplines could make a valuable contribution to Core Maths teaching, as part of a school/college 'Core Maths team'. New teachers could also be specifically recruited and trained as specialist Core Maths teachers – this could be an attractive choice for career changers who have practical experience of using maths and data skills in their previous roles. This would require significant investment in training and incentives, but the importance of more young people learning maths at this level means it would be worth it. Expert teachers from different subject disciplines and backgrounds teaching Core Maths would help young people to see how maths and data education is vital and relevant for many disciplines, not only STEM. Teaching Core Maths would also help established teachers (including maths teachers) to further develop their expertise in teaching their own subject.



Retention

Retaining experienced and effective maths teachers is crucial. This means maths teachers need to find their careers rewarding and feel valued by society.

Maths education benefits from government funding for the NCETM/ Maths Hubs and the AMSP to provide high-quality professional development for maths teachers. Feedback from teachers suggests that these programmes are greatly valued.

A key feature of the Maths Hubs programme, which has now been running for 10 years, is the development of a collaborative professional culture²⁷ – an ongoing practice of maths teachers working together, within and between schools, to improve their practice. Secondary maths teachers report that they find this very rewarding; it can both improve teaching and reduce workload.

I think three changes in particular are needed to make maths teaching more attractive as a professional career. These changes would improve both recruitment and retention:

1) *Time*

Excellent, fully funded, subject-specific professional development opportunities are available for secondary and post-16 maths teachers, but engagement is limited because teachers do not have dedicated time to undertake ongoing professional development. All teachers should have an entitlement to time for subject-specific professional development throughout their careers and should be required to engage with at least a statutory minimum amount each year. Entitlement to professional development is a feature of educational systems that score highly in international comparisons²⁸, and is expected in other professional careers.

2) *Subject specific career structures*

The Head of Maths role is vital in secondary schools. In primary schools, there is now a National Professional Qualification (NPQ) in leading primary maths. Perversely, no such qualification

exists for leading secondary maths. Such a qualification should be established.

Through the Maths Hubs programme, there are now leadership roles for expert practising maths teachers as Local Leaders of Maths Education (expert maths teachers who have funded time to support other maths teachers, within their own school and in other local schools), and as members of Maths Hubs leadership and management teams, but there is no professional recognition for these roles.

In Multi-Academy Trusts MAT, there are now roles as Director of Maths across the MAT, but again there is no professional recognition for these roles.

Subject-specific, professionally recognised career pathways could help to retain expert maths teachers (the same would be true for other subjects). A problem with our current system is that ambitious expert subject specialists may feel that their only route to career progression at a senior level is either to move out of teaching or progress into school or college senior management, a role for which they may not be especially well-suited and where their skills as an expert maths educator may be wasted. Subject specific career pathways are a feature of internationally high-performing education systems^{29,30}.

3) *Professional status*

Expert teachers are highly skilled professionals, but they are not widely recognised as such. The Chartered Maths Teacher status exists, but it is rarely taken up because it brings no tangible recognition in terms of professional status or pay.

A career structure could be developed whereby new maths teachers are required to demonstrate their professional learning over the early part of their careers in order to achieve Chartered Maths Teacher status. Achieving Chartered Status could trigger a salary increase. Chartered Maths Teachers would need to complete a minimum professional development requirement each year to maintain their chartered status, and Chartered status could also be a pre-requisite for promotion to more senior subject-specific roles. Such a structure could help raise the status of teaching to that of other professions.

Conclusion

- 1) The shortage of expert secondary and post-16 maths teachers disproportionately affects disadvantaged young people and is damaging to our economy.
- 2) For someone who enjoys maths and wants to pursue a 'pro-social' career, maths teaching



should be hard to beat. There is evidence to suggest that the current generation of graduates is attracted to pro-social careers.

- 3) Graduates of many different degree subjects have sufficient maths skills to train as secondary maths teachers, so recruitment campaigns should target a wide range of degree subjects.
- 4) Key Stage 3 and post-16 GCSE Maths resit are key areas of maths teacher shortage. A focus on recruiting and developing expert Key Stage 3/GCSE Foundation maths teachers could help to address the secondary and post-16 maths teacher shortages.
- 5) The importance of maths and data education to individual and national success means that investment should be prioritised to recruit and develop Core Maths teachers.
- 6) Pay incentives should be considered to attract and retain secondary and post-16 maths teachers and to encourage maths teachers to work in schools and colleges serving disadvantaged areas.
- 7) To improve maths teacher recruitment and retention, maths teaching must compete with other careers that require similar levels of expertise and commitment. As well as appropriate levels of pay

and general working conditions, opportunities for professional development and career progression are crucial.

- 8) Fully funded, high-quality subject-specific professional development is available, but workload and the maths teacher shortage often prevent access.

- 9) Through the Maths Hubs programme, we are developing a collaborative professional culture for maths teachers that can be built upon.

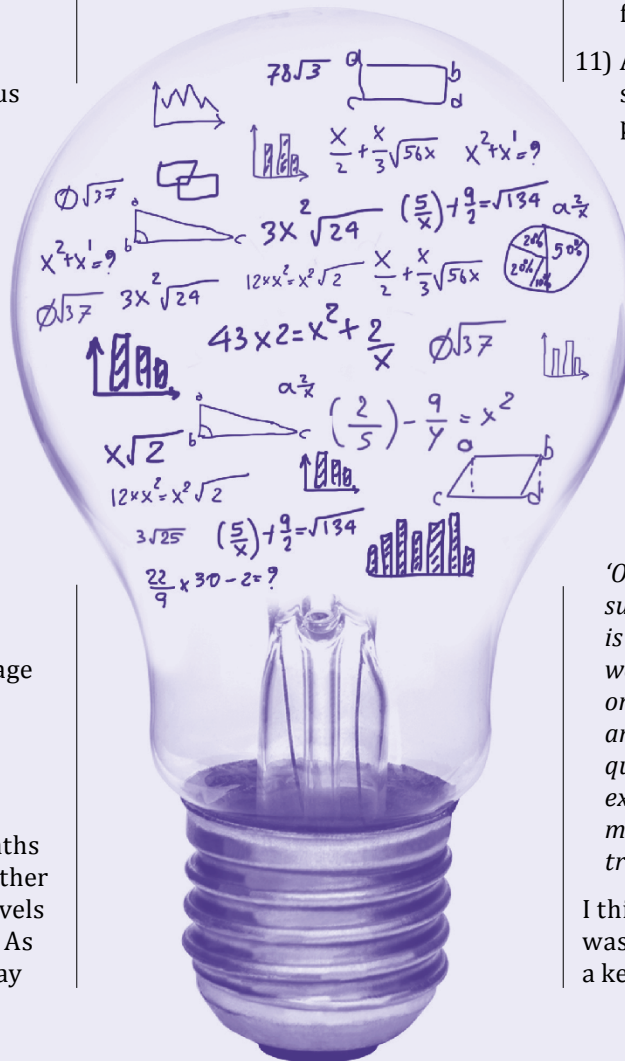
- 10) Teachers need a prioritised entitlement to time for professional development, and ongoing professional development should be embedded as a key feature of a teaching career.

- 11) A subject-specific career structure and appropriate professional recognition would raise the status of maths teaching as a prestigious, socially respected career.

Addressing the shortage of secondary and post-16 maths teachers and ensuring that all young people can access high-quality maths teaching is crucial for a successful society. Bertrand Russell is one of my heroes. In 1932 he wrote:

*'One of the impediments to successful democracy in our age is the complexity of the modern world, which makes it difficult for ordinary men and women to form an intelligent opinion on political questions, or even to decide whose expert judgement deserves the most respect. The cure for this trouble is to improve education.'*³¹

I think this is at least as true now as it was in 1932, and maths teachers have a key role to play.



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