

Policy briefing on teachers of mathematics

Recruitment, retention and development

This briefing is from the Royal Society Advisory Committee on Mathematics Education and supersedes the *Maths Snapshot: Teacher supply, training and development* (2014)¹. Since then, there have been significant changes to the policy landscape and new data and analysis on the teaching workforce is now available. However, some of the challenges remain unchanged.

In addition, the demand for maths teachers has grown for a number of reasons, including increasing pupil numbers, policy changes to increase participation in mathematics among students aged 16 – 18 and new accountability measures (Progress 8). *The Smith Review* (2017)² identified a number of delivery challenges that limit the ability of education providers to offer mathematics qualifications and teach them well. This briefing draws on a range of sources to provide an overview of the capacity of maths teachers across all key stages, as well as the implications for policy.

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Supply and demand

There is a shortage of appropriately qualified mathematics teachers across all phases of education.

- The school population is growing and it is expected that by 2023 there will be 900,000 more primary learners, 9% more than in 2014, and 480,000 more secondary learners, 17% higher than 2014³.
- At primary level, there is a shortage of maths expertise. Less than 1% of trainees take a maths specialism and up to 13,000 new specialists need to be trained to meet the target of one per primary school, as set out in the *Williams Review* (2008)⁴.
- At secondary level, schools are finding it difficult to fill posts with the quality of teachers they need. At least 4,400 more specialist maths teachers are needed to fill current vacancies⁵. In 2016 – 17, the number of postgraduate trainees in mathematics missed the Teacher Supply Model target by 16%⁶. Furthermore, 18% of maths lessons were taught by teachers who do not have a post A-level qualification in the subject⁷.
- In further education (FE) colleges, a sizable minority of maths teachers are underqualified. 16% have a Level 4 or below qualification in mathematics. Furthermore, a quarter hold no teaching qualification^{8,9}.

1. Advisory Committee on Mathematics Education. 2014. *Teachers of maths: supply, training and development*. London: ACME.

2. Smith A. 2017. Report of Professor Sir Adrian Smith's review of post-16 mathematics. London: DfE.

3. Advisory Committee on Mathematics Education. 2015. *Beginning Teaching: Best in Class? High-quality initial teacher education for all teachers of mathematics in England*. London: ACME.

4. Williams P. 2008. *Independent Review of Mathematics Teaching in Early Years Settings and Primary Schools*. London: DCSF.

5. Department for Education. 2017 *Data from: School Workforce Census in England*. Tables, SFR25/2017 <https://www.gov.uk/government/collections/statistics-school-workforce> (accessed 9 November 2017).

6. Foster D. 2017. *Teacher recruitment and retention in England*. Commons Briefing papers CBP-7222. London: HMSO.

7. Gibb N. 2016. *Education Committee Oral evidence: Supply of teachers*, HC 199, Wednesday 19 October 2016.

8. Education and Training Foundation. 2017. *Further Education Workforce Data for England*. London: ETF.

9. Hayward G and Homer M. 2015. *Profile of the mathematics teaching workforce in the college sector in England*. London: The Gatsby Charitable Foundation.

Rates of early-career teachers of mathematics leaving the profession are particularly high.

- Rates of recently qualified maths teachers leaving the profession are 2 percentage points worse than for humanities (but similar to science and English). This equates to a cumulative shortfall of 7 percentage points over the first 5 years, compared to humanities¹⁰.
- More research is needed to identify what the specific issues are and what initiatives might help to improve early-career retention rates. Better employment prospects outside of teaching for those with training in a STEM subject are likely to raise the leaving rate, but other subject-specific factors may also have an influence¹¹.

Areas for action

There is an urgent need for better data on the school workforce.

- As previously noted, without a clear picture of the current workforce, particularly of subject specialists, it is difficult to plan for the future^{12,13}.
- In FE, the evidence base is particularly poor and demand for teaching as a result of GCSE resits creates pressures¹⁴.
- There is a shortage of knowledge about which teachers leave the classroom and why, particularly at the subject-specific level.

Incentives for recruitment are poorly understood and further cost-benefit analysis is needed.

- The DfE has developed bursary and scholarship schemes to improve recruitment numbers, including bursaries for primary specialists. However, the cost of training teachers needs to be analysed and compared with the cost of professional development. The annual cost of bursaries is £150 million per year¹⁵.

- Bursaries have had a positive impact on the recruitment of maths graduates with a 2:1 or above¹⁶. However, trainees attracted only by the bursary may also be those who are more likely to leave teaching in the first few years¹⁷.
- There is no evidence of any increase in educational achievement of new teachers since the introduction of more generous bursaries and scholarships¹⁸.
- An evaluation of a series of supply and upskilling interventions aimed at maths and physics teachers suggests variation in effectiveness, with paid internships and Teacher Subject Specialist Training (TSST) courses working most effectively¹⁹.

Mathematics-specific professional development for all teachers of mathematics is essential.

- There are concerns about accessibility to subject specific professional development and geographical equity. There is a need to create a map of formal activities to establish what professional development is available to whom, where, of what quality and for what cost²⁰.
- There are multiple routes into teaching containing different levels of maths specific training. There is no guarantee of high-quality, mathematics specific content across ITE courses²¹.

There is potential for technology to address some of the challenges around teacher supply and demand²².

- There is an important need to explore the evidence around the effectiveness of technologies to improve teaching, research and use of evidence²³.

Although the remit of the Royal Society Advisory Committee on Mathematics Education now covers maths education across the UK, this publication focuses on England only. For information on the maths education workforce in Scotland, see [rse.org.uk/advice-papers/vision-for-science-and-maths-education](https://www.rse.org.uk/advice-papers/vision-for-science-and-maths-education)

10. Worth, J. and De Lazzari, G. 2017. Teacher retention and turnover research – Research update 1: teacher retention by subject. London: NFER.

11. *Ibid.*

12. Advisory Committee on Mathematics Education. 2015. Beginning Teaching: Best in Class? High-quality initial teacher education for all teachers of mathematics in England. London: ACME.

13. *It is unclear what impact SDS and TF routes are having on schools' classification of subject specialism in the SWS.*

14. Smith A. 2017. Report of Professor Sir Adrian Smith's review of post-16 mathematics. London: DfE.

15. National Audit Office. 2016 Training new Teachers. London: NAO.

16. School Teachers' Review Body. 2017 *Twenty-seventh report – 2017*. London: HMSO.

17. Hobson *et al.* 2006. *Becoming a Teacher: Student Teachers' Experiences of Initial Teacher Training in England*. Nottingham: University of Nottingham.

18. Institute of Fiscal Studies. 2017 *The Changing Educational Attainment of Graduate Recruits to Major Public Sector Occupations*. London: HMSO.

19. Straw S. Poet H. and Worth J. 2017. *Maths and physics teacher supply package*. London: HMSO.

20. Advisory Committee on Mathematics Education. 2015. *Beginning Teaching: Best in Class? High-quality initial teacher education for all teachers of mathematics in England*. London: ACME.

21. Advisory Committee on Mathematics Education. 2016 *Professional Learning for all teachers of mathematics*. London: ACME.

22. Smith A. 2017 Report of Professor Sir Adrian Smith's review of post-16 mathematics. London: DfE.

23. Wentworth J. *et al* 2018 *Topics of Interest 2018*. London: Houses of Parliament Parliamentary Office of Science and Technology.