

REVAMP

Research summary 2



The University of
Nottingham

UNITED KINGDOM · CHINA · MALAYSIA

Increasing A-level Mathematics uptake

The A-level Mathematics problem

Concerns about the uptake of AS/A level Mathematics have been widely discussed and debated in recent years. Although mathematics is now the most popular A level, international comparisons show that post-16 mathematics participation in England is relatively low¹. In March 2016 the Chancellor's budget speech reiterated the government's interest in moving towards *mathematics for all to 18*.

At the start of the millennium, Curriculum 2000 introduced new A levels and the negative impact on mathematics uptake was dramatic due to the difficulty of the new AS. Over the last ten years there has been sustained growth in the numbers of young people completing A-level but it remains the case that around 200,000 young people in each cohort stop learning mathematics at age 16.

Most students studying AS/A level Mathematics have a GCSE A* or A grade so the qualification is considered to be for the 'clever core'². The rising participation pattern raises the question of whether A level Mathematics now has broader appeal. For those not choosing AS/A level, new Core Maths qualifications are available, though whether they will achieve mass uptake remains to be seen.

The research

The annual reporting of A level entries is not easy to interpret because it is unclear who is being counted and whether results are the final ones achieved by students. We adopted a cohort-tracking approach with the aim of understand the changing flow of young people through 14-19 mathematics education.

The research analysed full-year cohorts of 16-year-old students in England from the Department for Education's National Pupil Database from 2004 to 2010, a total of just over 4.5 million young people. Each group of GCSE students was tracked over the following three years to ascertain whether they completed various AS/A level Mathematics qualifications.

Earlier research shows that the best predictor of whether someone completes AS/A level Mathematics is their GCSE grade but other factors also play a part (e.g. gender, socio-economic status and ethnicity). In this research each GCSE grade sub-group was considered to see what has changed over the period in question

Key findings

- ◆ GCSE mathematics grades are the best indicator of whether a student will choose AS/A level Mathematics. The new grade structures (1-9) might have an adverse affect on students' self-perceptions and thereby their choice of A levels.
- ◆ The GCSE cohorts from 2004 to 2010 saw the numbers of students with A* and A grades rise by 34% and 56% respectively. This inflation is the key driver of growth in AS/A level Mathematics uptake.
- ◆ Of those awarded A level Mathematics from the 2010 GCSE cohort, over 90% had attained an A* or A grade at GCSE.

¹Hodgen, J., Pepper, D., Sturman, L., & Ruddock, G. (2010). Is the UK an Outlier? London: Nuffield Foundation.

²Matthews, A., & Pepper, D. (2007). Evaluation of Participation in A level Mathematics: final report. London: QCA

For information contact:

Professor Andrew Noyes, University of Nottingham, NG8 1BB

Email: Andrew.Noyes@nottingham.ac.uk

Key findings (continued)

- ◆ Only around 1% of GCSE Mathematics grade C students completed AS/A level Mathematics.
- ◆ The proportion of GCSE Mathematics grade B students attaining AS/A level Mathematics has increased from 15 to 18%. This is all explained by increases at AS level so the decoupling of AS and A level is likely to have an adverse effect on this figure.
- ◆ Only GCSE A* students have increased their likelihood of completing A-level Mathematics and/or Further Mathematics.

The research shows that choice patterns have not changed that much over this period, except for the most able students. The vast majority of B and C grade GCSE students do not take A-level Mathematics.

In his March 2016 budget, George Osborne committed to "...ensure the future workforce is skilled and competitive, including looking at the case and feasibility for more or all students continuing to study maths to 18, in the longer-term."

Implications for policy

The percentages of students completing AS/A level mathematics, by GCSE grade, has not changed significantly over the period in question, with some exceptions. The increase in A level Mathematics numbers is driven by the growing proportion of A* and A GCSE grades.

The reformed GCSE Mathematics is being taught for the first time and includes a new grading structure (1-9). One of the goals of the reforms is to make the GCSE more demanding. This could produce unintended consequences. If students achieve less than the top grades in Mathematics alongside strong grades in other subjects, A level uptake will reduce.

Secondly, the decoupling of AS and A levels is likely to have a negative impact on the growth in GCSE A and B grade students completing AS Mathematics. Careful monitoring of the impact of GCSE and A level reforms is needed.

There remains an outstanding need for the new Core Maths qualification to provide attractive mathematics pathways for the GCSE B and C grade students who are no more likely to complete A level Mathematics now than they were 10 years ago.

Full details of the research can be obtained at the link below or from the author

Noyes, A. and Adkins, M. (2016). Reconsidering the rise in A level mathematics participation. *Teaching Mathematics and its Applications*. 35(1), 1-13. DOI: 10.1093/teamat/hrv016

Rethinking the Value of Advanced Mathematics Participation (REVAMP)

The REVAMP project was funded by the Nuffield Foundation and considers the value of A level Mathematics participation from several viewpoints. Five strands of work address the following:

- ◆ The economic return to A-level Mathematics (*Research summary 1*);
- ◆ The changing nature of A-level Mathematics participation over time (*Summary 2*);
- ◆ The relationship between A-level Mathematics and outcomes in a range of science and social science degree programmes (*Summary 3*);
- ◆ The policy trajectory of 14-19 mathematics education; and,
- ◆ Attitudes to post-16 study of advanced mathematics amongst 17-year-olds in England (*Summary 4*).

For more details visit <http://www.nottingham.ac.uk/research/groups/crme/projects/revamp.aspx>.

This project was funded by the Nuffield Foundation but the views expressed are those of the authors and not necessarily those of the Foundation.

