



Mathematics after 16: state of play, challenges, and ways ahead

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Aims of the presentation

- Outline current state of play in post-16 maths
- Identify challenges (and some government responses to them)
- Suggest collective areas and ideas for further work

Is the UK an outlier? Participation in mathematics post-16

Proportion of post-16 students studying *any* mathematics

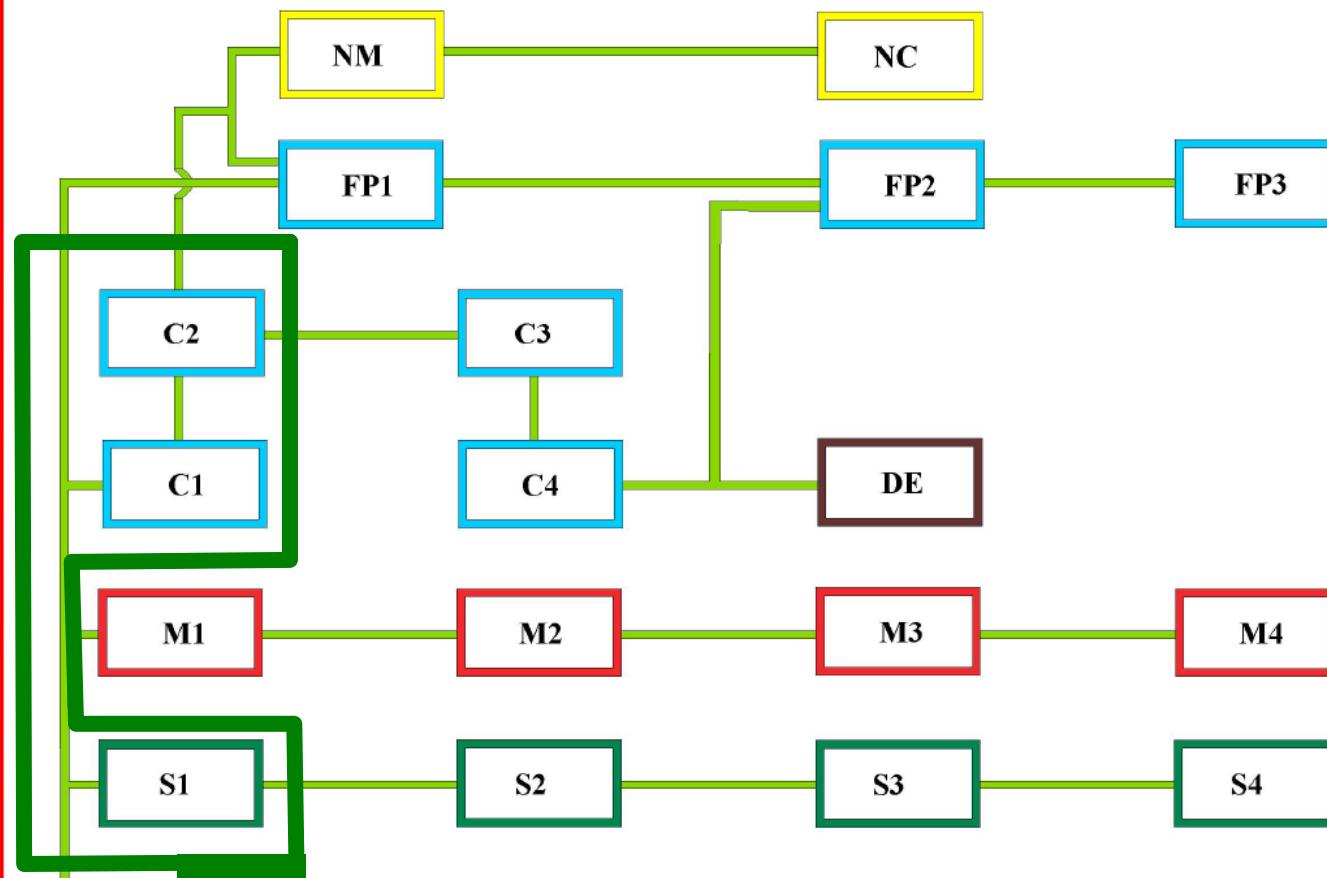
All (95-100%)	Czech Republic, Estonia, Finland, Japan, Korea, Russia, Sweden, Taiwan
Most (81-94%)	Canada (BC), France, Germany, Hungary, Ireland, USA (Mass)
Many (51-80%)	Australia (NSW), Netherlands, New Zealand, Singapore
Some (21-50%)	Hong Kong, Spain, Scotland
Few (6-20%)	England, Wales, Northern Ireland

Proportion of post-16 students studying advanced mathematics

High (31-100%)	Japan, Taiwan, Korea, New Zealand, Singapore
Medium (16-30%)	Australia (NSW), Estonia, Finland, France, Hong Kong, Scotland, Sweden, USA (Mass)
Low (0-15%)	England, Northern Ireland, Wales, Ireland, Germany, Netherlands, Russia, Spain

Data from *Is the UK an outlier? An international comparison of upper secondary mathematics*, Nuffield Foundation, 2010.

MEI Structured Mathematics



- Pure mathematics
 - Mechanics
 - Statistics
 - Decision mathematics
 - Numerical analysis
 - Differential Equations
- FSMQs Additional Mathematics, Foundation of Advanced Mathematics

Current Mathematics

A level reform

- Delay for maths and further maths: teaching from September 2016
- Modular to linear
- ALCAB
- Consultation with awarding bodies
- Cambridge Mathematics Education Project

Reform of GCSE Mathematics

- More ‘demanding’ in terms of content, volume and assessment
- Change in grading and retention of two tiers (Foundation and Higher)
- Double weighting for maths on performance measures
- Changes to policies on re-takes pre- and post-16

Core mathematics: the basics and some comments

- Who is it aimed at?
- What will it involve?
- How will it be assessed, graded and accredited?
- Who will teach it?
- How is it being developed?
- What is the timescale?

A level reform: Maths in other subjects (for teaching starting September 2015)

Minimum weightings for mathematical skills in a range of A level assessments

At least 10%	Biology, Business, Computing, Geography, Psychology
At least 20%	Economics (with 15% for AS Economics)
At least 40%	Physics

Mathematics teaching capacity

Recommendation 16: Research, including modelling scenarios, is necessary to understand how many more mathematics teachers are needed, the extent to which existing teachers can be retrained, whether former teachers can be attracted back, and how any potential negative effects on lower secondary or existing advanced mathematics routes can be avoided.

From *Towards universal participation in post-16 mathematics: lessons from high-performing countries* (Nuffield Foundation, 2013)



'Extra-curricular' approaches to developing quantitative skills

- Nuffield Research Placements
- Authentic STEM-related projects
- Successfully targeting disadvantaged students
- Maths-, statistics- and computing-related placements e.g. around use of QM in social sciences and industry



Research into policy and practice

- Quantitative approaches and skills across all subjects
- Transitions into and beyond post-16 maths
- Use of technology
- Implications for the school and college workforce
- Gender dimensions