



KING'S
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Is the UK an outlier?

An international comparison of upper secondary mathematics education

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Report Launch at the Nuffield Foundation, 13 December 2010

Background

- Compulsory education to 18 by 2015
- Concerns about participation in mathematics post 16
 - Mathematical preparation for nursing, teaching, engineering ...
- Is the UK unusual ...

Caveats and limitations

- Data produced differently and for different purposes
 - Not directly comparable
- Educational systems are culturally different
 - Different meanings of terms, such as vocational
- Upper secondary ***not*** post 16

UK Nations	OECD	Accession	Pacific Rim
England	Australia (New South Wales)	Russian Federation	Hong Kong
Scotland	Canada (British Columbia)		Singapore
Wales	Czech Republic		Taiwan
Northern Ireland	Estonia		
	Finland		
	France		
	Germany		
	Hungary		
	Ireland		
	Japan		
	Korea		
	Netherlands		
	New Zealand		
	Spain		
	Sweden		
	US (Massachus setts)		

	Mean	OECD Ave	Below L1	L5&6
Singapore	562	Above	3.0	35.6
Hong Kong	555		2.6	30.7
Korea	546		1.9	25.5
Taiwan	543		4.2	28.5
Finland	541		1.7	21.6
Japan	529		4.0	20.9
Canada	527		3.1	18.3
Netherlands	526		2.8	19.8
New Zealand	519		5.3	18.9
Australia	514		5.1	16.4
Germany	513		6.4	17.8
Estonia	512		3.0	12.0
Scotland	499	Average	6.2	12.3
France	497		9.5	13.7
Sweden	494		7.5	11.4
Czech Republic	493		7.0	11.7
Northern Ireland	493		6.5	10.3
England	492		6.1	9.9
UK	492		6.2	9.9
Hungary	490		8.1	10.1
Ireland	487	Below	7.3	6.7
USA	487		8.1	9.9
Spain	483		9.1	8.0
Wales	472		8.4	5.0
Russian Federation	468		9.5	5.3
OECD Average	496	-	8.0	12.7

Research questions

Main:

- National policy and structure of mathematics?
- Overall participation rates in mathematics?
- Participation rates within different routes?
- Content and levels of mathematics available?

Additional:

- Drivers for participation (HE, employers...)?
- How is the picture changing over time?

Methodology

- **Stage 1: online searches and country profiles**
www.inca.org.uk
www.eurydice.org
TIMSS 2006 Encyclopaedia
Ministry and agency websites
- **Stage 2: international networks**
- **Stage 3: final country profiles**
- **Stage 4: comparative analysis**

'Fiche methodology'

Upper secondary education

- **Two to four years, between ages 15 and 19**

Outliers: Hungary, Netherlands

- **Optional rather than compulsory**

Exceptions: Germany, Hungary, Netherlands

- **Optional yet the norm**

Australia- NSW, Czech, Estonia, Finland, Korea, Taiwan

Mathematics is compulsory in...

- **All of general and all of vocational education (8)**
Czech, Estonia, Finland, Japan, Korea, Russia, Sweden, Taiwan
- **All of general and some of vocational (5)**
Canada- BC, Germany, Hong Kong, Hungary, USA- Mass.
- **Some of general and all of vocational (1)**
France
- **Some of general and some of vocational (3)**
Netherlands, Spain, Singapore
- **None of general and some of vocational (6+1)**
Australia- NSW, Ireland, England, Scotland, Wales, Northern Ireland + NZ
- **None of general and none of vocational (0)**
None

Upper secondary education

In summary, mathematics is:

...compulsory for all students in upper secondary **general** education in 13 systems

...compulsory for all students in upper secondary **vocational** education in 9 systems

...out of 24 education systems.

What else is compulsory?

- **First language (16)**

Australia- NSW, Canada- BC, Czech, Estonia, Finland, Germany, Hong Kong, Hungary, Japan, Korea, Netherlands, Russia, Spain, Sweden, Taiwan, USA- Mass

- **Second language (15)**

Canada- BC, Czech, Estonia, Finland, France, Germany, Hong Kong, Hungary, Korea, Netherlands, Russia, Spain, Sweden, Taiwan, USA- Mass

- **Science (11)**

Canada- BC, Estonia, Finland, Germany, Hungary, Japan, Korea, Russia, Sweden, Taiwan, USA- Mass

- **One or more others subjects (14)**

Canada- BC, Estonia, Finland, Hong Kong, Hungary, Japan, Korea, Netherlands, Russia, Singapore, Spain, Sweden, Taiwan, USA- Mass

- **Mathematics (15)**

Canada- BC, Czech, Estonia, Finland, France, Germany, Hong Kong, Hungary, Japan, Korea, Russia, Singapore, Sweden, Taiwan, USA- Mass

- **Free choice (5+1)**

England, Scotland, Wales, Northern Ireland, Ireland + New Zealand

What else is compulsory

In addition to mathematics:

- First language is almost always compulsory
- A second language is usually compulsory
- Science is often compulsory
- Usually one or more other subjects too.

...Mathematics is never the only compulsory subject.

Structure

Three broad structures:

- Pathways
- Free choice
- Limited choice

England, Wales and Northern Ireland are unusual in the extent of “free choice”

Content

- Basic mathematics
 - Available in most countries
 - Most introducing mathematical literacy
- Advanced mathematics
 - Pure content broadly similar
 - England, Wales & Northern Ireland unusual in free choice for applied options

Participation in *some* maths

All (95-100%)	Czech Republic; Estonia; Finland; Japan; Korea; Russian Federation; 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; Scotland; Spain; UK
Few (6-20%)	England; N Ireland; Wales

Factors ...

- Compulsory
- Availability
 - An option between basic and advanced
- Requirement for HE and employment
- Structure of choices
- Advice, Information and Guidance

Advanced Maths Participation

High (31-100%)	Japan (85%); Taiwan (>70%)
	Korea; New Zealand
	Singapore
Medium (16-30%)	Australia (NSW); Estonia; Finland; France; Hong Kong; Scotland; Sweden; USA (Mass)
Low (0-15%)	England; Germany; Ireland; N Ireland; Spain; Wales; UK; Netherlands
	Russian Federation

Factors ...

- High attainment
- Advice, Information and Guidance
 - Singapore's contrasting subject at A-level
 - “Strategic” choices not to do maths in the UK
- Structure of choice
 - Scotland: breadth and narrower range of choices
 - New Zealand: Mathematics with statistics

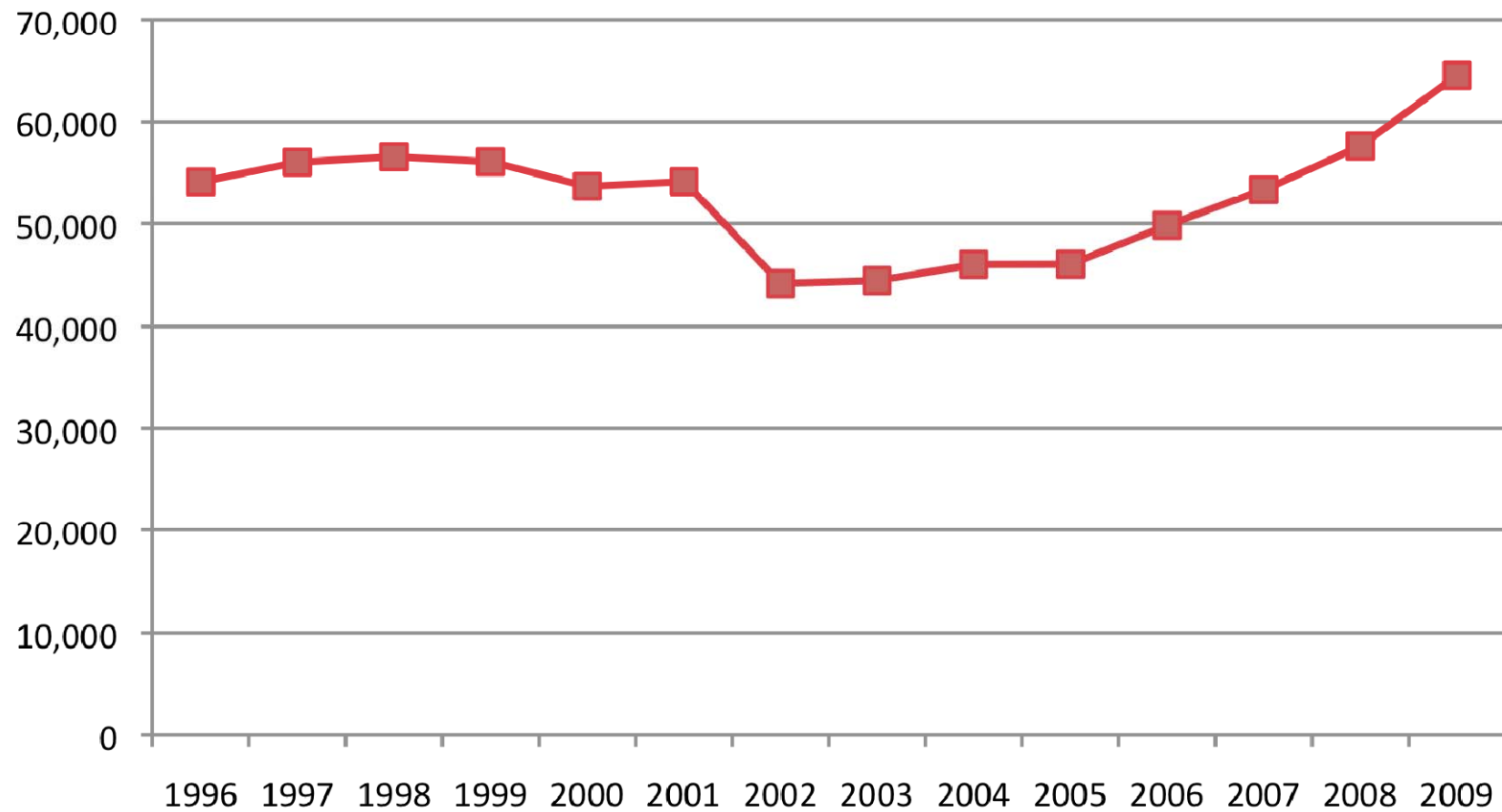
The UK is unusual ...

... particularly in England, Wales, N Ireland

Recommendations

- Review of post-16 mathematics policy
- Develop alternative models
 - Free Standing Mathematics Qualifications
- Further research
 - Scotland & the UK nations
 - Policy in near and far neighbours

Total Mathematics A-level Entries



Maths A-level Entries as a % of A-level Entries, 18 year olds, E&T cohort

