



# The link between East Asian ‘mastery’ teaching methods and English children’s mathematics skills



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## ABSTRACT

A small group of high-performing East Asian economies dominate the top of the Programme for International Student Assessment (PISA) rankings. Although there are many possible explanations for this, East Asian teaching methods and curriculum design are two factors to have particularly caught policymakers’ attention. Yet there is currently little evidence as to whether any particular East Asian teaching method actually represents an improvement over the status quo in England, and whether such methods can be successfully introduced into Western education systems. This paper provides new evidence on this issue by presenting results from two clustered Randomised Controlled Trials (RCT’s), where a Singaporean inspired ‘mastery’ approach to teaching mathematics was introduced into a selection of England’s primary and secondary schools. We find evidence of a modest, positive treatment effect that comes at a relatively low per-pupil cost.

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## 1. Introduction

The Programme for International Student Assessment (PISA) is a major cross-national study of school children’s academic achievement. Since its inception in 2000, its ranking of the world’s education systems has drawn the attention of academics, educationalists, journalists and policymakers alike. A small group of high-performing East Asian economies (e.g. Singapore, Japan, Hong Kong, South Korea) consistently dominate the top of these international ‘league tables’. This is particularly true in mathematics, where children from such countries are, on average, more than one school year ahead of their Western peers. Consequently, two of the most frequently asked questions by education policymakers today are ‘*what drives East Asian educational success*’ and ‘*what can we do to catch up?*’

There are, of course, several explanations as to why PISA test scores differ between countries in the East and the West. This point is illustrated in [Table 1](#), which compares various aspects of the education systems in England and Singapore (two countries of particular interest within this paper). A number of substantial differences exist, including school resources, provision of out-of-school tuition and school discipline. Yet, despite these many differences, it is teaching methods and design of the curriculum that has particularly caught policymakers’ attention. For instance, to inform upcoming changes to the mathematics curriculum in England, the [Department for Education \(2012\)](#) conducted an extensive review of the mathematics syllabus in a number of East Asian countries. Similarly, a selection of British officials have visited East Asian economies to observe their teaching practices ([Department for Education, 2014a](#)), under the presumption that this is driving their educational success. Indeed, as Liz Truss (former Under Secretary of State for Education in England) noted of one such visit:

*‘this represents a real opportunity for us to see at first hand the **teaching methods** that have enabled their*

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**Table 1**  
A comparison of England and Singapore's education systems.

	England	Singapore
Average PISA test scores		
Mathematics (mean)	495	573
Reading (mean)	500	542
Science (mean)	516	551
Average class size (lower secondary school)		
Mean	24	36
Pupil: Teacher ratio		
Mean	13.2	13.7
% of GDP spent on education by government		
Percent	5.8	2.9
Average weekly working hours of teachers		
Total time at work (mean)	46	48
Total time actually teaching	20	17
Hours spent on out-of-school tuition per week		
Mean (median) hours	8.5 (6)	16 (14)
Headteachers reporting inadequate school resources		
Percent	78	35
Do teachers believe profession valued by society?		
Percent	35	68
Proportion of class time spent on maintaining discipline		
Percent	11	18
Teacher report of noise / disruption in classroom		
% agree that noise / disruption is a problem	22	36
Percent teachers who give different work to children of different ability		
Percent	63	21
Children's 'work ethic' in mathematics		
Standardised scale (mean)	-0.01	0.08
Children's 'perseverance' in mathematics tasks		
Standardised scale (mean)	-0.02	0.17
Children's 'motivation' in mathematics		
Standardised scale (mean)	-0.01	0.08

Source: Figures based upon PISA 2012, TALIS 2013 (Micklewright et al., 2014) and World Bank (<http://data.worldbank.org/indicator/SE.XPD.TOTL.GD.ZS>) data.

*young people to achieve so well in maths.* [Emphasis our own].

As a consequence of such visits, the Department for Education has now set-up an exchange programme, where teachers from East Asia are being flown into England to demonstrate and apply their teaching methods within this country's schools (see [Department for Education, 2014b](#)). Thus, despite difficulties in even defining the concept of an 'East Asian teaching method', policymakers continue to believe this to be a key reason why mathematics achievement is so much greater in the East than the West.

Yet simplistic attempts to 'borrow policy' from other countries is problematic (Crossley & Watson, 2009). Two particular issues stand out. The first is causality. There are significant cultural, economic and historic differences between countries, as well as a number of differences in how the education system is designed and managed (see [Table 1](#)). It is therefore almost impossible to tell from studies like PISA what is leading to the cross-national variation in children's test scores. Indeed, there is very little evidence that East Asian teaching methods, however defined, are actually superior to those currently being used in England's (or other Western countries) schools. Second, even if some East Asian teaching methods are potentially more effective than those used in England, one simply does not know whether they can be successfully implemented within the English, or, indeed, other, educational system.

This paper does not therefore attempt to determine whether so called 'East Asian teaching methods' can improve children's achievement in England, especially since it is not even clear what these methods are. Instead this paper provides (to our knowledge) the first evaluation of how introducing a specific teaching approach, inspired by current practise in Singapore, influences achievement within England's schools. This is done via estimation of the causal effect of the 'Maths Mastery' teaching programme after it had been implemented within a selection of England's primary and secondary schools for one academic year. This particular programme is based upon approaches to teaching mathematics in Singapore (ranked 2nd out of 65 economies in the PISA 2012 mathematics rankings) and, potentially at least, represents a radical change to standard practise in England (see [Guskey, 2010](#)). In particular, fewer topics are covered in greater depth, with every child expected to reach a certain level (i.e. to 'master the curriculum') before the class progresses on to the next part of the syllabus together. The notion that Singaporean teachers place more emphasis on whole class mastery of concepts is indeed supported by the Teaching and Learning International Survey (Micklewright et al., 2014). This survey indicates that, whereas three-in-five teachers in England differentiate their lessons for pupils with different abilities, only one in five Singaporean teachers do (also see [Table 1](#)). Greater emphasis is also placed upon children's problem solving skills, with this complemented

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