

### **Can we learn anything from China about Education in Mathematics?**

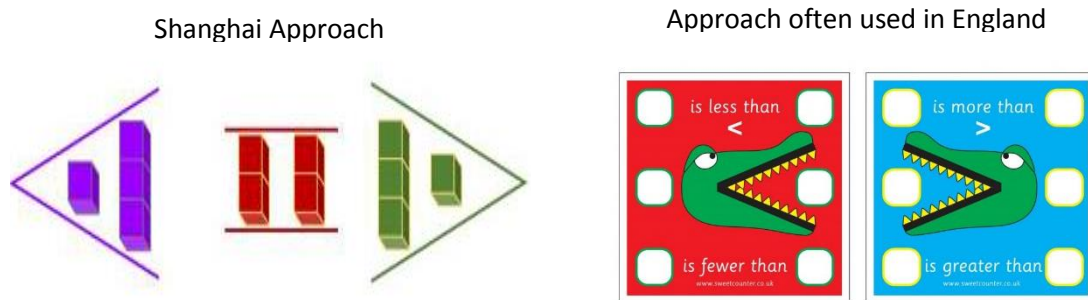
We cannot deny that some areas of South East Asia do better than the UK in international mathematics tests. Tests, including TIMSS (Trends in International Mathematics and Science Study) and PISA (Programme for International Student Assessment) demonstrate that Shanghai and Singapore continue to hold top ranking positions, while children in England appear to be falling behind. The financial costs to society of an innumerate population are considerable, 'with one quarter of national GDP resulting from the mathematics based financial services sector' Williams (2008:32). Indeed, those of us teaching in Higher and Further Education settings may also be aware of a decline in our students' mathematical abilities, with evidence to suggest that some universities are "marginalising the mathematical content" on degree courses due to students' lack of basic mathematics, alongside deemphasizing the level of mathematics needed to study a particular subject for fear of decreasing applications, (Norris 2012:11). The knock on effect of this could be to make our graduates less employable, and us as a nation less able to keep pace and compete globally. The Confederation of British Industry reports that only 30% of employers are very satisfied with numeracy skills (CBI, 2009). So, with such high stakes, it is important to examine what areas of South East Asia are doing to reap such outstanding results. What could we learn? And what part does culture play in influencing success?

Our Government is presently keen to explore practices in Shanghai which could raise standards in the UK. In 2013 The Department for Education, co-ordinated by the National Centre for Excellence in Mathematics (NCETM), funded the creation of 34 National Maths Hubs charged with leading improvement in their local schools. These hubs bring together professionals in collaborative national networks, locally led by an outstanding school or college. In 2014/15 a key focus has been on a 'National Shanghai Exchange Programme', with representatives from each Hub visiting Shanghai, followed by Shanghai teachers visiting the UK to teach here.

In spring 2015 I observed two such teachers from Shanghai, and yes there were some clear differences. In all honesty, I had held several pre-conceived ideas and many of these were actually dispelled. I witnessed a different approach from our often used pedagogical structure of '*first the teacher will explain and then the children will do*'. Instead, what came to mind was the 'Chuckles Brothers' phrase of '*to me to you!*' The teacher did not let go of the children for longer than 10 minutes – the learning went back and forth with regular interactive assessment of learning before progressing forward.

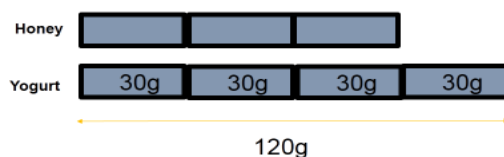
This made me reflect that when our children are left to work independently for 40 minutes or more during a lesson, whole class assessment of learning is more likely to be summative than formative. There was also a focus throughout on engaging children in high quality, explanatory and exploratory talk; a common phrase used by these teachers is *'the answer is only the beginning'* (Schleppenbach et al 2007).

A key aspect of their pedagogical approach, which will be controversial in the UK, is the lack of differentiation. Their pedagogical practice focusses on keeping the class together through a 'Mastery Curriculum' where depth of understanding replaces accelerated learning. Mastery learning is a phrase coined by Benjamin Bloom in the 1970s to describe the mastering of a concept before moving on; this involves deeper understanding, flexibility, application and synthesis, and aims to reduce the achievement gaps often seen between students (Stevenson et al. 1992). Progressive examples are carefully chosen by mathematics experts **at a national level**, to enable students to reason and generalise. Professor David Reynolds (2014) suggests that in the UK our more random approach to examples, particularly in text books, often demonstrates one way of thinking, with numerous examples that lack progression, reasoning and conceptual understanding. In Shanghai there is consistent focus on conceptual understanding, with clear models and images. An example of this is their approach to equality signs ...not a 'hungry crocodile' to be seen!



Other Chinese representations include 'the bar model' (Hoven et al 2007). Children become familiar with nationally consistent representation, on which the concepts themselves get progressively more difficult each year. Approaches to modelling in the UK tend to be more ad hoc, and less progressive and cohesive across the WHOLE school.

Ratio using the Bar Model



A herbal skin remedy uses honey and yoghurt in the ratio 3 : 4

How much honey is needed to mix with 120 g of yoghurt?

25

Perhaps at this point we should consider that in the 1960s these areas of South East Asia were not doing at all well in the teaching of mathematics. There followed a national comprehensive review of the curriculum, focussing on the work of educational theorists including Bruner, Skemp, Viagotsky and Dienes. So it appears that much of the knowledge that we ourselves value in education is actually integrated within their curriculum – we in turn have had a more random approach to embedding this theory into our own practice.

So should we just import their practices wholesale? Before we consider this, we will need to reflect on some key difference between us and China. In China the teacher training is completely government controlled. Children are taught by maths specialist in primary schools, a huge shift from general UK policy. Crucially this allows teachers to develop their subject knowledge beyond that of generalist primary teachers in the UK, giving all children a consistently strong early start (Merttens 2015). Their teacher training takes up to 5 years; in stark contrast we appear to be moving towards an era of devaluing the profession, with the introduction of more non-qualified teachers. The NUT reports that in 2013 13% of teachers in Free Schools were unqualified.

Teachers in China are also given access to regular mandatory high quality CPD, including sabbaticals. They generally **only teach two or three lessons each day** – crucially allowing them to quickly mark children's work and in the same afternoon pick up on those children who have not fully understood before moving on the next day; a key reason why differentiation is not such an issue. There has also been curriculum stability over many decades – content is honed at a national level by mathematics specialist, with an eye on perfecting rather than wholesale change – an approach much longed for by the teaching profession in England.

It must also be remembered that the children's school day is much longer, regularly followed by home tutoring. Many children have tuition before they begin formal school at 7, and so the wide gap we experience in Foundation Stage is not present. And in terms of student well-being, there

is evidence that educational pressures could be part of the reason for high suicide rates among the young in China (Chelala 2014; The Guardian 2015). Added to this, as a nation we should not aspire to uniformity over creativity.

It is clearly important that our government does not 'cherry pick' only the parts that will bring excessive pressure on our teachers and children, and involve less expenditure over real investment in change. That said, with intelligent interpretation at a national level, we could be at the cusp of some beneficial changes. With the government's financial support, more stability, a national programme of *continued* CPD and some reductions in content in our National Curriculum to allow for deeper learning, we could adapt the best of their practices and combine them with the **best of ours** to create a more effective and dynamic curriculum. Over time, we might then also see an improvement in the mathematical ability of our young adults entering higher and further education, with increased opportunities for success in a 21<sup>st</sup> century global economy.

Wordage 1248

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