

# England-China Teacher Exchange

## Background

This document is a summary of the initial reports from the primary schools that hosted Shanghai teachers (the Lead Primary Schools, LPS) in 2014-15. Comments in text boxes are quotations taken from the schools' reports.

71 teachers from the Lead Primary Schools (one or two schools from each of the then 32 Maths Hubs) visited Shanghai from 19 September to 4 October 2014. Most of their time was spent at the Shanghai primary schools participating in the exchange; there were also lectures and presentations at Shanghai Normal University, the lead teacher training university in the city.

21 schools then hosted 29 Shanghai teachers in wave 1 (3 to 28 November 2014), and 26 schools hosted 30 teachers and 1 researcher in wave 2 (23 February to 20 March 2015). The schools were asked to report under the five headings that structure this document. These reports were submitted immediately after the departure of the Shanghai teachers; they therefore capture the LPSs' "first thoughts". Schools are submitting a second report in June 2015.

## 1. Teaching for Mastery

### “What Went Well”

Schools have reported that the lessons taught by the Shanghai teachers have generally been very well received by the children, who have responded very positively to the high levels of challenge. This has led not only to improved attainment and motivation but also to improved attitude to the subject, the willingness to ‘have a go’, with a number of schools saying that this has been particularly noticeable in children who hitherto have been low attainers. A key factor mentioned by many schools in the improved attainment was the strong focus given to expecting the children to explain their reasoning (‘the answer is only the beginning’), to use correct terminology and mathematical vocabulary, and to give answers in full sentences. The strong use of procedural and conceptual variation in the lessons by the Shanghai teachers is also seen as a key element to the success of the approach, as is the explicit teaching about misconceptions and critical points. One school reported that this approach revealed that some high attaining children had relatively weak conceptual understanding.

Many schools referred to the successful use of high quality pictorial representations as a bridge between the concrete and the abstract, and of the value of not only moving from the concrete to the abstract but also then of going back from the abstract to the pictorial and indeed to the concrete. This linked to comments made about helping the children develop secure conceptual understanding, and how this in turn has helped teachers to focus much more on **deepening** learning, not on **accelerating** it. The comments from schools show clearly that teachers are rapidly (and enthusiastically) developing their understanding of the nature of teaching for mastery.

The time available for teachers to discuss the designing of lessons with the Shanghai teachers has helped them develop good understanding of the pedagogical approaches being used, and also has had a positive impact on their subject knowledge: in order to ensure progression within a lesson, the teachers have had to think carefully about the particular mathematical concept and how it relates to other concepts, for example the relationship between division and fractions, or between division and repeated subtraction.

*“Discussion revealed that in Shanghai teachers deliberately plan for confusion. Kris explained, ‘A good lesson doesn’t lead the children smoothly through the steps. In a good lesson the children need to be confused, then have a discussion/debate, then see the link, then understanding comes. If all hands are up it’s not good because they haven’t learnt anything new. The cycle should be: confused/got it/confused again/got it.’ “*

*“One teacher pointed out, ‘It seems the English way is to move on when the first person gets it but in China they don’t move on until they’ve all got it!’ “*

*“We now understand to a far greater degree that we need to use the opportunity that the new curriculum has provided us (less content) to spend more time on a skill and find ways to approach it from different angles in order to give students the opportunity to really master it and build on this skill in the future.”*

### **“Even Better If”**

Very few problems were identified by schools, and those that were seem to be mainly transitional problems. One school felt that the higher attaining children sometimes found the work too easy and that this was demotivating, but the school recognised this may be that the Shanghai teacher had not had time to get to know the attainment range. One school identified an issue with using the Shanghai approaches when the attainment range in a class was already very large, while another school identified some challenges using the Shanghai approach with a relatively immature Year 1 class (children who would still be in kindergarten in Shanghai).

### **Next steps**

All the schools have plans for developing the use of the Shanghai approaches, which shows clearly that the schools have found the approaches to be valuable. Schools are identifying ways to spread the approach more widely within their own school, and some have started designing new units of work based on the principles of teaching for mastery learnt from the Shanghai teachers. A number of schools are planning CPD programmes in order to develop teachers’ mathematical subject knowledge. A school which moved away from setting in Year 6 is committed to continuing to do so, while some schools are experimenting with changing the length of mathematics lessons.

Most schools are also identifying ways to work with their wider local networks in order to ‘spread the message’. Schools have, for example:

- organised meetings with local schools at which the Shanghai teachers and the English teachers talked about the project, which has encouraged other schools to consider adopting the Shanghai approach;
- set up or developed local teacher research groups (TRGs) in order to explore the Shanghai approach further;
- used the TRG to evaluate the impact of the Shanghai approach.

Schools are reviewing their calculation policies in order to incorporate conceptual and procedural variation to support deep learning, and to include the explicit teaching of misconceptions, and some are considering developing the use of specialist mathematics teachers.

[Note that the school reports were completed before the NCETM-led Primary Maths Specialist programme was announced; no doubt many of the teachers who have participated in the exchange will want to apply for the PMS role.]

### **Good practice to share**

Schools reported a number of elements to the Shanghai approach which they felt were of value and therefore worth sharing more widely. These include:

- The use of low entry/high ceiling tasks to support the development of conceptual understanding and procedural fluency by all children.

- The focus on helping children to develop their understanding of the patterns and relationships within arithmetic.
- The use of immediate intervention in order to prevent wide gaps in attainment opening up.
- Breaking down carefully the teaching steps and sequence of questioning in a lesson in order to help all develop understanding and fluency.
- Developing activities and tasks for the children that are modelled on the high quality examples of “intelligent practice” seen in the Shanghai textbooks.
- The use of the NCETM observation proformas to help teachers observing lessons get more value from the observation itself, by focusing on the core features of Shanghai pedagogy.
- A decision by one school to have questioning as the main focus of the next round of mathematics observations by the subject leader.
- The increased use of homework to support the development of fluency.

*“A child commented, ‘He made us explain things so many times it stuck in our heads!’ “*

*“Over the course of the two weeks that the Shanghai teachers were teaching, children were anticipating the ‘why’ questions much more and were answering in full sentences, increasingly before the ‘why’ questions was asked.”*

*“Children commented that the approach made them have to stick at the skill until they got it and they felt that this increased their resilience.”*

## 2. Calculation practice and developing number fluency

### “What Went Well”

Schools all felt that the approaches used have led to increased fluency in calculations. A consistent message is that this is a result of the focus on developing conceptual understanding, not just procedural fluency. Some teachers commented that this approach helped them see that they had over-estimated the conceptual understanding of children whose calculation skills were secure at a procedural level. Teachers appreciated the ‘mixed diet’ that the Shanghai teachers gave the children: rote practice, where appropriate, as well as a consistent focus on identifying patterns, for example within times tables in order to develop understanding of the deeper relationships within (and between) the times tables.

*“Due to the small incremental steps of each lesson the pupils began to develop greater understanding and more fluency was beginning to emerge.”*

*“When children calculate beyond single digits, we noted that Shanghai teachers encourage calculation NOT counting, for example use  $3 + 4 = 7$  to calculate  $13 + 4 = 17$ .”*

*“We recognised that conceptual understanding often comes using small numbers so that the focus is clearly on the operation and not the answer. Our pupils (particularly the ‘more able’) often knew ‘what’ but didn’t know ‘why’.”*

*“The short sharp starters which involved recapping calculation practice on skills previously learnt meant that students were constantly using and refreshing their procedures.”*

*“Due to daily chanting of tables the children are becoming more confident.”*

Teachers identified a number of factors that helped to develop conceptual understanding:

- Consistent focus on the idea that the aim is not just procedural accuracy, but also conceptual understanding.
- Consistent focus on expecting children to explain their thinking accurately, and the need both to give children adequate thinking time and to use rich questions to prompt deeper thinking.
- Carefully graduated progression within a lesson, using procedural and conceptual variation.
- Consistent focus on identifying patterns and relationships, for example using doubling and halving with multiplication and division, and using commutativity.
- Use of inverse operations based on known number facts and using “what you know to work out what you don’t know” (e.g.  $20 \times 4 = 80$ , therefore  $21 \times 4 = \dots$ ).
- Teaching addition with subtraction, and multiplication with division.
- The movement from use of pictorial representations to symbolic form and (importantly) back again. For example when using pictures of three cars, each with four wheels, to represent  $3 \times 4$ , asking questions such as “What does the 3 mean, what does the 4 mean?” to get the children to relate the product back to the pictorial representation.

- With young children, teaching  $<$ ,  $>$  and  $=$  before the addition and subtraction symbols.
- Teaching the correct meaning of the  $=$  symbol.
- Deliberately raising misconceptions in lessons, and addressing them immediately.

Teachers consistently reported that these approaches led to children developing greater confidence, and as a result higher motivation. The need to think about patterns and relationships, and to develop very careful progression within a lesson, has also led to improved teacher subject knowledge. One teacher commented that the approach has helped her develop greater clarity about the core learning objective for a lesson, and ensure that activities are consistently aligned to this.

### “Even Better If”

One school reported that some children with special educational needs did not benefit from some of the more competitive elements of learning number facts, while some high attaining children who had already successfully learned times tables found it hard to return to developing conceptual understanding of the underlying relationships. One school noted that the Shanghai teachers’ interpretation of  $2 \times 3$  as “2 groups of 3” is not consistent with existing local authority guidance that  $2 \times 3$  means 2 multiplied by 3, hence “3 groups of 2”.

### Next steps

Schools are clearly keen to develop the pedagogical approaches that the Shanghai teachers have been using, and to develop these as whole school approaches. They recognise that developing teachers’ understanding of the progression needed within lessons is a key part of this, and some are exploring ways to continue shared lesson designing to support this. A number of schools are planning a specific whole school focus in order to raise the profile of calculation. Many schools are starting to revise their calculation policies, with one commenting that they want to embed the ethos that the goal is to understand, not just to learn, calculation skills. They see that for this to happen more time needs to be given in lessons to teaching the concepts that underpin the calculation, and for the children to have more opportunities to develop this understanding before moving on to more complex calculations of the same type, or more complex word problems. Another has identified the need to incorporate opportunities for children to talk about patterns in all lessons, and to be helped to identify effective calculation methods.

*“More work needs to be done with KS1 pupils so fluency is embedded earlier and teachers are not moving pupils on too soon and before pupils have the basic understanding consolidated.”*

*“We will be having a whole school push on completely securing the times tables.”*

*“We are beginning to develop some ‘non-negotiables’ for each year group regarding number facts.”*

### Good practice to share

Key messages for other schools are:

- Fluency grows from conceptual understanding, which in turn develops from time spent identifying patterns and relationships and discussing and justifying mathematical reasoning.
- Another significant element is incorporating carefully designed progression within each lesson.
- Fluency is successfully supported by regular, daily skills practice to build up rapid and accurate recall.
- Schools need to revise calculation policies and information for parents to take account of the different approaches being used.

### 3. Lesson design

#### “What Went Well”

It is very clear that all the schools have been very enthusiastic about the lesson design approach used by the Shanghai teachers. The English teachers have worked in a variety of ways to develop their understanding of this approach and hence to begin to embed it in their own teaching. Schools have found it valuable to do joint lesson designing with the Shanghai teachers in order to get a real insight into the thought processes of the Shanghai teachers, and they have valued the way that each lesson is reviewed straight away. This then informs the lesson design for the next day, thus ensuring that formative assessment is embedded in the design.

*“Every example/image is carefully selected for a reason – each one challenging the pupils to move forward with their understanding.”*

*“The progression through the examples has been key.”*

One school took a carefully thought through approach to the way they observed the Shanghai teachers teaching in order to develop understanding of the approaches and the overall structure of a lesson. Questions they developed to help make their observations purposeful were:

- How is the concept represented in concrete, pictorial and symbolic terms?
- How are questions such as “What’s the same, what’s different?” and “What do you notice?” used?
- How are children asked to compare and contrast using  $<$ ,  $>$  and  $=$ ?
- Why have the questions/examples been chosen?
- How are misconceptions addressed?
- How does questioning go past ‘what’s the answer?’ to develop fluency and reasoning, for example use of missing box problems?
- Is the content and activities more or less difficult than the previous phase?
- What key information stays on the board?

The use of high quality visual representations was mentioned by several schools as a key factor in the success of the approach. One school commented that it helps the children “see the maths before the abstract concept is introduced”. With key information remaining on the board, children are developing their understanding that they can use this as a resource, and this is encouraging them to develop resilience and independence as learners.

Schools reported that the expectation that children will explain their reasoning using mathematical vocabulary accurately has contributed to enhanced conceptual understanding, and that this in turn has resulted in higher levels of motivation and engagement amongst the children. The focus on consistently addressing misconceptions is also seen as a key factor in the success of the lesson design approach. Some schools said that the impact on children who had been low attaining was particularly striking, with these children now proud that they are achieving at a comparable level to their peers. One school said that the children themselves said they like working in mixed attainment groups, and that the children enjoyed

being able to help each other; several schools said that the children like having their tables in rows during the lessons since this helps them concentrate.

### “Even Better If”

Some schools reported that the Shanghai approach to lesson design and delivery did not always adequately meet the learning needs of children with complex special educational needs, and also that some high attaining children became disengaged by the step by step approach since they had already achieved fluency in the concept. One school is considering integrating small chunks of independent work at intervals throughout the lesson in order to maintain the children’s focus. However, other schools noted that it had been very beneficial for their higher attainers to go deeper for longer rather than be accelerated; one school reported explicitly that high attainers’ conceptual understanding had been shown to be insubstantial and insufficient, but this had hitherto been masked by their procedural fluency.

*“Sometimes for the more able pupils the step by step approach can disengage them as they have already understood. But generally for most of the class, the sequential steps have been beneficial and are a good scaffold.”*

Some schools mentioned the significant resource issues that arise from the Shanghai approach to lesson design, as well as the need for further CPD to help teachers develop their subject knowledge.

One school stated that “the Chinese teaching did not work successfully” in Year 2, but gave no explanation or analysis of this.

### Next steps

All the teachers are considering ways to embed the lesson design approaches in their own teaching, building on their existing strengths, and they are also looking at ways to introduce these approaches more widely in their own schools and across their local networks of schools. Some are considering lesson study approaches to help develop successful wider dissemination. Several schools are revising their approaches and proformas for lesson planning, to capture the Shanghai approach to lesson designing. The desire of all the schools to develop the use of the Shanghai approaches more widely is clear evidence of the positive impact these approaches have been seen to have on children’s learning.

Schools have identified different aspects they want to focus on to start with. For example:

- Explicitly raising and addressing misconceptions
- Use of the children’s work to move learning on
- Use of the children’s work to move learning on
- Develop the use of strong starter hooks for lessons
- Have shorter lessons, reduce differentiation and have higher expectations for all
- Develop the use of conceptual and procedural variation and of small steps in progression within lessons
- Daily number bond practice to develop a deep sense of number

- Reduce the amount of content in medium term plans, in order to focus on key number work, and in the areas where pupils have traditionally struggled to develop secure understanding.

*“As a staff we will consider how small steps in progression and critical points can be incorporated into lesson designing.”*

*“Teachers will not have to write lesson plans. Instead, planning time will be used to produce clear visuals for the lesson.”*

*“A major cultural shift has occurred in our school to call this lesson design rather than lesson planning.”*

### **Good practice to share**

Schools are clear that, for the Shanghai approach to be successfully embedded in practice, teachers need to develop a strong understanding of the underlying rationale, and so the professional development approaches being explored have this at their heart. A key element of this is about establishing the expectation that all the children (or at least the vast majority) will be able to develop understanding of the concepts, and that they have sufficient opportunities to practise in order for this to happen. Another is the way formative assessment is built into lesson design so that lessons build successfully on the children’s prior learning.

The professional development approaches being explored, for example lesson study, recognise that time and collaborative working are needed in order for teachers to change their pedagogical approaches.

## 4. Effective use of high-quality Shanghai textbooks

### “What Went Well”

Response to the use of the text books was overwhelmingly positive, and the teachers have been keen to develop their own resources using the type of approach seen in the Shanghai textbooks, embedding conceptual and procedural variation in their own resources.

Teachers have appreciated the consistent clarity of progression that the textbooks show, the ‘clarity of the pathway through teaching a concept’ as one teacher put it. This has helped them understand the way that procedural variation and conceptual variation are developed in the Shanghai approach. They also recognised the strong way that the visual representations in the text books are then used in the teaching PowerPoints and the way that the same visual representations are used for different purposes. They can see how this has helped the children develop their conceptual and procedural understanding, and helped the children identify key underpinning conceptual connections. One school identified that this has developed from the more open-ended challenges that the children have been working on. Teachers said that the children found the exercises engaging and motivating, and that the children are now more confident about explaining their reasoning. One school commented that while the children were doing less recording than before, this recording was seen as being very effective, while others commented on the way the text books can be used as a powerful aid to lesson designing.

*“The key factor that stood out is how these textbooks supported the lesson. They were not just a mass grouping of questions without care or thought to be handed to the children but a very deliberate progression of examples and questions to support the lesson and children’s learning.”*

*“The intelligent practice has been very successful in presenting students with deepening problems through variation. Staff have seen how it is the quality of practice rather than quantity which is important.”*

### “Even Better If”

Two schools reported that developing their own resources using the approaches seen in the Shanghai textbooks has been hampered by lack of access to the Shanghai textbooks and the ebooks, and by the pressures of teaching a full timetable. They are struggling to find the time needed to develop new resources.

Two other schools said that in any wider development and use of pupil textbooks, it is essential that there is a supporting teacher resource that explains clearly the rationale of the procedural and conceptual variation.

One school said that they felt that in the textbooks the variation could have gone further in order to challenge the highest attaining children.

A small number of schools said that the teachers they hosted did not use, or share with the English teachers, the Shanghai textbooks.

*“Alongside the text book needs also to be a teacher’s guide – which explains why certain examples are important and what to focus on and also some form of interactive presentations – as this is what takes the time in preparing lessons, time that UK teachers don’t have.”*

*“We have begun to design PowerPoint’s and worksheets in the Shanghai style. However without a Shanghai style ‘ebook’ or textbook, coupled with teaching all subjects all day, this is*

### **Next steps**

All the teachers say that they intend to embed the new approaches they have seen more strongly in their own practice, and also to disseminate these more widely in their own schools and across their wider networks of schools. Some are starting to consider ways in which to evaluate the impact of their use. This enthusiasm for further development and use of the approaches shows clearly that the teachers see these approaches as having a positive impact on the children's learning. In particular, the schools all recognise the power of using conceptual and procedural variation in the resources they develop.

### **Good practice to share**

Schools recognise that successful development of the Shanghai approaches requires teachers to have a very good understanding of the rationale of conceptual and procedural variation, and this has significant implications for the budget and time allocated to CPD. They are thinking clearly about ways of working with local networks to spread the ideas embedded within the Shanghai textbooks more widely, and some are starting to consider more formal ways to evaluate the impact of the use of such resources. Schools recognise the value of group lesson designing in order to develop new resources in line with the approaches used in the Shanghai textbooks. Plans for further dissemination of the Shanghai approach are realistic in terms of developing at a sustainable pace.

## 5. Assessment and feedback of class- and homework

### “What Went Well”

Most schools commented very favourably about the use of same day intervention to support the children’s learning. A number of schools specifically said that the children have been enthusiastic about the approach, recognising that it helps them learn successfully. This is having a positive impact on their resilience and independence as learners. One school said that children “now believe that they will make the required progress by the end of the day”.

One school commented that some high attaining children were surprised to be included in an intervention group because of inaccuracies in their working. This has encouraged these children to be more accurate in their work.

Schools commented on the way the Shanghai teachers gave a lot of oral feedback during lessons, picking up on misconceptions quickly and addressing these, while the written feedback on children’s work was often much sparser than the English teachers are accustomed to. But they saw that this quick marking was necessary in order to allow same day intervention to take place.

*“Many visiting teachers commented on how much of each lesson was spent with the pupils talking/explaining and the teacher listening/evaluating their responses. Kris’ questioning enabled him to get a clear understanding of the children’s thinking, which helped him to make decisions about where to take the learning next.”*

*“Children are beginning to see errors as a teaching point without any embarrassment.”*

Many schools referred positively to the way homework has been used to support the Shanghai approach, with short daily homework activities (linked closely to the day’s lesson) introduced in place of longer weekly homework. Schools recognise the way that daily homework contributes to formative assessment and hence to lesson design. Some schools also mentioned that homework has been an effective way to help parents understand the Shanghai approaches.

*Daily homework “has been incredibly successful. It gives pupils an opportunity to practise skills learnt in each lesson and gives parents an insight into what their children are learning. It has also meant that the teacher can do a quick follow up first thing in the morning for those pupils who need extra support.”*

### “Even Better If”

Two schools reported that it was difficult giving enough time to same day intervention. Other curriculum pressures at times made these sessions too short. In one school, children did not reliably complete homework tasks, so they gave children lesson time in which they could

complete them. Some schools have decided to purchase visualisers to enable effective sharing and discussion of children's work during lessons.

*"The Shanghai teachers have met with children who needed extra input in short afternoon sessions. These have been no longer than 15 minutes. The children may have needed longer at times, but pressures of class work meant this wasn't possible."*

### **Next steps**

As with other aspects of Shanghai pedagogy, schools are clearly keen to extend the use of same day intervention, and are considering how to solve the logistical challenges of embedding this in English classrooms – issues of timetabling and staffing – in order to create sustainable change. Schools are also keen to develop the quality of oral feedback given in lessons. Two schools mentioned that they want to maintain the more detailed written feedback that they have been accustomed to giving.

Schools are also very positive about the focus given to addressing misconceptions in lessons, and one school said it wanted to increase opportunities for teachers to share and talk about children's work in order to develop knowledge and understanding of misconceptions.

### **Good practice to share**

The main message here is that the Shanghai approach clearly embeds formative assessment in a rich and successful way. However, schools are being realistic about the challenges of creating sustainable change in their practice.

*"We need to ensure we have the confidence to spend greater time on a concept where needed and not move on just as the children are about to grasp a topic mathematically."*

*"We need not to be afraid to slow down and go over the same concepts rather than just focus on getting through National Curriculum objectives."*

## **Use of tests to measure impact**

Most of the schools used the tests provided by the NCETM before and after the visit of the Shanghai teachers. Most have done detailed question level analysis of the children's responses that will have been a very useful way to reflect on the children's learning. While there is evidence from the post-test of positive impact on learning, the data are not robust enough (e.g. no control group data have been collected) to support wider conclusions.