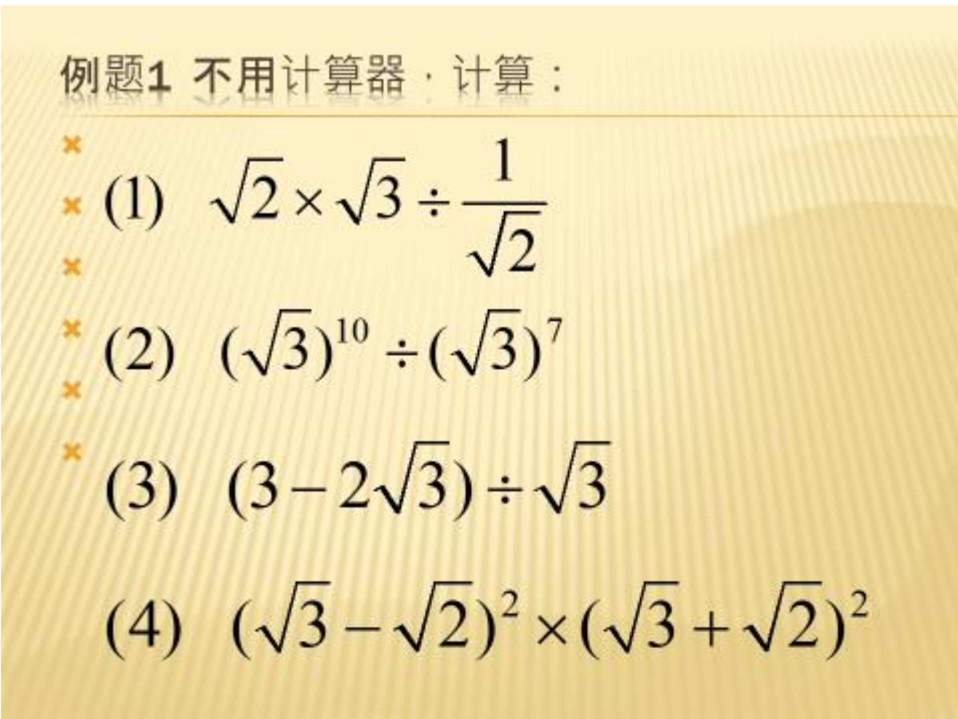
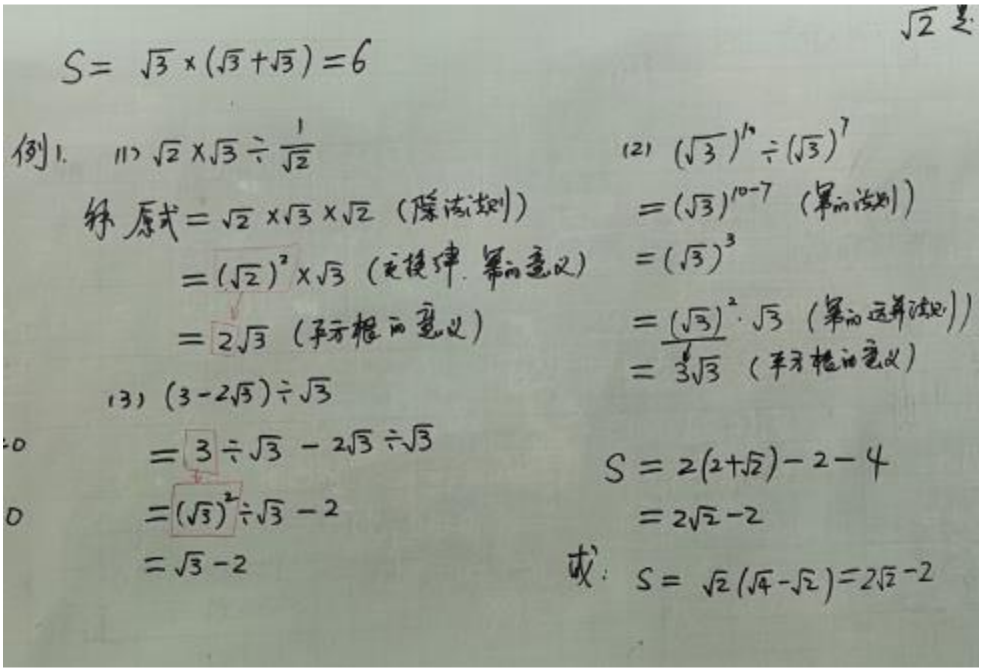
In 2016, I became a cohort 1 Secondary Mastery Specialist through the NCETM programme. As part of my role I was given the opportunity to apply for the England-China Mathematics teacher Exchange. The two-week trip consisted of one day at Shanghai Normal University with a welcome ceremony and a lecture by Professor Gu followed by three days in a secondary school and one day in a primary school each week, as well as a lecture on the middle Sunday. It was an amazing opportunity to observe in practice the inspiration behind the principles of Teaching for Mastery and learn about the Shanghai education system and culture.

In Shanghai, when teaching for mastery, children are encouraged to explore abstract mathematical rules, through hypothesising, visualising, representing and reasoning. Each lesson clearly builds on the previous one; there is very little new knowledge within a lesson and there is clear emphasis on linking old knowledge and new knowledge, which makes connections, develops fluency and encourages retention. Though the lesson is focussed around one small key learning point it does not lack challenge. The marginal gains are made through highly skilled questions and carefully-designed models constantly deepen understanding. Teachers meticulously plan each part of the lesson, and are supported by their peers and leaders to deliver the most effective lessons they can. For example, we observed a lesson on calculating with irrational numbers, the teacher wanted students to understand the similarities between calculating with rational numbers and operations with irrational numbers.

The key focus of the lesson was $\left(\sqrt{a}\right)^2 = a$ when $a \geq 0$

Four key questions of the lesson





Notice how although the lesson is focussed around one key idea, a variety of concepts are incorporated into the examples (commutativity, inverse operations, laws of indices, differences of two squares…), encouraging students to make links and aiding their retention.

In lessons in Shanghai there is a notable emphasis on generalisation, proof and vocabulary. Summaries of the key learning points are made regularly throughout lessons and are articulated by students or read aloud by the class. Students are regularly exposed to proof and algebraic generalisation, and as a result they are able to fluently work between problems. For example, in England we may teach different lessons for different types of percentage problems, such as percentage profit and percentage increase using slightly different methods. However, in Shanghai teachers do not differentiate between the different types of percentage problems. Students work with the generalisation and manipulate it to solve different types of problems, therefore students are remembering one key generalisation instead of slightly different methods for solving lots of different types of percentage problems, thus reducing what students need to remember. I believe this aspect of teaching is key, for me it raised questions about the sequencing of lessons and the curriculum in England, it also links to recent focus in England on core knowledge.

Mathematical vocabulary was a key element of every lesson; specific and technical mathematical vocabulary was used to support teaching and learning. Language was not ‘simplified’ to make learning ‘more accessible’ to learners, rather, high expectations of learning and using mathematical terms correctly was promoted. Students were consistently expected to explain and justify their answers using key vocabulary.

The Teacher Research Groups (TRGs) were used to critically analyse the impact of pedagogy. A culture of shared responsibility and critical evaluation were encouraged to improve pedagogy and ultimately to improve learning. Regular TRGs focused on the learning, for example question design and sequencing. This allowed teachers to critically reflect on their own lessons, classes and year groups to consider what learning must come before and after the lesson they had observed. In doing so, teachers continue to develop coherent lessons and a curriculum which allowed learning to be built upon from the first years to the final years of school.

In summary, although the Shanghai system is different to here in the United Kingdom and some systematic aspects cannot be replicated there is a lot that we can learn from mathematics pedagogy in Shanghai that we could implement and embed into our lessons to improve the learning and outcomes of our students.