Shanghai Maths Teaching

A snapshot of Shanghai, background to maths teaching, some context and my own experience

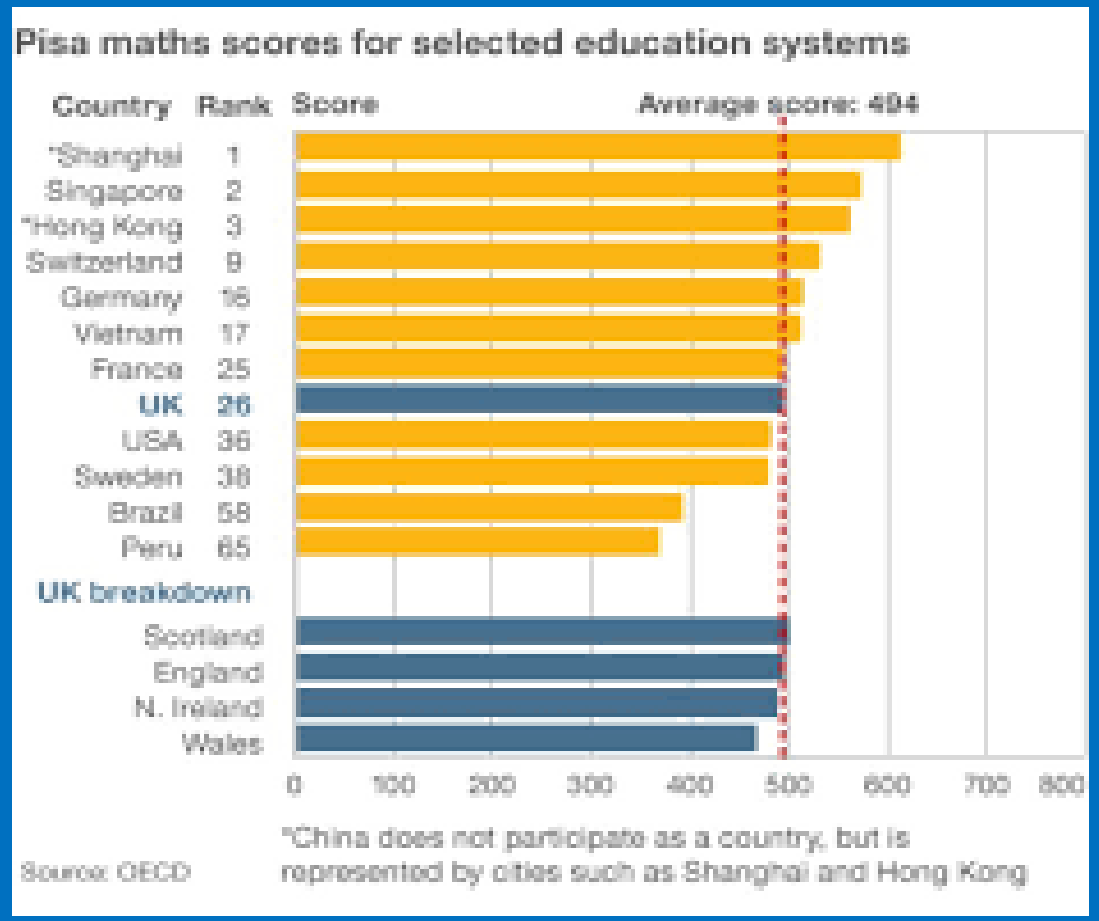
Snapshot of Shanghai

- China's largest city with over 24 million people
- Financial and economic centre of China
- Cosmopolitan and developed
- 20% of the population have a higher education degree
- A leader in many areas of reform including education

Maths Performance in Shanghai

Since 2009 Shanghai has consistently performed well in both PISA and TALIS measures. 2012 results for PISA

- Shanghai = 613
- Singapore = 573
- England = 494



In 2015 Shanghai's results were combined with three other parts of China (Beijing, Jiangsu and Guangdong). The results were not so impressive but still significantly above England (544, whilst England's was 492)

Some Context

- Formal education does not start until Grade 1 (age 6/7)

- Exams at the end of grade 9 (age 14/15). Only Maths, English, Chinese, Physics and Chemistry examined, weighted towards first three.

My Experience in Shanghai

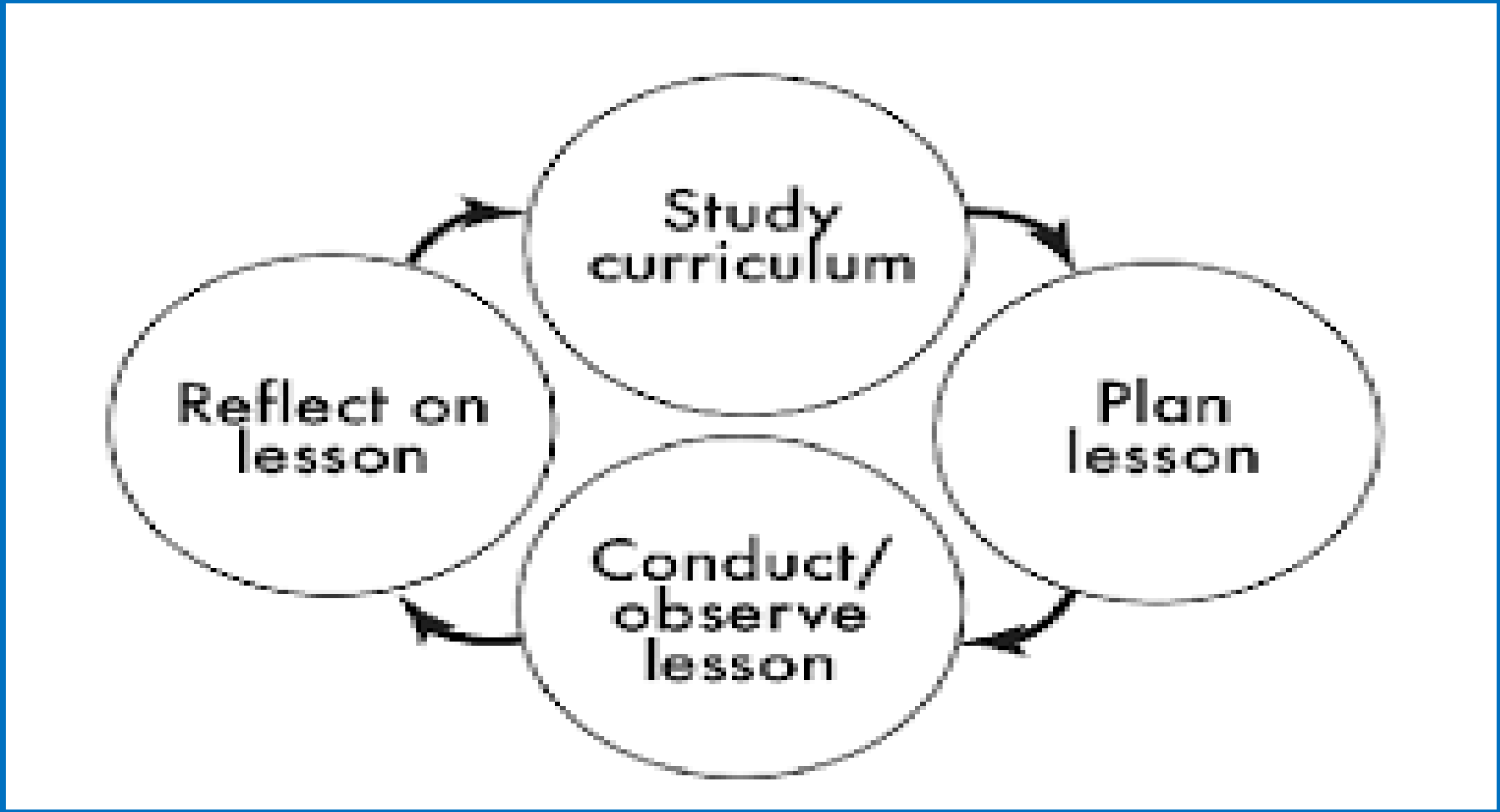
- Observed primary and secondary teaching
- Taught a lesson (in English ☺, phew!)
- Contributed to and observed many TRG sessions
- Time to discuss in detail the content of the lesson and the approach.

My Experience in Shanghai

Different Emphasis

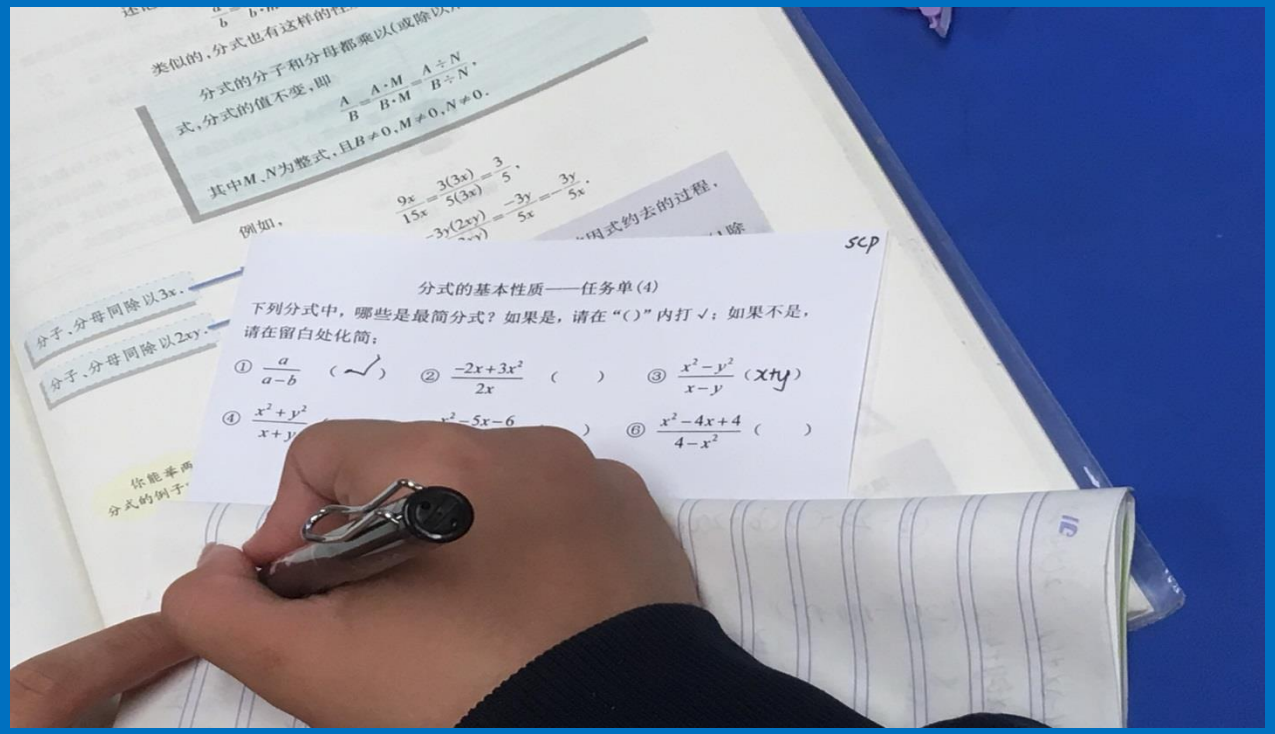
- Teachers teach much less each week but they still work hard!
- Typically they teach one or two classes in the same year group.
- Much heavier focus on research, collaborative planning and joint reflection (lesson study cycle)
- Culture of ‘mistakes are a learning opportunity’ for both students and teachers.

The Lesson Study Cycle



Number and Algebra Skills = Impressive

- By high school number and algebra skills are one or two years ahead of peers in England. This includes fluency, making connections and ability to reason.

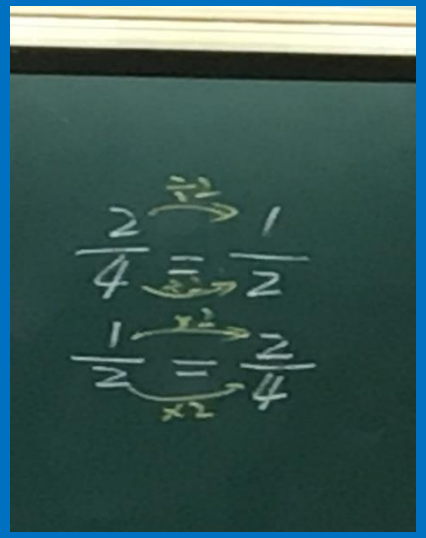


- How do they achieve this?

Emphasising what we *could* take away…

The Start of a Lesson

Formal and respectful.



Lessons routinely begin with a concise carefully structured recap from the previous lesson…

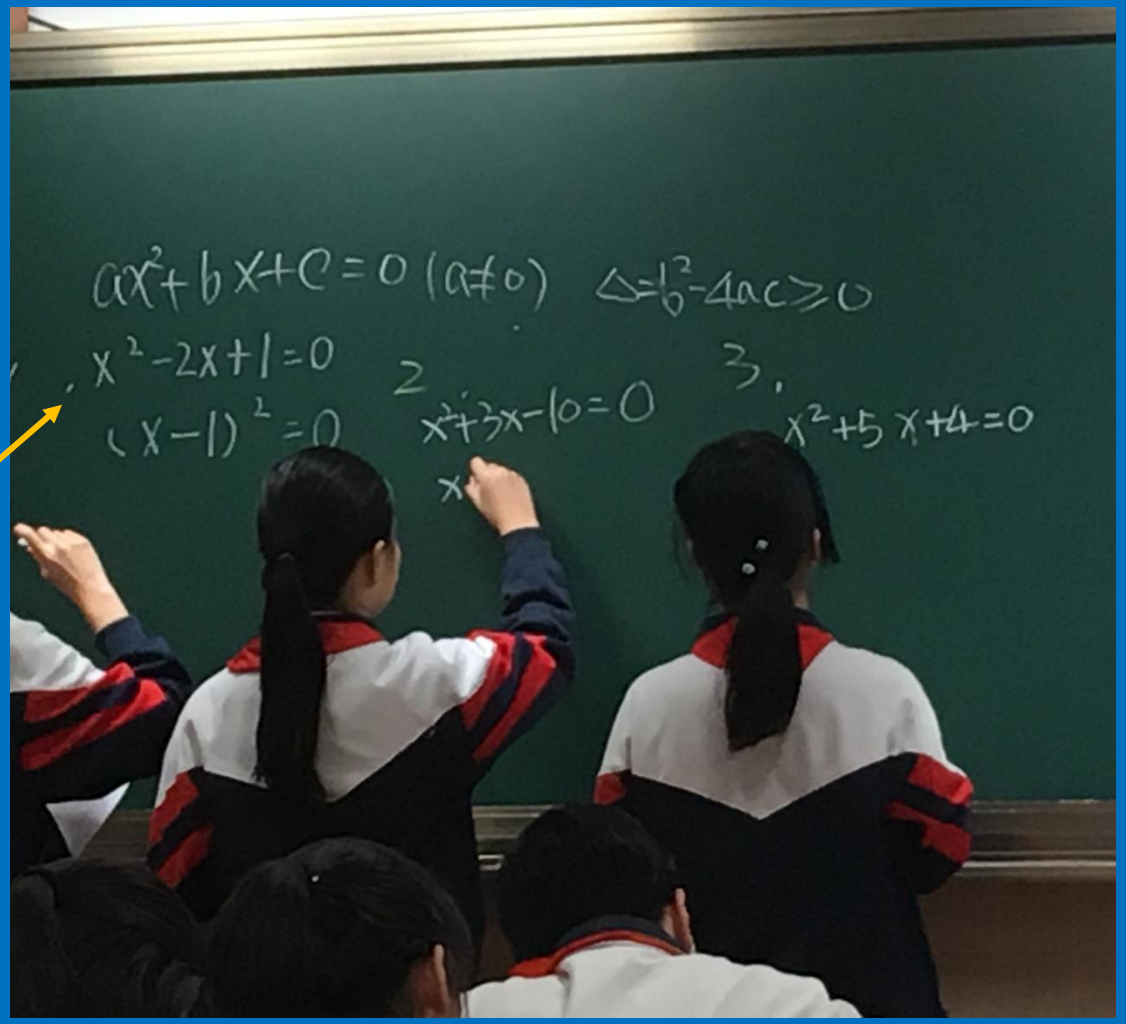
Links made with algebra where possible including with younger high school children

Answering Questions

- Students stand up to answer questions.

Explanations and Methods

- Emphasis on explaining answers. Answering why?
- Teacher encourages students to contribute different methods to answer the same questions

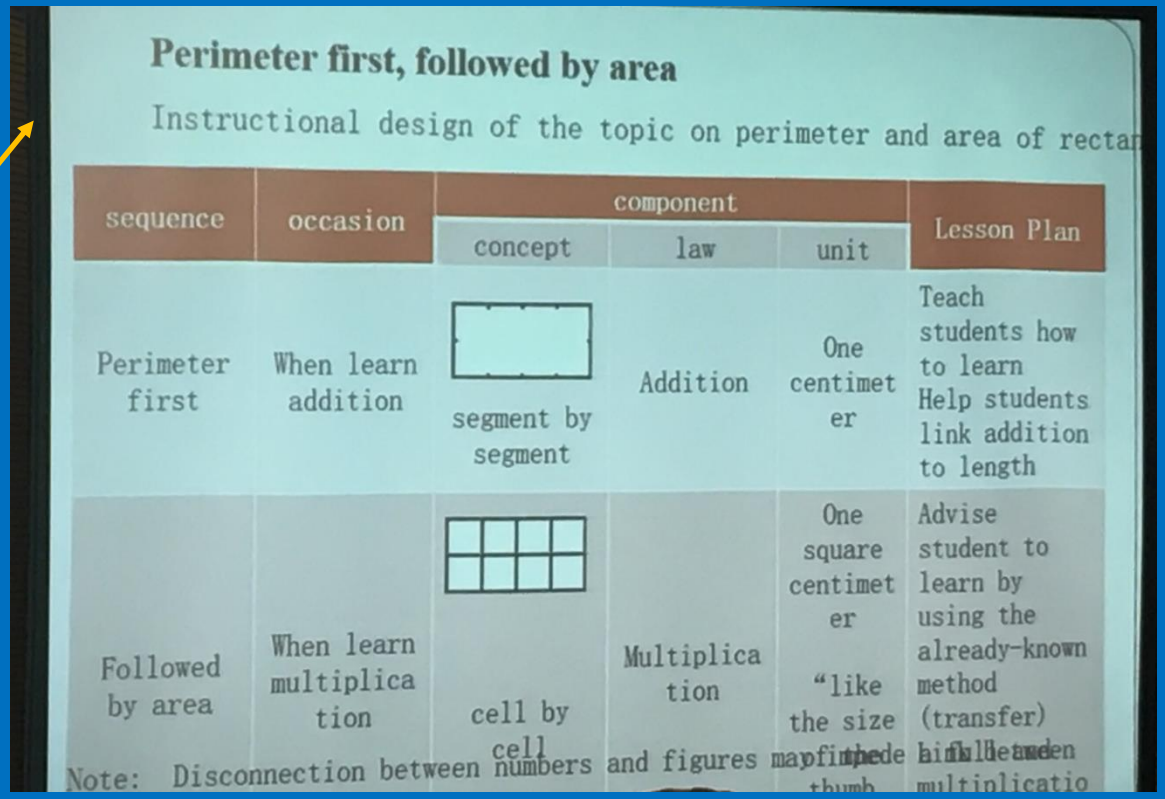


Students encouraged to show different ways to solving the quadratic equations.

Careful Use of Text Books

- All students have a government issued text book. This book has carefully been constructed and is revisited regularly by experts to ensure the content is still suitable.

Recently the Chinese education authorities had to decide whether perimeter or area should be taught first. They considered perimeter easier to master (just addition) but that area easier to visualise suggesting children notice first the 3-D shape (volume), then the area and then the side lengths.



Perimeter first, followed by area

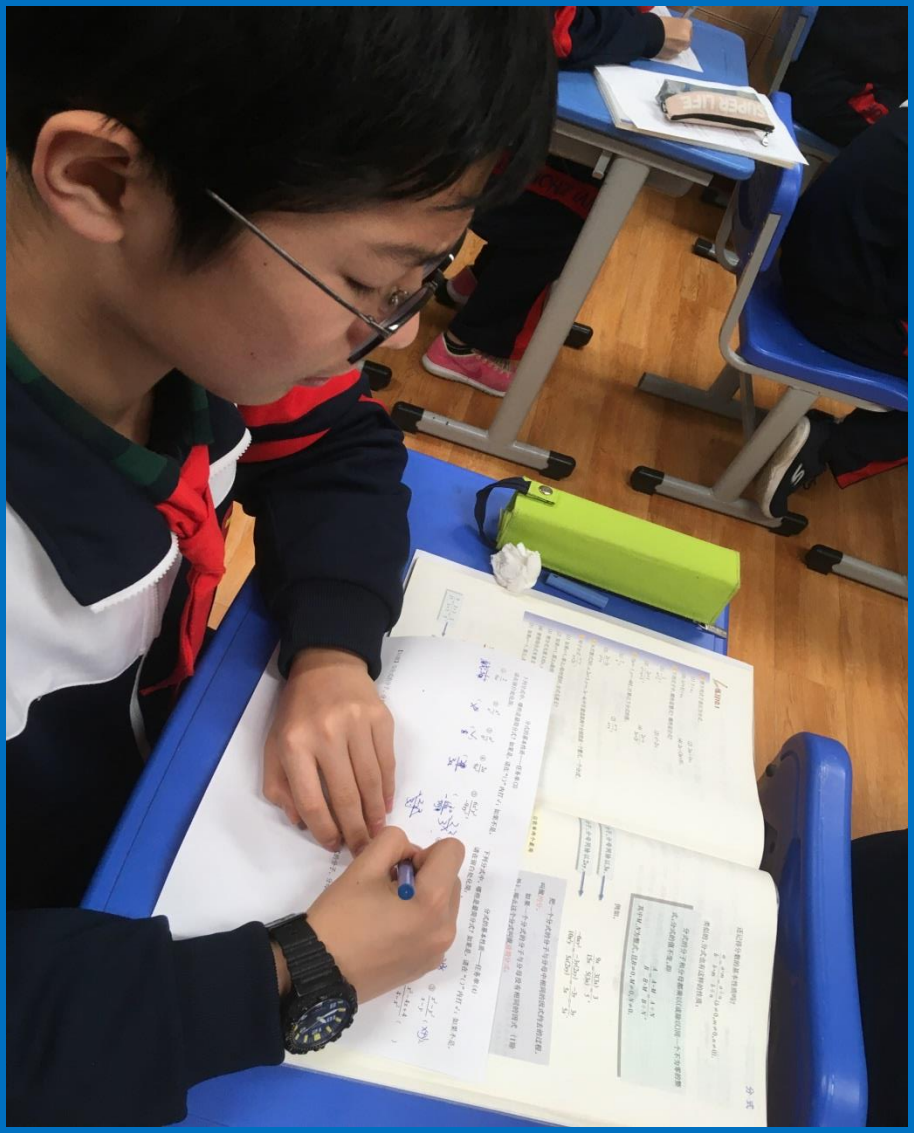
Instructional design of the topic on perimeter and area of rectan

sequence	occasion	component			Lesson Plan
		concept	law	unit	
Perimeter first	When learn addition	segment by segment	Addition	One centimeter	Teach students how to learn Help students link addition to length
Followed by area	When learn multiplication	cell by cell	Multiplication	One square centimeter "like the size of the thumb"	Advise student to learn by using the already-known method (transfer)

Note: Disconnection between numbers and figures may [illegible] multiplicatio

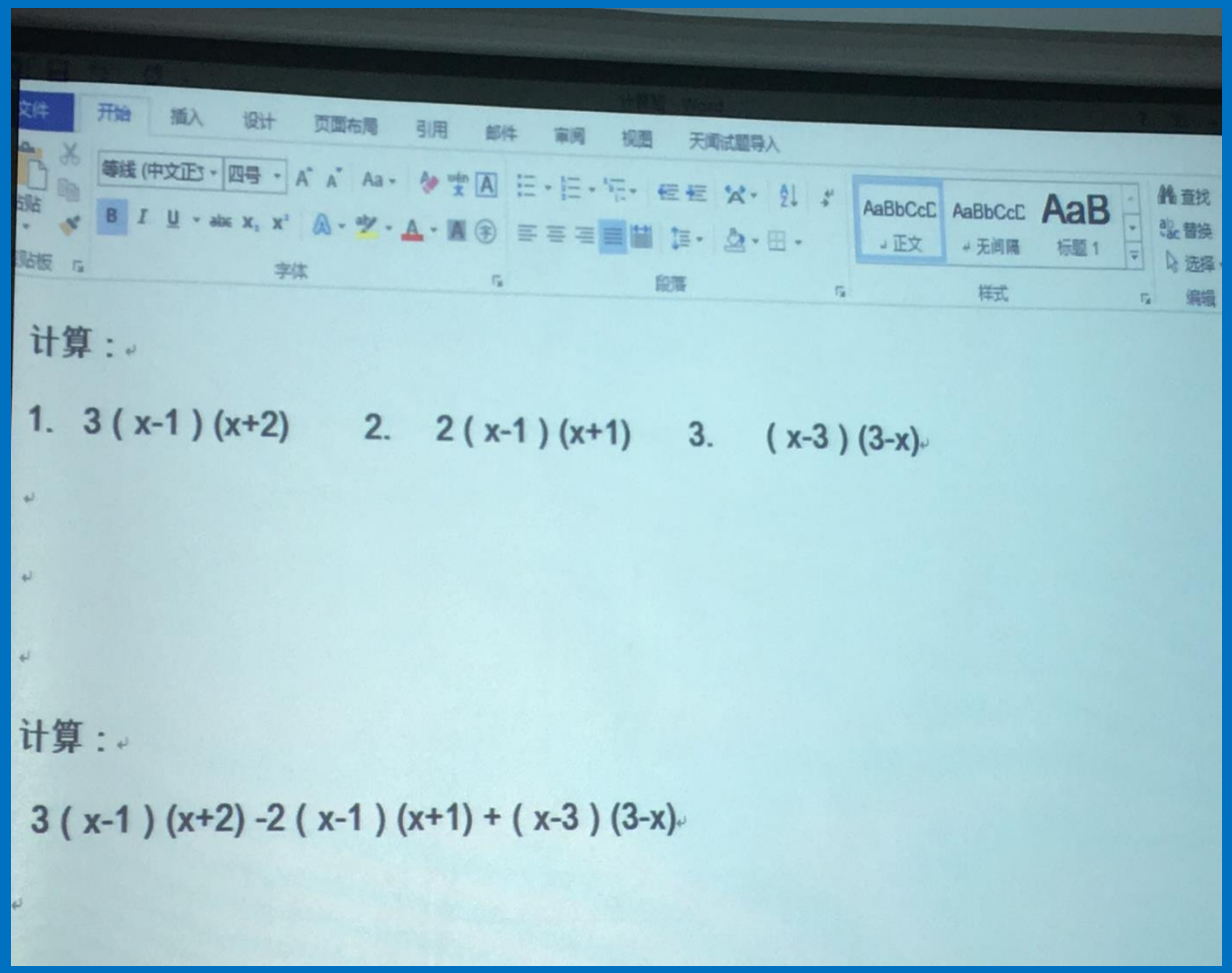
Text Book Use In Lessons

- Provides a quality base-line.
- Teacher picks out small directly relevant sections within the text books and asks students to silently read these parts.
- Books used to strengthen and refine students own explanations and understanding. Helping them to formalise what they have learnt.



Careful Planning

- Class discussion of how to answer a certain type of question before students are asked to complete a batch independently.
- Questions carefully structured. Usually only a few questions are given but each one has carefully been selected offering tailored variation.



计算：

1. 3 (x-1) (x+2) 2. 2 (x-1) (x+1) 3. (x-3) (3-x)

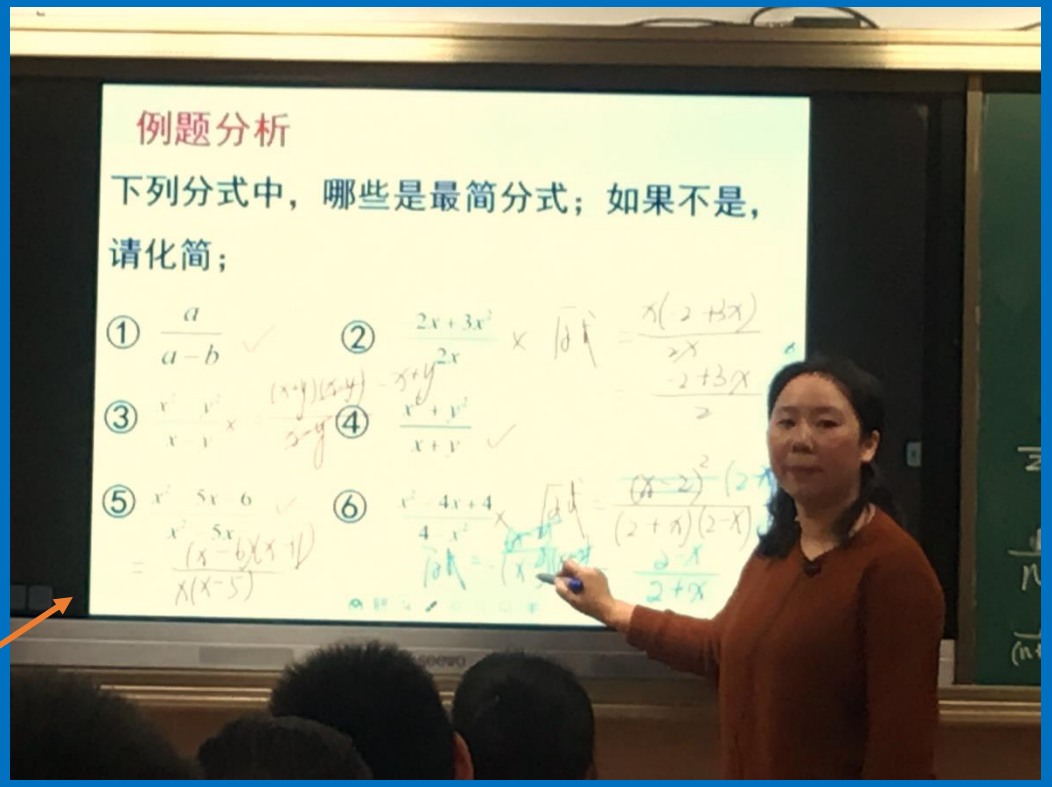
计算：

3 (x-1) (x+2) -2 (x-1) (x+1) + (x-3) (3-x)

The final question revisits skills taught on a previous lesson.

Errors and Misconceptions

- Students work is frequently selected to highlight errors and misconceptions.
- Students do not feel embarrassed. Teachers give students the message that ‘the wrong answer is the reward for all the students and that making mistakes is normal and nothing to be ashamed of.’



Fantastic IT facilities used to enable this to happen efficiently and easily (photo taken of students work, 30 seconds later up on smart board and teacher able to annotate work.)

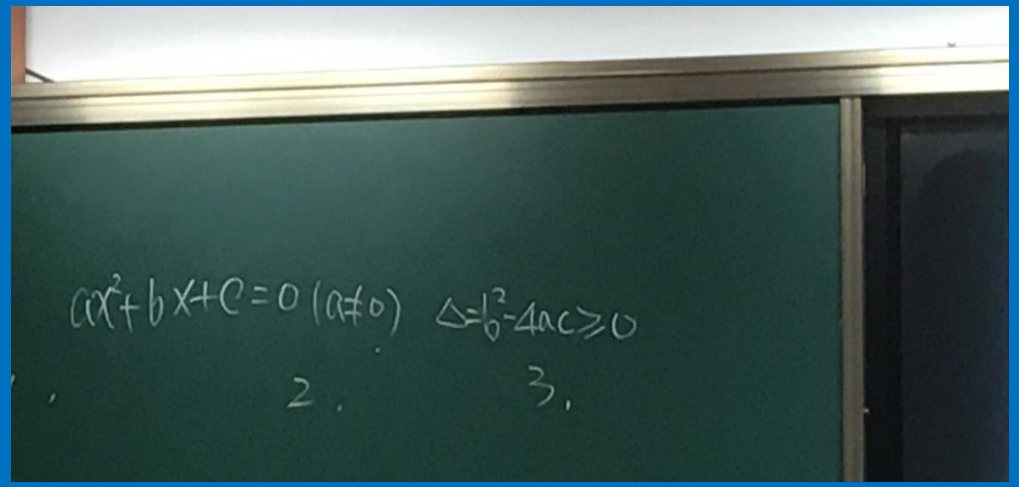
Lesson Structure and Peer Learning

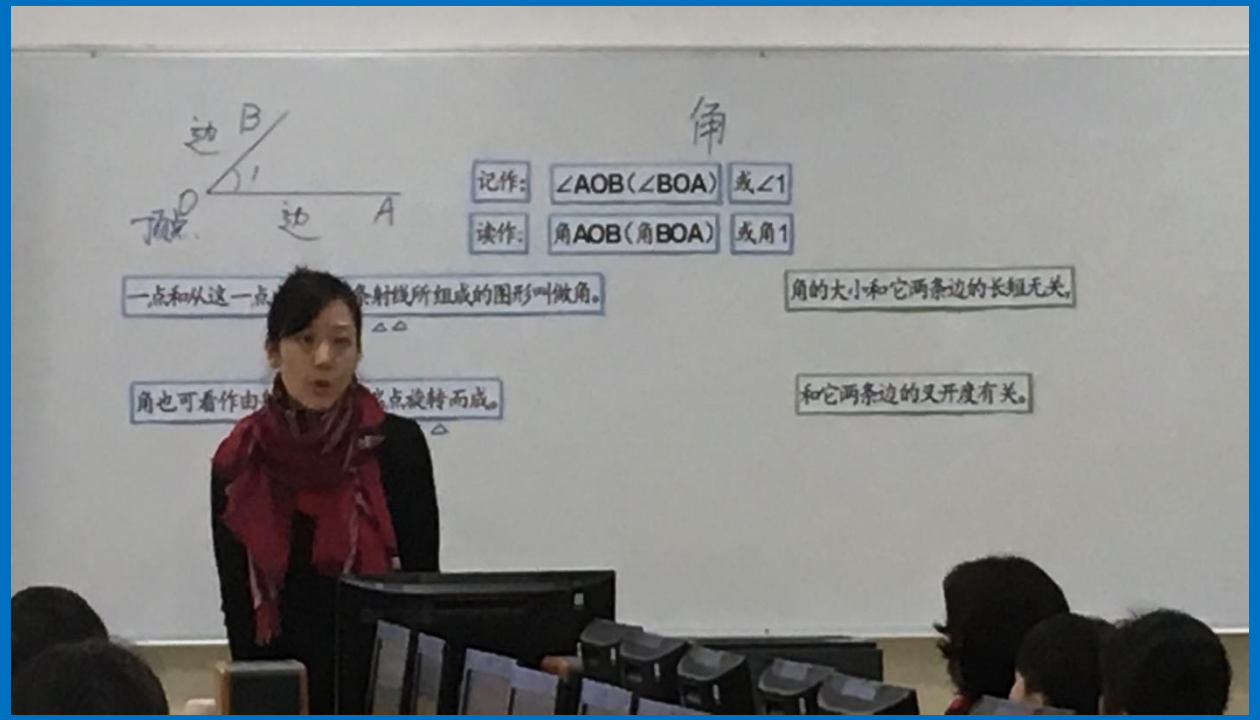
- Tightly defined short sections in a lesson. Fast paced but leaving no stone unturned within the topic area.
- Lessons include independent work (no talking at all) and group discussion (for a limited time in pre-planned groups).

Students asked to discuss and compare answers in small groups of 4s before answers are explored as a whole class. In some classes these groups consisted of a high ability student, a low ability students and two middle ability students.

Accuracy and Precision

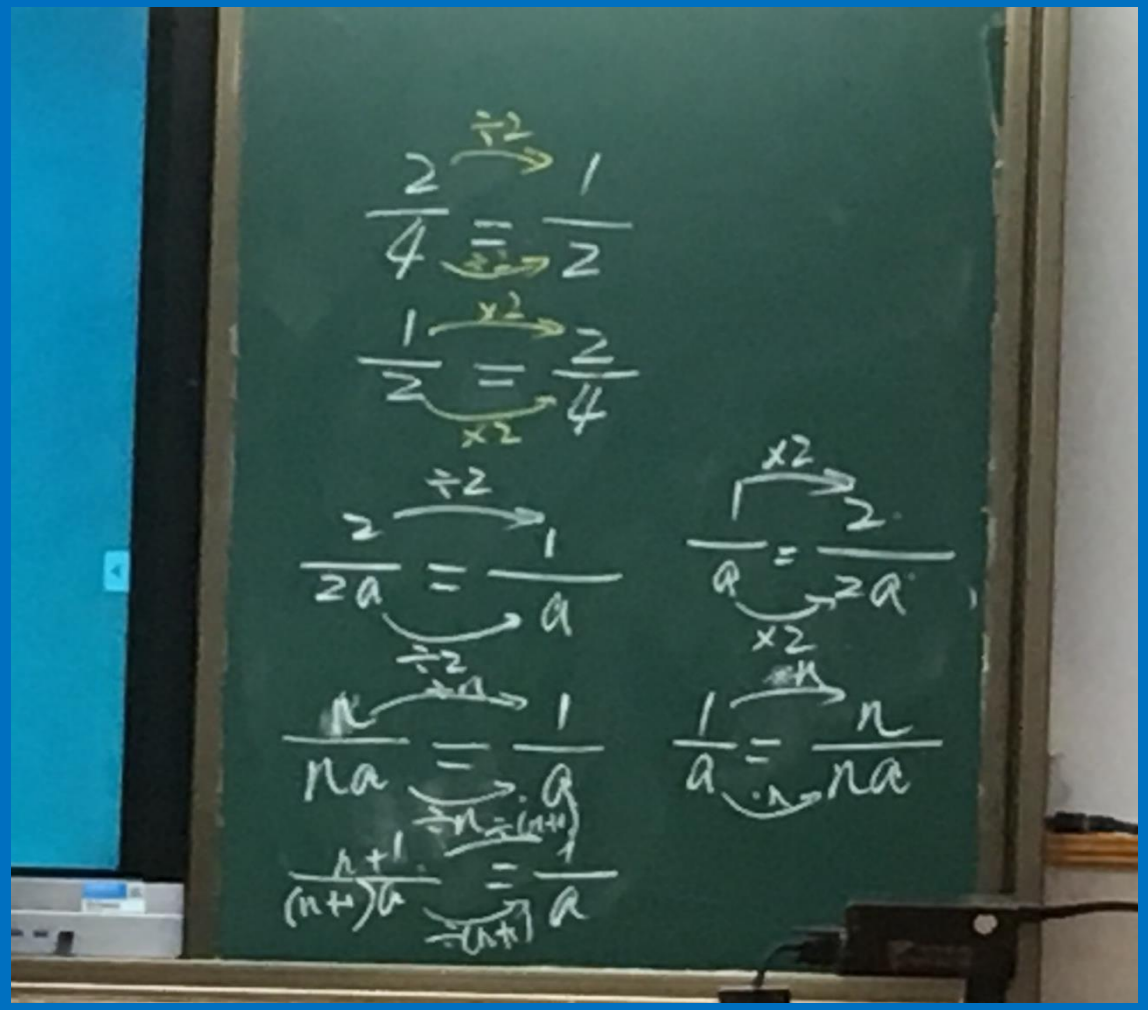
- Emphasis on using correct mathematical notation, language and full sentences.
- Emphasis on restrictions





Linking and Exploring Concepts

- Emphasis on linking mathematical concepts together
- Lessons on number are linked where possible to algebra and the general situation. Students allowed time to explore connections between the questions and the answers to discover these rules for themselves.



Connections with Real Life

- Relating concepts being taught to meaningful real life concepts.

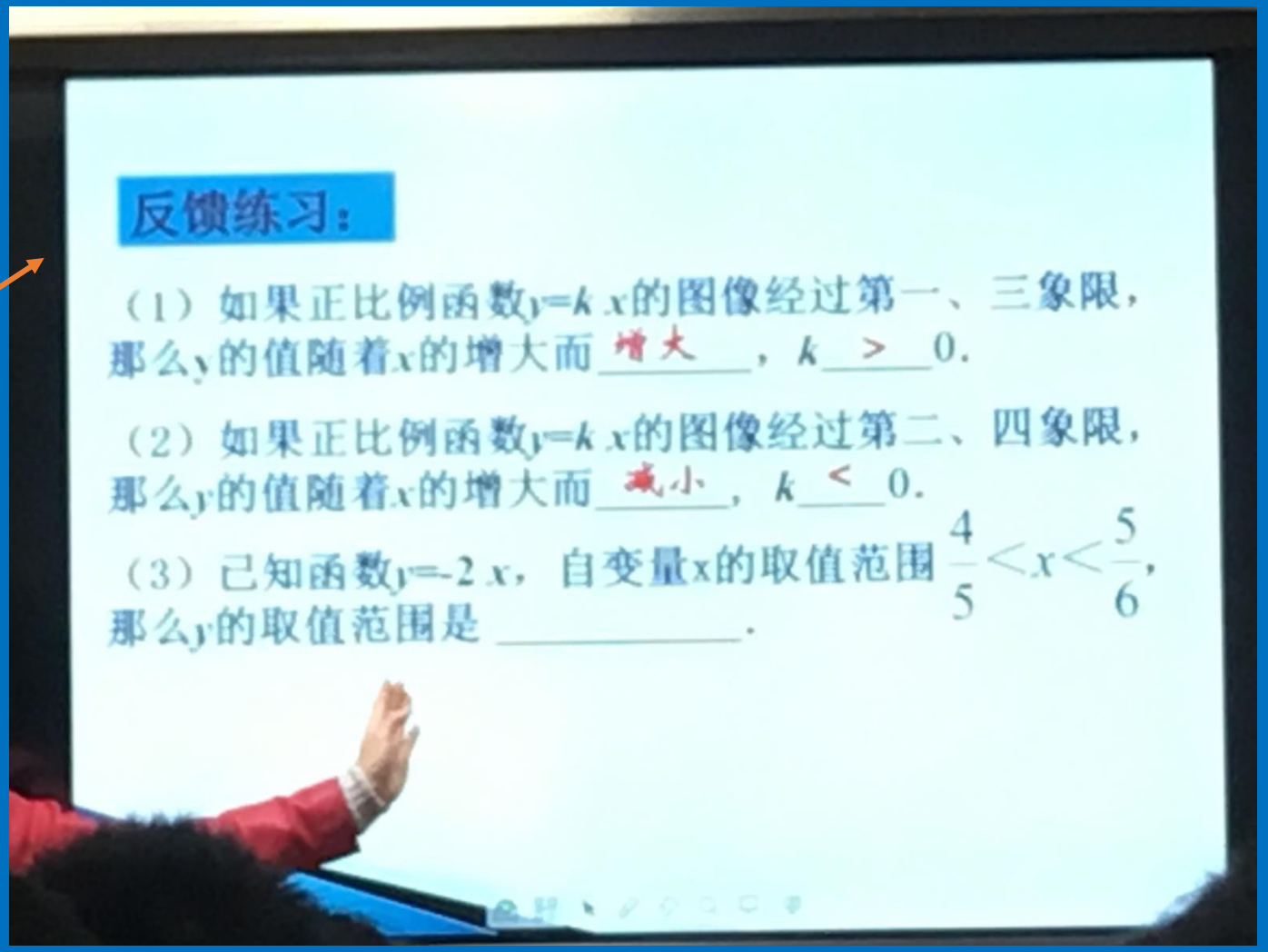
A grade 5 lesson introducing the concept of an angle starts with a light show centred on the skyscrapers in the centre of Shanghai.

Later in the same lesson, whilst exploring acute and obtuse angles, pupils are shown an open fan. Again an object that pupils would be familiar with.

3-Point Summaries

- Key points and summaries given using precise language.

In many lessons these were given as 3 distinct points.



My Take-Away Thoughts…

- **It’s not all perfect**
- The bottom 5% in each class are not catered for.
- Possibly the most able are not being fully stretched?
- Less focus on the individual
- Class size of 40 is standard
- Opportunities for innovation are limited
- No heating in schools!

And there is lots that is unlikely to change

- Investment levels
- Teaching hours in the classroom
- High quality government issued text book
- Schemes of work carefully considered and decided upon centrally
- Levels of respect and behaviour
- Attitude to education (students and parents)

But… Here are some changes I hope to make

- Encourage those I work with to share, collaborate and communicate more. Hopefully this will provide better quality for our students and save us time in the long run.
- Think carefully about how I start lessons. Aim to have a concise recap on relevant previously taught knowledge.
- Trial the approach of having a student stand to answer a question.
- View students mistakes and misconceptions as a learning opportunity. Use IT to maximise the effectiveness of this.
- Increase opportunities for students to explain different approaches.

And Also…

- Look carefully at the possibility of using the translated copies of the Shanghai text book for some parts of lessons.
- Place a greater emphasis on students using the correct mathematical language and notation.
- Carefully find and construct questions to match the topic area. Emphasis on quality rather than quantity.
- Consider adopting the 3-point summary approach.

Finally

- Think about the seating arrangement carefully.
- Consider adopting a more tightly structured approach to the parts within each lesson.
- Link concepts, where possible, to the general and algebraic situation (including with younger children where previously I might not have done this).
- Emphasise restrictions. In the past I have often left this to year 11 or even AS level.
- Make more connections with real life where appropriate and possible.