Mathematics and Mandarin: How Mandarin Chinese can help improve KS2 and KS3 mathematical skills

Julie Li

Facts

• Poor numeracy skills cost UK £20 billion a year. (FT.com March 12, 2014)
• Shanghai pupils rank high in maths in international tests.
• Even children from poor families in Shanghai were 3 years more advanced in maths than middle-class British children of the same age (OECD - Pisa).

Why and how Shanghai’s kids have achieved this?

What can we do in a Mandarin class to help?

Some activity ideas

Your views, questions and comments

Possible reasons

• Has Chinese history led people towards heavier studying through things like Confucianism and civil service entrance examinations over many centuries?

• Is the Chinese “face” culture strong driver to succeed?

• Has the revolution, the cultural revolution and resulting poverty driven Chinese people to compete even harder? 穷则思变

• Has Chinese language in Math helps understanding at the early ages learning maths – workshop focus

Chinese Culture impacts on Maths

• Confucius: organising facts; interaction with people; organisation of fact and ideas. All central to maths??
• Chinese hold Education in high esteem: and Maths is king! 学好数理化, 走遍天下都不怕.
• So kids have to work hard at it. Maths teachers are specialists, and only teach maths

Chinese parents involvement

• Parents’ high expectations
• Private tuition /Homework

China’s long history of examination system: from about 1300 years of Imperial Examination (科举) to today’s Gaokao (高考).

Education still remains the primary lever for upward social mobility in China.

Can this contribute to Chinese kids better at doing exams?
Chinese language and culture’s impact on Maths – our workshop focus

- How Does Language Impact the Learning of Mathematics?
  "Language is used to describe mathematical processes, to read and interpret notation, and to define mathematical terms. Considering that communication is a key factor in the building of understanding, … it is important for teachers to use clear language that reveals the reasoning behind mathematical procedures".

Genevieve Boulet
JOURNAL OF TEACHING AND LEARNING, 2007, VOL. 5, NO.1

Maths language in Chinese

- is more literal, direct, logical
- has simpler entry to maths:

### Number system

<table>
<thead>
<tr>
<th>Chinese</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, … 10</td>
<td>One, two, three, … ten</td>
</tr>
<tr>
<td>11</td>
<td>Eleven</td>
</tr>
<tr>
<td>12</td>
<td>Twelve</td>
</tr>
<tr>
<td>13</td>
<td>Thirteen</td>
</tr>
<tr>
<td>20</td>
<td>Twenty</td>
</tr>
<tr>
<td>21</td>
<td>Twenty one</td>
</tr>
<tr>
<td>22</td>
<td>Twenty two</td>
</tr>
<tr>
<td>30</td>
<td>Thirty</td>
</tr>
</tbody>
</table>

### Shape naming system

<table>
<thead>
<tr>
<th>Chinese</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>四边形 (4 side shape)</td>
<td>Quadrilateral</td>
</tr>
<tr>
<td>五边形 (5 side shape)</td>
<td>Pentagon</td>
</tr>
<tr>
<td>六边形 (6 side shape)</td>
<td>Hexagon</td>
</tr>
<tr>
<td>七边形 (7 side shape)</td>
<td>Heptagon</td>
</tr>
<tr>
<td>八边形 (8 side shape)</td>
<td>Octagon</td>
</tr>
</tbody>
</table>

### Fraction and % naming system

3 OUT OF 2 PEOPLE HAVE TROUBLE WITH FRACTIONS
Fraction and % naming system

<table>
<thead>
<tr>
<th>Chinese</th>
<th>English</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2</td>
<td>二分之一</td>
<td>1 of the 2 divided parts</td>
</tr>
<tr>
<td>1/3</td>
<td>三分之1</td>
<td>1 of the 3 divided parts</td>
</tr>
<tr>
<td>1/4</td>
<td>四分之1</td>
<td>1 of the 4 divided parts</td>
</tr>
<tr>
<td>1/5</td>
<td>五分之1</td>
<td>1 of the 5 divided parts</td>
</tr>
<tr>
<td>1/100</td>
<td>百分之1</td>
<td>1 of the 100 divided parts</td>
</tr>
<tr>
<td>1%</td>
<td>百分之一</td>
<td>1 percent</td>
</tr>
<tr>
<td>1/32</td>
<td>三十二分之五</td>
<td>5 of the 32 divided parts</td>
</tr>
</tbody>
</table>

Chinese fraction and percentage naming system:

1/2 二分之一
1/3 三分之1
1/4 四分之1
1/5 五分之1
1/10 百分之1
1% 百分之一
1/32 三十二分之五

Example:
Astronauts started their moon landing mission on 1st July, they came back on the 1st Nov, how many months they stayed on the moon?

English way: Jan, Feb, ....
Chinese way: 11-7

Days of week (星期)

<table>
<thead>
<tr>
<th>Chinese</th>
<th>English</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>星期一(week day 1)</td>
<td>Monday</td>
</tr>
<tr>
<td>2</td>
<td>星期二(week day 2)</td>
<td>Tuesday</td>
</tr>
<tr>
<td>3</td>
<td>星期三(week day 3)</td>
<td>Wednesday</td>
</tr>
<tr>
<td>4</td>
<td>星期四(week day 4)</td>
<td>Thursday</td>
</tr>
<tr>
<td>5</td>
<td>星期五(week day 5)</td>
<td>Friday</td>
</tr>
<tr>
<td>6</td>
<td>星期六(week day 6)</td>
<td>Saturday</td>
</tr>
<tr>
<td>7</td>
<td>星期日(week day 7)</td>
<td>Sunday</td>
</tr>
</tbody>
</table>

Cultural difference - think differently

Western way
Chinese way

Place value illustration

Hundreds
Tens
Units
tenths
Hundredths

Good interactive website: http://www.mathsisfun.com/numbers/abacus.html
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A Quote from a head of Confucius classroom
• A few years ago two of our Peninsula Group Hanban teachers set up some Maths lessons using the Chinese abacus during a 6-week session in a local village primary school. Afterwards I was contacted by the teacher to say how successful the Maths lessons had been and in particular they had noticed that as far as some young students who really struggled with Maths were concerned, the teacher suddenly ‘saw the light come on’ and they began to understand Maths in a way they had not done before.

Ofsted framework:
• When evaluating the achievement of pupils, inspectors will consider
  • the extent to which pupils develop a range of skills well, including communication, reading and writing and mathematical skills and how well they apply these across the curriculum
  • the standards attained by pupils by the time they leave the school, including their standards in reading, writing and mathematics
• When evaluating the quality of teaching in the school, inspectors will consider
  • how well teaching enables pupils to develop skills in reading, writing, communication and mathematics

Aspects of Maths contents can be reinforced in the Mandarin lessons:
• Number recognition / Number sequencing
• Percentages / Fractions
• Measures / Time / Age
• Addition and subtraction / Multiplication and Division
• Data Handling
• Shapes ....

What Maths activities do you use in your lessons please?

Activities
• Song / nursery rhymes / poem / joke / PE games
• Number cards / Snake and Ladder / 11 out
• Seven pieces of cleverness
• Symmetry: Chinese words paper cuttings
• Paper folding
• Train, Flight Timetables / shopping
• Number Carroll diagrams
• Date/time practice – Cluedo ...
• Bingo / dominos
• Algebra – patterns, rules
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6th June 2014

Idiom 守株待兔: shǒu zhū dài tù

Video: https://www.youtube.com/watch?v=HkfallyFyOc

Progression to build math thinking and skills

Predicting the next one in the sequence with fruits (or any new sets of words):

Apple, banana, pear, apple, banana, pear, apple... what’s the next?

Predicting the next one in the sequence with color:

Red, yellow, green, red, yellow, what’s the next?

With numbers:

1, 2, 3, 4, 5... (1, 2, 3, 4, 5... what’s the next?)

Progression to Algebra: 2*N + 1

Algebra – patterns, rules and abstraction

I was good at math before they decided to mix the alphabet in it

More pics on www.LaFunnny.net

PE games for KS1 – shape and numbers
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Number cards (cut out, draw/write on the back, order, snap, listen/show the card…)

<table>
<thead>
<tr>
<th>一</th>
<th>六</th>
<th>十</th>
<th>三</th>
<th>九</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yi</td>
<td>liu</td>
<td>shi</td>
<td>san</td>
<td>jiu</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>四</th>
<th>七</th>
<th>二</th>
<th>八</th>
<th>五</th>
</tr>
</thead>
<tbody>
<tr>
<td>si</td>
<td>qi</td>
<td>er</td>
<td>ba</td>
<td>wu</td>
</tr>
</tbody>
</table>

The 1-2-3 Game – (11th out) (speak, listen and think! Numbers, Maths strategies)

- Each child stands behind their chairs and choose one to start off. They start at 1 and can say up to 3 consecutive numbers e.g. 1, or 1,2 or 1,2,3. The next child follows on with up to three numbers e.g. if the last one said 1,2, then this child can say 3 or 3,4 or 3,4,5. You continue like this around the room and the one that has to say 11 is out and sits down.
- The next child starts from 1 and it all follows again until a child would have to say 11 again. The last one standing is the winner.
- It is a great game and good for teaching numbers to 10 in any language and Maths strategies – which number needs be controlled to get others out?

Nursery rhymes

你也拍一我拍一 (http://www.4399er.com/erge/egty/20120712-67465.html)

- 你拍一我拍一 一个小孩坐飞机
- 你拍二我拍二 二个小孩梳小辫儿
- 你拍三我拍三 三个小孩吃饼干
- 你拍四我拍四 四个小孩写大字
- 你拍五我拍五 五个小孩敲大鼓
- 你拍六我拍六 六个小孩吃石榴
- 你拍七我拍七 七个小孩架飞机
- 你拍八我拍八 八个小孩吹喇叭
- 你拍九我拍九 九个小孩去跑步
- 你拍十我拍十 十个小孩猜谜语

Snake and Ladder

Teacherspayteachers.com

Song – from “We Love Bilingualism” (Singapore)

- Numbers are our good friends (我们再来数一数)

https://www.youtube.com/watch?v=ahvxaKXgbI0

- Fun with shapes (快乐的形状)

https://www.youtube.com/watch?v=4kA8jgIK6A

https://www.youtube.com/watch?v=RGJ NOT (B_G1S)

Also 五指歌 (Wǔ zhǐ gē): Five fingers song

http://resources.echineselearning.com/kids/kids-chinese-691.html
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6th June 2014

11th Annual Chinese Conference
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Bingo
• Students enter the numbers they think are going to occur, into the grid when two fair 1-6 dice are thrown.
• Throw two dice numbered 1 – 6 and add the scores. Call out this score. If you have this on your grid cross it out.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

Differentiation
Throw 2 dice and subtract, multiply, divided them
Throw 1 dice then * N (N<10) to practice timetable
encourage the winners to come out and call next time. More shy pupils can choose a friend to help.

Domino – (read, speak, listen, and calculate)
• Make a set of cards with a number and questions like
• "我是 10, 谁是 6+3?" - I am 10. Who is 6+3?
• each pupil has one card with different questions. The 1st pupil starts
• "我是 10, 谁是 6+3?" - I am 10. Who is 6+3? (Then sit down).
• The one has number 9 card then stand up, "I am 9, who is 7+4?"
• ...
• Extensions:
  • Can replace +, by -, x, /, rounding ...
  • Replace number by negative numbers, ...
  • Can also replace numbers by animals, weather (sunny, rainy, foggy, windy, ...

Number Joke
had swim race across channel.
'一, 二, 三' cat won because
... ...
'un, deux, trois' cat sank!

Poem
One look, we see two or three miles four or five homes (houses), Six or seven trees in front of the door and Eight, nine or ten branches of flowers

Symmetry: Chinese paper cuttings
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折纸 paper folding: develop 2D, 3D parallel ...

• Mathematics of paper folding
  • Fields of interest include a given paper model's flat-foldability (whether the model can be flattened without damaging it)
  • the use of paper folds to solve mathematical equations.

• Folding Constructability :
  • https://www.youtube.com/watch?v=gCMxaRmweE8


days of the week, months of the year, seasons
day, week, fortnight, month, year
weekend, birthday, holiday
morning, afternoon, evening, night, midnight
bedtime, dinnertime, playtime
today, yesterday, tomorrow
before, after, next, last
now, soon, early, late
quick, quicker, quickest, quickly
fast, faster, fastest
slow, slower, slowest, slowly ...

old, older, oldest
new, newer, newest
takes longer, takes less time
how long ago?/how long will it be to...?
how long will it take to...?
hour, minute, second
o'clock, half past, quarter to, quarter past
clock, watch, hands
digital/analogue clock/watch, timer
how often?
always, never, often, sometimes, usually
once, twice
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http://www.cambridge.org/elt/resources/young/interactive/clock/index.htm

Time
- To generate the time practice sheets online:
  - Apples4theteacher
  - themathworksheetsite
  - i4nteacher

Day / Time cluedo (4 skills)
- Question: When do you go to Beijing?
- Answer:

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Today</td>
<td>1</td>
<td>a quarter</td>
</tr>
<tr>
<td>Tomorrow</td>
<td>2</td>
<td>17 half</td>
</tr>
<tr>
<td>Yesterday</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>Monday</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Tuesday</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>Wednesday</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Daily routine

ICT: Tesco 乐购 (http://www.cn.tesco.com)

Fast Train Shanghai – Beijing booking (date, time, pb solving..)
http://trains.ctrip.com/TrainBooking/shanghai-beijing/pedal/

What's more expensive? How much more?

买1斤西红柿和1斤土豆一共多少钱? 多少? How much is it in £?

土豆比西红柿便宜多少？
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Numbers crossword
http://ciforschools.wordpress.com/jin-bu-1/

Complete the puzzle by writing the answer using Chinese characters.

Across
1. 31
2. 42
3. 80

Down
1. 4 (3 x 10^2)
2. 5 (7 x 10^2 - 4 x 1)

Number Carroll diagrams

Money value and conversion
http://www.tizi.com/teacher/lesson/view/GGHFII

Minnetonka Chinese Immersion Program

<table>
<thead>
<tr>
<th>Mathematics</th>
<th>Fall 2011</th>
<th>Fall 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 101</td>
<td>201</td>
<td>202</td>
</tr>
<tr>
<td>Math 102</td>
<td>198</td>
<td>200</td>
</tr>
<tr>
<td>Chinese 101</td>
<td>203</td>
<td>204</td>
</tr>
</tbody>
</table>

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Conclusion

• The steeper the learning curve, the higher you achieve in life
• Learning maths relies on fundamental understanding of the basic building blocks, step by step.
• So the more a child really understands in a school year, the higher he/she can go in education.
• The Chinese system is simpler, so you can learn and understand more in a school year.

References

• UK School maths contents by year and by categories: http://uk.ixl.com/math
• US Chinese immersion program
  https://www.minnetonka.k12.mn.us/academics/immersion/Pages/Chinese-immersion.aspx
• Good interactive web page for abacus:
  http://www.mathsisfun.com/numbers/abacus.html
• Resources:
  Teacherspayteachers.com

Questions?

• Please share:
  • Your views
  • Your practices
  • Your comments
  • ….

The End!
完了!
Thank you!
谢谢！