Utilising the principles of RME to design and teach meaningful mathematics lessons in the government primary schools of The Cayman Islands

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Presentation Overview

- Welcome to The Cayman Islands
- Summary of Mathematics teaching and learning in the Cayman Islands –then and now
- Trajectory of development: national curriculum to units of study to exemplar lessons
- Exemplar lessons- RME framework, exemplar lessons, lesson study
- Reflection-Where are we now? What's next?

The Cayman Islands

Cayman Islands

(UK)

Caribbean Sea

Little Cayman

Cayman Brac

Grand Cayman

GEORGE TOWN

Caribbean Sea

The Cayman Islands

- Population of approximately 62,000
- 11 government primary schools –three islands
- Approximately 2400 students- Reception to Year 6
- 174 primary school teachers

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Background to primary mathematics teaching in The Cayman Islands

- Present curriculum introduced in 2008
- Introduction to the Numeracy Specialist – Frank Eade in 2011
- Baseline research on the teaching and learning of mathematics in The Cayman Islands

Findings

- Teaching algorithms and rules
- Delivery of curriculum was the focus
- Little evidence of the of use visualisation, mathematical discourse, contextualisation or recognition of the interconnectedness of the strands and big ideas in mathematics
- Differentiation by task
- Large number of students were achieving over one year behind international standards
- 25% of students achieved expected L4 at KS2 exams and 16% were ungraded

Recommendations

- Math Recovery training
- Leaders in Primary Mathematics 18 month course
- Development of Units of Study for each year group
- Professional Development: twilight sessions for teachers and administrators
- Numeracy Coaches
- Lesson Study

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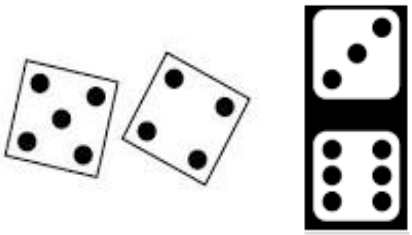
Yr3	As appropriate, recognising numbers to 100 in symbol and word form and being able to place them on a number track • Money problems using Cayman notes to $25. Introduction to $1 $5 and $10 • Counting forwards and backwards to 100 in 1's and 10's • Moving towards adding, say 11 by adding 10 and then adding 1. Moving towards adding, say, 19 to a two digit number • Ordering numbers to 100 (using positional value as the first stage) • Solving problems to 100 in context- including money • Properties of 2D shapes • Understanding directions - turns • Examine direct, indirect comparison of length and weight and using a balance to weigh.	• Recognising numbers in words and numeral form(place/face and positional value) • Ordering numbers to 100 using 100 bead bar • Solving menu problems -amount spent and change to $25 -combination of items purchased •Sense of time in context of school day, week, month and year • Looking at addition on a number track adding 11, 22....19... •Multiplication: groups/sets/lots, repeated addition and arrays •Division as sharing and grouping – repeated addition/subtraction, arrays • Angle as turn ½ , ¼, ¾ of a turn •Fractions - contexts, angles, time, area models or shapes • Measuring length using direct and indirect comparison. Use of arbitrary units moving to metre stick as a unit • Making sense of pictographs, bar charts and tables	•Sense of where numbers lie on a number track and line to 200 • Understanding even and odd numbers and their interrelationship • Using the empty numberline for N10, N10C and A10 to solve addition and subtraction problems • Solving missing number problems involving addition and subtraction to 100 • Solving missing number problems involving multiplication of single digit numbers • Reading a clock to ¼ of a hour (15 minutes) • Elapsed time in 15, 30, 45 minutes 1hour and 2 hours • Reading a thermometer	• Understanding numbers to 200 • Simple additions and subtractions • Developing number patterns • Know multiplication relationships for multiples of 2, 5 and 10 • Relate multiplying by 2,5 and 10 to "division" by 2, 5 or 10 or more • Understanding unit fractions in relation to continued halving • Review puzzles of the type 5 + ? = 8 and similar subtraction problems • Measuring to the nearest centimetre or decimetre • Understanding the concept of weight and capacity • Reading Bar and Block graphs	• Understanding numbers to 1000 • Explore addition using N10 and compare to 1010 • Develop understanding of how to solve multiplicative problems using repeated addition and subtraction • Start to develop understanding of 6 and 9 multiplication facts derived from knowledge of 5 and 10 multiplication knowledge • Rounding to the nearest 10 and 100 • Combining experience of angle and distance to solve problems • Reading tables Fractions -capacity, distance, weight

Year 3 Ma 2 Number			
Counting and understanding numbers			
Numbers and the number system	Whole Class Interactive Teaching	Resources	Evidence of learning
As appropriate, recognising numbers to 100 in symbol and word form and being able to place them on a number track Saying and writing these numbers. Moving from reading the numbers in word form to numerical form. Money problems using Cayman notes to $25 Introduction to $1 $5 and $10 Counting forwards and backwards to 100 in 1's and 10's both as a chant and using the number track. Moving towards adding, say 11 by adding 10 and then adding 1. Moving towards adding, say, 19 to a two digit number being careful to make use of the beaded number track Ordering numbers to 100 using the number tracks (this is a 100 bead bar)	Starters may require use of ten frames and dice images to encourage bonds to 10 and 20. Also review Number Word After (NWA) and NWB and students ability to count on and back E.g. add 5 and 6 but moving to teen numbers quickly Could ask about what the total is, how you got it, did anybody use 5 and 5 is 10… Could somebody explain how you know these two have the same total? You are initially likely to get counting strategies but look for compensation type arguments (e.g. 6 is one more than 5 and 3 is one less than 4 in the images below). This is an example of differentiation.  Ask student to show where 34 is on the track. Ask others is she right, how do you know, discourage	10 Frames, Dice and dice images, Abacus Year 2 Workbook 3 pages 20-22 has complements to 20 questions in context Variety of number tracks String for clothes line Variety of game boards	I can recognise teen numbers in a variety of visual presentations I know a variety of ways of describing the teen numbers (eg 13 = 10 + 3)

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Realistic Mathematics Education Framework

Construction instead of Instruction

- Human Activity
- Realistic contexts that can be mathematised
- Level principle- various levels of understanding; Mathematising/ reinventing mathematics; Models
- Intertwinement
- Interactivity
- Guided Re-invention

Human activity

Realistic Contexts/Situations

Mrs Cobb makes and sells her own apple-cranberry juice. In pitcher A, she mixed 4 cranberry flavoured cubes and 3 apple flavoured cubes, with some water. In pitcher B, she used 3 cranberry and 2 apple flavoured cubes in the same amount of water. If you ask for a drink that has a stronger cranberry taste, from which pitcher should she pour your drink?

Level Principle

Intertwinement Principle

Recipe for Tray Cake

130 g caster sugar

50g cocoa powder

130 g margarine

130 g self raising flour

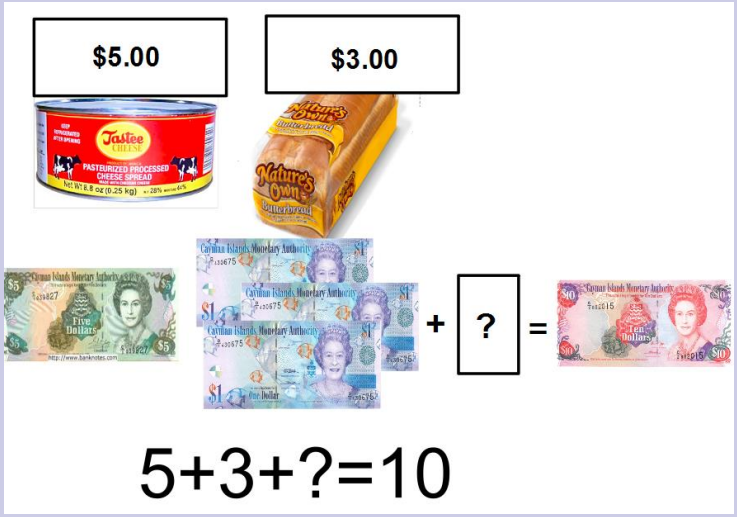
200ml milk

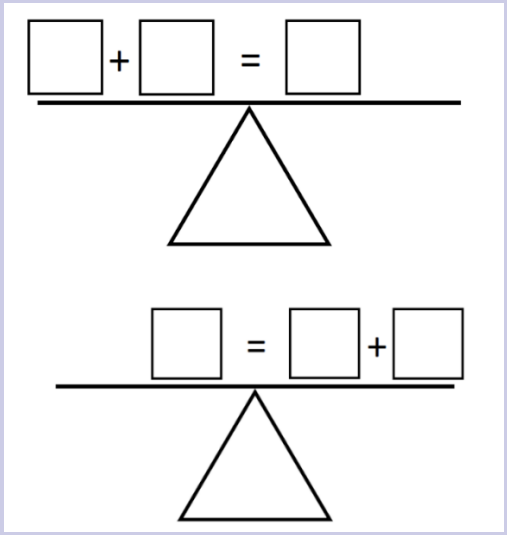
2 eggs

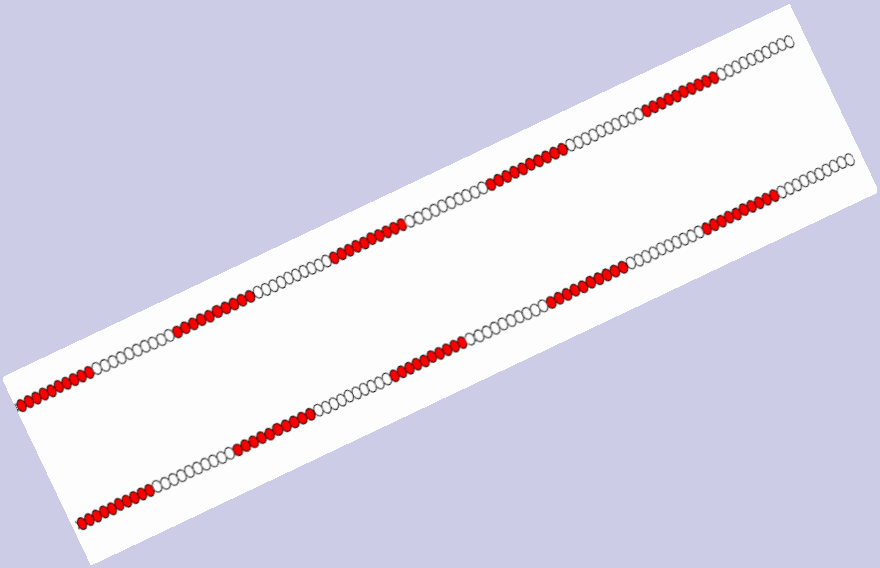
1 x 5 ml spoon baking powder

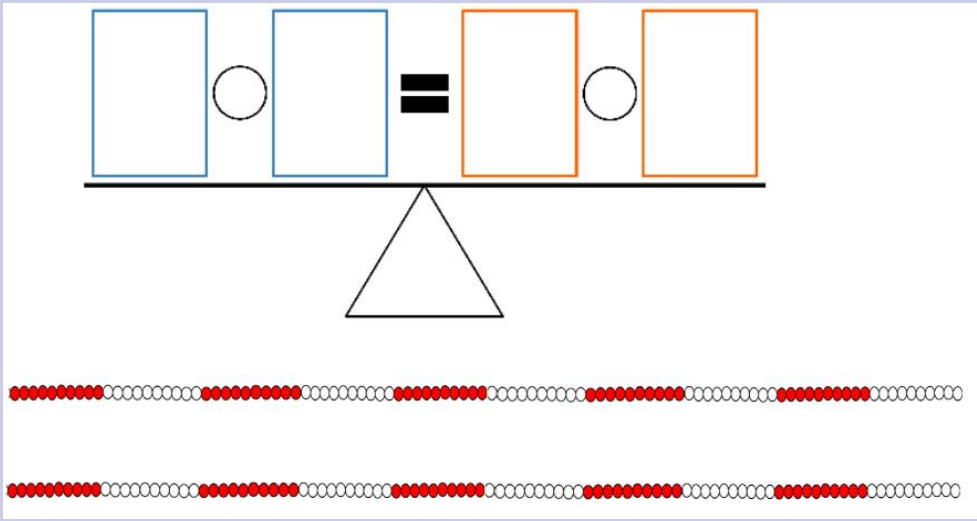
Interactivity

Guided Re-invention









Exemplar lessons

- Read both lessons – Y2 and Y4
- Identify the characteristics of the RME framework
- How can it be improved?
- Questions/Feedback

Lesson Study

- A teacher-centered job-embedded model of Professional Development
- Student Focused
- Involves:
  - teachers collaboratively working together in planning a research lesson
  - teaching and observing the research lesson
  - reflecting on the lesson taught
  - re-teaching the lesson by another teacher with another class
  - ending with a final reflection


A-380

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REFLECTION- WHERE ARE WE NOW? WHAT'S NEXT?

What changes have you seen in the ways that teachers teach mathematics in recent years?

- Facilitators rather than lecturers
- Confidence has grown
- Efficient strategies are being discussed
- Concepts as well as procedures are examined
- Teachers are giving purpose to maths
- Children exploring ideas
- Materials/equipment being used to enhance the maths
- Students articulating and sharing their ideas
- Peer-peer collaboration is taking place
- The teacher is a guide to learning rather than the orator
- Use of context to sense making

When I see effective mathematics teaching, I see evidence of:

- Students listening to each other
- Teachers have high expectations of behaviour and engagement
- Links made across topics
- Students listening and explaining to each other
- Challenging tasks being used
- Teachers have high expectations of behaviour and engagement
- Problems set in context

I have noticed the following changes in my students approach to mathematics

- Use of a variety of maths strategies (reasoning, efficiency, justifying, mental maths)36%
- Improvement in attitude (love maths, resilience, looking forward, highly motivated, risk taking)24%
- Students articulating (sharing ideas, enjoy discussion, talking about their thinking)22%
- Mental maths is developing 9%

I find students engage more when they:

- Justify their thinking
- Practice procedures
- Use visualisation
- Have stories that make maths real

Next steps

- Increase coherence within and across year groups and schools.
- Linking the lessons to assessment strategies – both formative and summative
- Helping teachers recognise when and how to progress the informal mathematics to the more formal mathematics
- Ensuring that vertical coherence across year groups is clear to teachers- having a clear picture of the learning trajectory of the concepts being taught
- Recognition that this way of effectively teaching mathematics takes years to develop and depends a lot on all stake holders' belief and attitude towards teaching and learning mathematics

Questions and Comments