Using Realistic Mathematics Education in Secondary Schools: What does progress look like?

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Presentation overview

- Description of two projects and associated research
- Looking at the work of project and 'control' pupils for the two projects
- Exploring the conjecture that "*it is possible to develop both content knowledge and problem solving skills using an approach based on Realistic Mathematics Education (RME)*".

Project 1 - Maths in context

- 2004-05: six secondary schools, year 7 pupils
- 2005-06: twelve secondary schools, year 7 and 8 pupils
- 2006-08: limited extension, year 7,8 and 9 in local schools + 16 schools clustered around 4 regional universities

The project focused on three main issues:

- Developing an understanding of RME in an English context
- Understanding how learners develop
- Supporting teachers to develop practical skills and a deep knowledge of RME

Insanity: doing the same thing over and over again and expecting different results.
Albert Einstein

Project 2 – Making Sense of Maths

- Collaboration with Freudenthal Institute
- 2007-08: six secondary schools, year 10 pupils
- 2008-10: ten secondary schools, year 10 and 11 pupils

The project focused on three main issues:
- Development of new materials
- Understanding how learners develop
- Supporting teachers to develop practical skills and a deep knowledge of RME

Data collection

Data collected from Project & Control pupils based on
- KS3 Sats & KS4 GCSE results
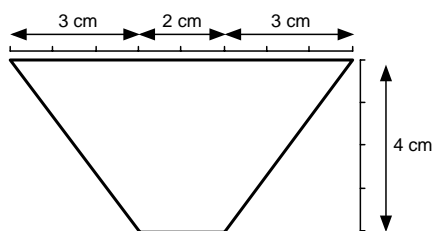- Problem Solving Tests
- Attitude questionnaires

KS4 GCSE results 2009

	Average KS3 level	Average KS4 level	Average value added
Project (n = 70)	5.1	6.5	1.4
Control (n = 102)	5.1	5.9	0.8

Problem Solving Results

- Area
- Fractions

Problem solving 1

3 cm   2 cm   3 cm

4 cm

Yr7&8 Trapezium N=100	% 'making Sense'	% Correct
Project	74%	52%
Control	32%	30%

(b) Find the area of the shape shown below.

Show carefully how you worked it out.

12cm

3 cm   2 cm   3 cm

4 cm
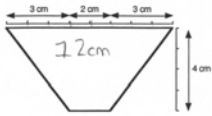
I got this because 3×2×3×4 = 48
and the I divided by 4 because
there a 4 numbers.

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1. Find the area of the shape shown below.
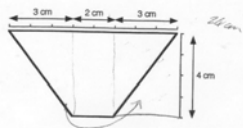
Show carefully how you worked it out.

88cm.

3 cm   2 cm   3 cm

4 cm

3×? = 6
3×6 = 18
4×11 = 64

64
18
+ 6
88

18
×4
64

8×4 = 32 cm

(b) Find the area of the shape shown below.

Show carefully how you worked it out.

3 cm   2 cm   3 cm

24 cm

4 cm

realloted the triangle on the left to make a
rechangle and times 6×4 = 24 So the area
the shape = 24 cm².

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1. Find the area of the shape shown below.
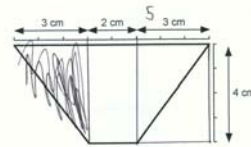
Show carefully how you worked it out.

3 cm   2 cm   5   3 cm

4 cm

5 cm × 4 cm = 20 cm²

(b) Find the area of the shape shown below.

Show carefully how you worked it out.
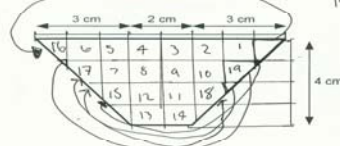
4½

3 cm   2 cm   3 cm

4 cm
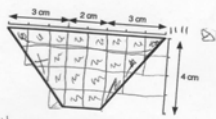
15 whole squares.

I divided the shape into squares
and counted how many whole
squares there was there was 15.
I then added pieces to other pieces
to make them whole and I got 4½
I added this to 15 so it was
the area of 19 ½

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4 b project

(b) Find the area of the shape shown below.

Show carefully how you worked it out.

19 ½.

3 cm   2 cm   3 cm

4 cm

I think its 19½ squeares because I reallotd
them to fit together to form a whole
squeare and then I added them all together
and got 19½!

Pupils may attempt to solve a problem by

- Engaging solely with the numbers

- Attempting to make sense of the problem

The journey to formal mathematics

- Teacher as developer

- Teacher as replacer

Problem Solving 2

Find

$$\frac{1}{4} + \frac{1}{2}$$

Do you think you have got this right?

Explain why.

Year 11 Fractions N=50	% correct Target grade C	% Correct Target Grade D/E
Project	83%	57%
Control	72%	30%

Top left:

2. a) Find $\frac{1}{4} + \frac{1}{2}$

$\frac{2}{4} + \frac{4}{16}$

Do you think you have got this right? I am not too sure.

Explain why.
Because I learnt how to do these at saturday maths class a couple of weeks back but have not revised this topic recently and this was all I could remember.

3. (4)

Top right:

2. a) Find $\frac{1}{4} + \frac{1}{2}$ $\frac{1+2}{4+4} = \frac{3}{8}$

Do you think you have got this right?

Explain why.
I changed the fractions so they were equal and had the same denominator then I had to add the top numbers 1+2=3 then I added the bottom numbers 4+4=8 so My answer became $\frac{3}{8}$

b) Circle which you think is the largest fraction $\frac{3}{}$ or $\frac{4}{}$

Middle left:

2. a) Find $\frac{1}{4} + \frac{1}{2}$

$= \frac{2}{4} + \frac{4}{6}$

Do you think you have got this right? NO

Explain why.
im not very good at fractions

Middle right:

2. a) Find $\frac{1}{4} + \frac{1}{2} = \frac{2}{6}$

$\frac{1}{3}$

Do you think you have got this right? Yes.

Explain why.
Because I added the top numbers together then the bottom which was $\frac{2}{6}$ the simplyfied it to $\frac{1}{3}$

Bottom left:

2. a) Find $\frac{1}{4} + \frac{1}{2} = \frac{2}{6}$

Do you think you have got this right?

Explain why. yes I do think it is right because 1+1=2 and 4+2=6 so it must be.

Bottom right:

2. a) Find $\frac{1}{4} + \frac{1}{2}$

I am stuck with this question because I forgot the method.

Do you think you have got this right?

Explain why.

2. a) Find $\frac{1}{4} + \frac{1}{2} = \frac{3}{4}$

Do you think you have got this right?
yes

Explain why.

2. a) Find $\frac{1}{4} + \frac{1}{2} = \frac{3}{4}$

Do you think you have got this right?

Explain why.

because there are 4 quarters in a whole and 1 half = 2 quarters + 1 quarter = 3/4

2. a) Find $\frac{1}{4} + \frac{1}{2} = \frac{6}{8}$

Do you think you have got this right?

Explain why.

What is it about an RME based approach which produces these apparent differences?

RME Based Approach

- Well researched activities encourage pupils to move from informal to formal representations
- Use of context sustained throughout
- Use of *models* to support pupil development
- Progress towards formal notions seen as a long-term process.

Some of the Parts

Formal.
Abstract.
World of Maths

Equivalence, addition …

Contexts

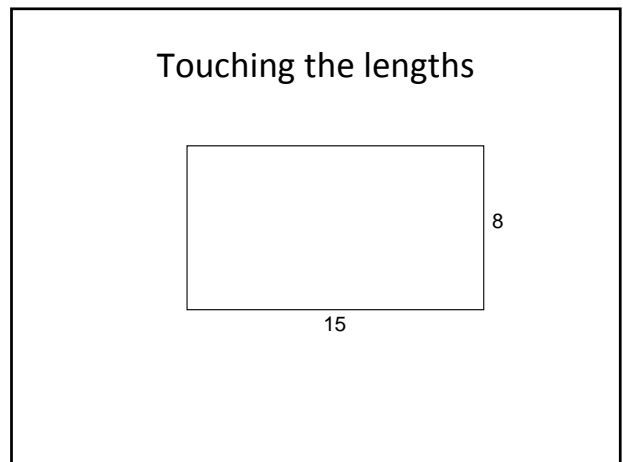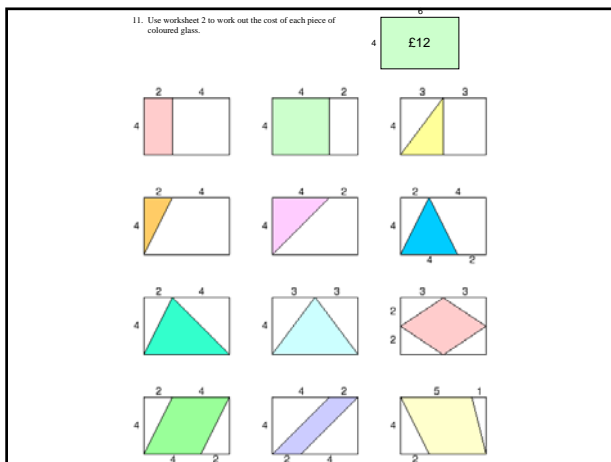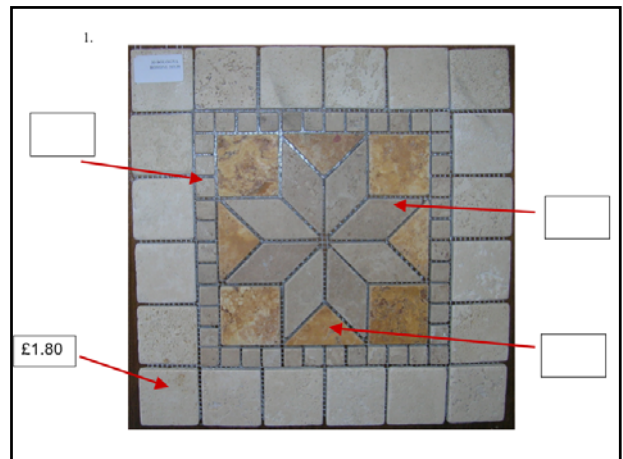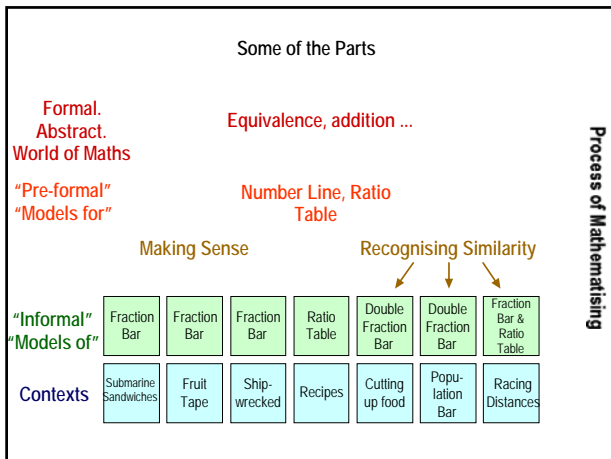| Submarine Sandwiches | Fruit Tape | Ship-wrecked | Recipes | Cutting up food | Popu-lation Bar | Racing Distances |

Slide 1

Some of the Parts

Formal.
Abstract.
World of Maths

Equivalence, addition …

"Pre-formal"
"Models for"

Number Line, Ratio
Table

Making Sense   Recognising Similarity

"Informal"
"Models of"

| Fraction Bar | Fraction Bar | Fraction Bar | Ratio Table | Double Fraction Bar | Double Fraction Bar | Fraction Bar & Ratio Table |

Contexts

| Submarine Sandwiches | Fruit Tape | Ship-wrecked | Recipes | Cutting up food | Popu-lation Bar | Racing Distances |

Process of Mathematising

Slide 2

1.

£1.80

Slide 3

11. Use worksheet 2 to work out the cost of each piece of coloured glass.

£12

Slide 4

Touching the lengths

8

15

Slide 5

Access to the classroom resources

- The 'Making Sense of Maths' units are available on the MEI VLE for a charge of £150

- To sample a taster of the materials visit the MEI website www.mei.org.uk/gcse and click on teaching resources

Slide 6

Contacts

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