

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

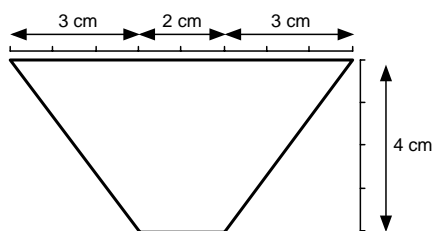
KS4 GCSE results 2009

	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

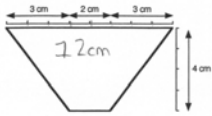
Problem solving 1



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

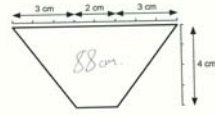
Questions 1 continued

- (b) Find the area of the shape shown below.
Show carefully how you worked it out.



I got this because $3 \times 2 \times 3 \times 4 = 48$
and the 1 divided by 4 because
there a 4 numbers.

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



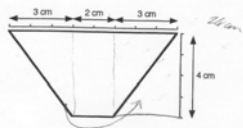
~~32~~
~~32~~ = 32 cm

$$\begin{array}{r} 64 \\ 18 \\ + 6 \\ \hline 88 \end{array}$$

$$\begin{array}{r} 3 \times 2 = 6 \\ 3 \times 6 = 18 \\ 4 \times 17 = 68 \\ \hline 18 \\ + 64 \\ \hline 82 \end{array}$$

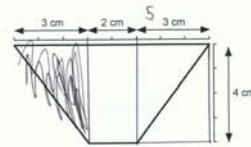
Questions 1 continued

- (b) Find the area of the shape shown below.
Show carefully how you worked it out.



reallotted the triangle on the top so make a
rectangle and since $6 \times 4 = 24$ so the area
the shape = 24 cm^2 .

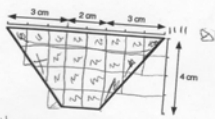
1. Find the area of the shape shown below.
Show carefully how you worked it out.



$$5 \text{ cm} \times 4 \text{ cm} = 20 \text{ cm}^2$$

Questions 1 continued

- (b) Find the area of the shape shown below.
Show carefully how you worked it out.



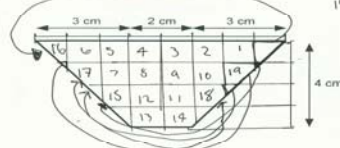
15 whole squares.

I divided the shape into squares
and counted how many whole
squares there was there was 15.
I then added pieces to other piece
to make them whole and I got $4\frac{1}{2}$
I added this to 15 so it was
the area of $19\frac{1}{2}$.

4b project

Questions 1 continued

- (b) Find the area of the shape shown below.
Show carefully how you worked it out.



I think its $19\frac{1}{2}$ squares because I reallotted
them to fit together to form a whole
square and then I added them all together
and got $19\frac{1}{2}$!

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%

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

$$\frac{6}{8} = \frac{3}{4}$$

Do you think you have got this right?

yes

Explain why.

by ~~timings~~ timing them together
you get your factor

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

$$\frac{4}{4}$$

Do you think you have got this right?

yes

Explain why.

I Did the grid way

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)

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

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 $\frac{3}{8}$.

3. Circle which you think is the largest fraction $\frac{3}{8}$ or $\frac{4}{11}$.

2. a) Find $\frac{1}{4} + \frac{1}{2} = \frac{2}{4} + \frac{4}{4} = \frac{6}{4} = \frac{3}{2}$

Do you think you have got this right? NO

Explain why.
I'm not very good at fractions

2. a) Find $\frac{1}{4} + \frac{1}{2} = \frac{3}{6}$

$$\frac{1}{3}$$

Do you think you have got this right?

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

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.

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 = $\frac{3}{4}$

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.

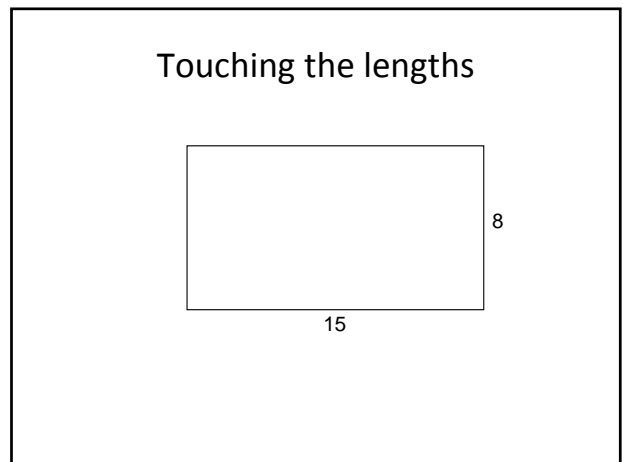
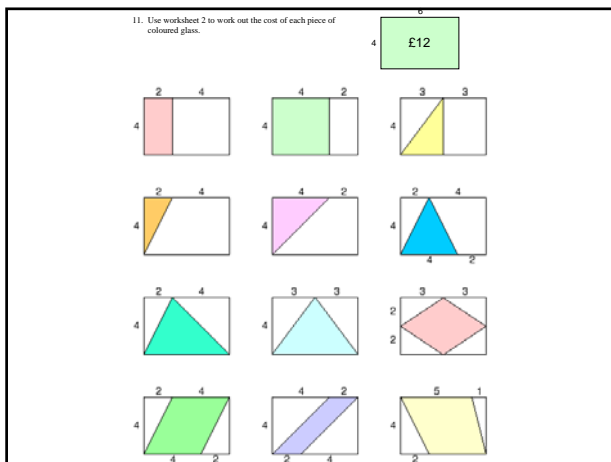
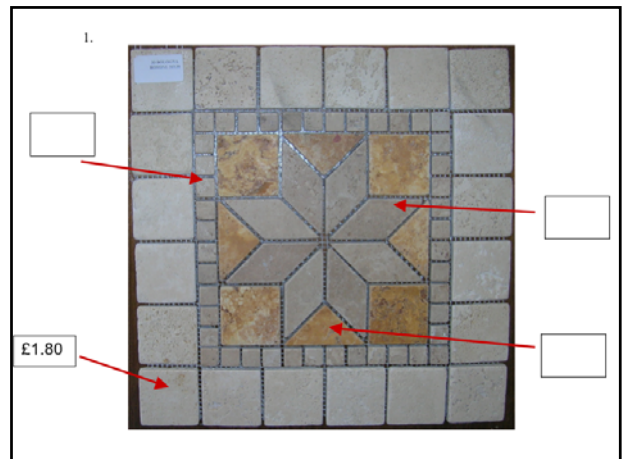
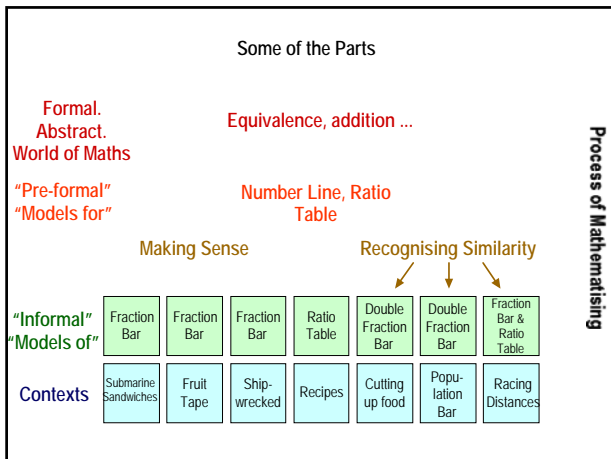
Some of the Parts

Formal.
Abstract.
World of Maths

Equivalence, addition ...

Contexts

Submarine Sandwiches	Fruit Tape	Ship-wrecked	Recipes	Cutting up food	Population Bar	Racing Distances
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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

Contacts

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