The Model Method: A Tool for Representing & Solving Word Problems

Workshop Objective

You will be guided through some of these problem solving methods and strategies which include

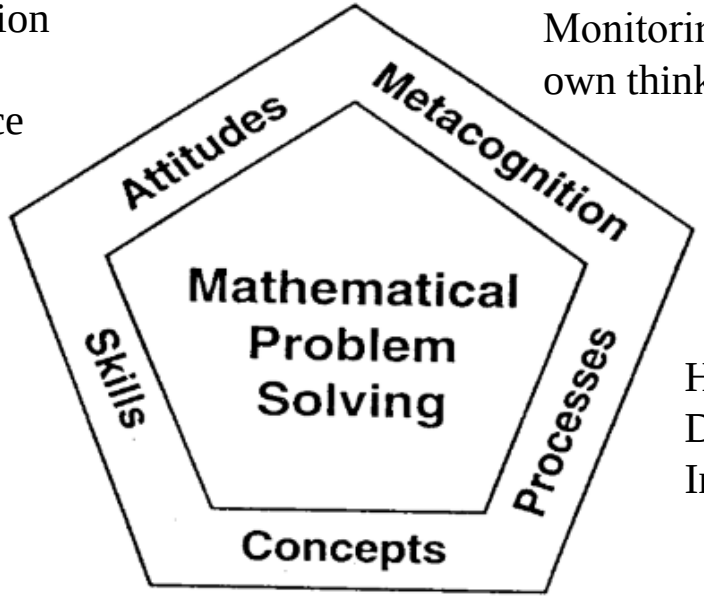
- different stages of problem solving
- model-drawing

Workshop Overview

- Mathematics Curriculum Framework
- Stages of Problem Solving
- Introduction to the Model Method
- Hands-on Experience

MOE Mathematics Curriculum Framework

1991 - 2000



Appreciation
Interest
Confidence

Monitoring one's own thinking

Estimation and Approximation
Mental calculation
Communication
Use of mathematical tools
Arithmetic manipulation
Algebraic manipulation
Handling data

Heuristics
Deductive reasoning
Inductive reasoning

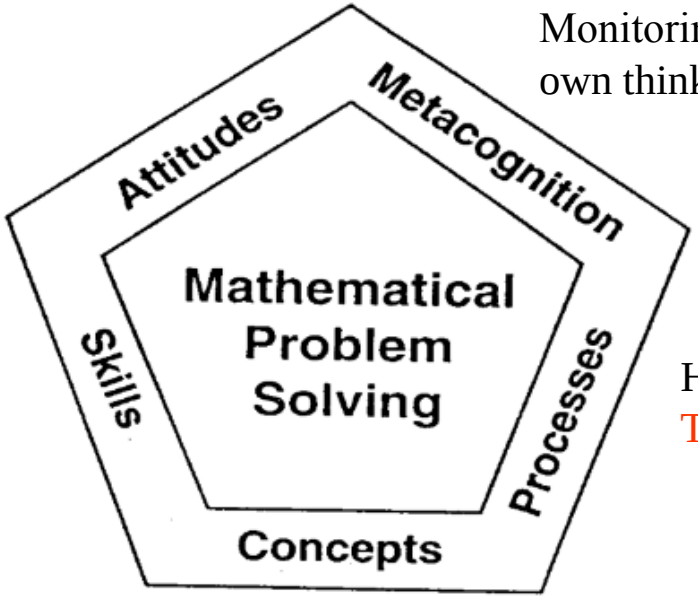
Numerical
Geometrical
Algebraic
Statistical

MOE Mathematics Curriculum Framework

2001 - 2006

Appreciation
Interest
Confidence
Perseverance

Monitoring one's own thinking



Estimation and Approximation
Mental calculation
Communication
Use of mathematical tools
Arithmetic manipulation
Algebraic manipulation
Handling data

Heuristics
Thinking skills

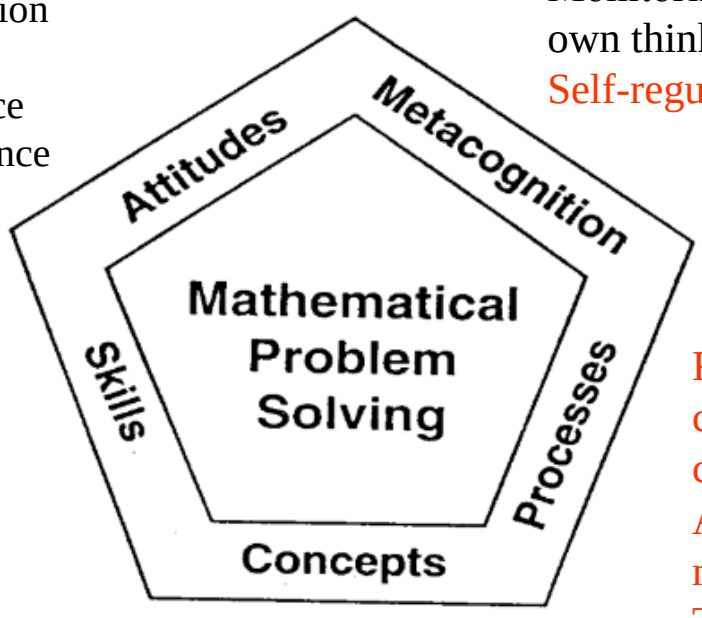
Numerical
Geometrical
Algebraic
Statistical

MOE Mathematics Curriculum Framework

2007 & Beyond

Beliefs
Appreciation
Interest
Confidence
Perseverance

Monitoring one's own thinking
Self-regulation of learning



Numerical calculation
Algebraic manipulation
Spatial visualisation
Data analysis
Measurement
Use of mathematical tools
Estimation

Reasoning, communication & connections
Applications and modeling
Thinking skills and heuristics

Numerical
Geometrical
Algebraic
Statistical
Probabilistic
Analytical

Phases in Problem Solving

- Understanding the Problem
- Devising a plan to solve the problem
- Carrying Out the Plan
- Looking Back

Learning from research about the model method…

The table show the strategies used by pupils and their success rate.

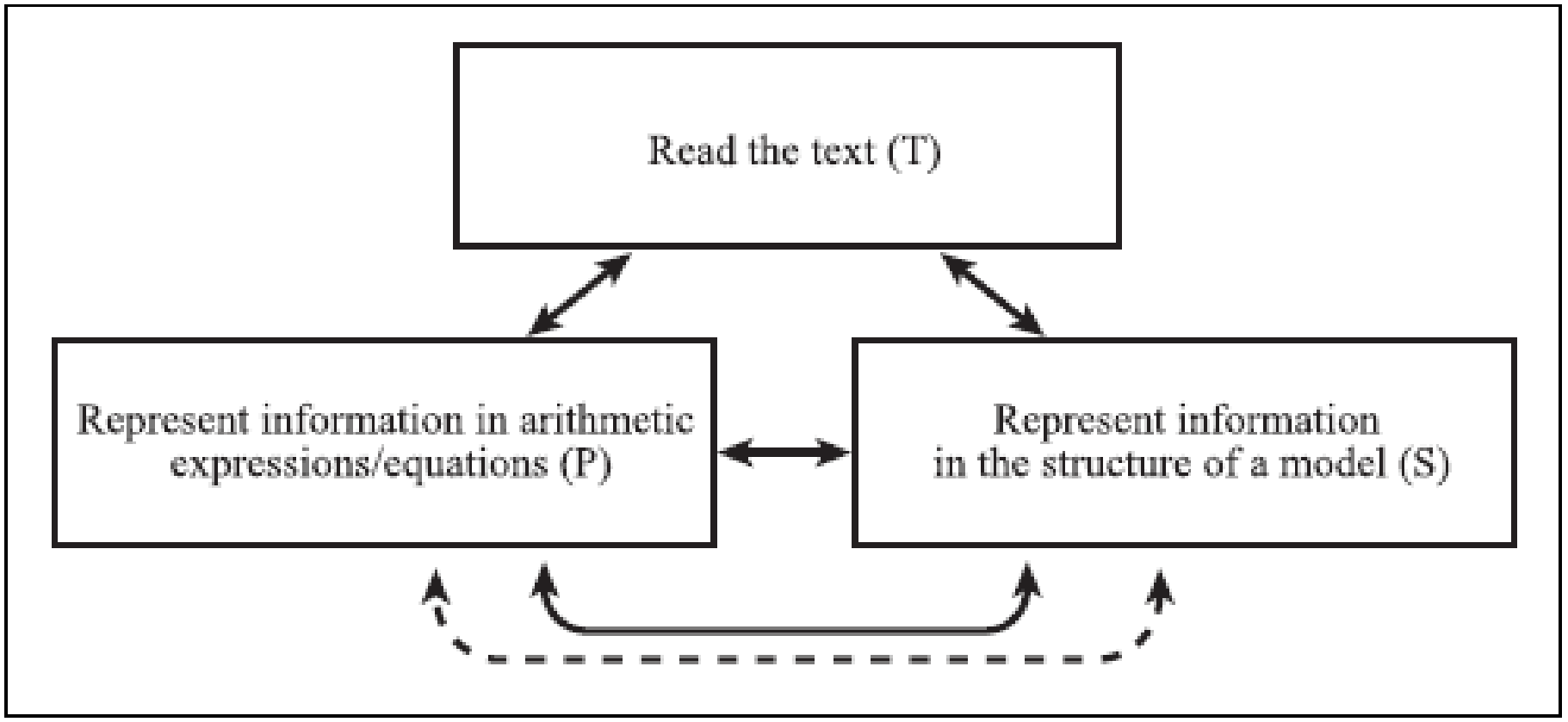
Pupils	Used the model method		Used number sentences	
	No. of pupils	No. successful	No. of pupils	No. successful
High-achievers n = 3	3	3	0	0
Mid-achievers n = 10	10	10	0	0
Low-achievers n = 19	10	8	3	1

Learning from research about the model method…

Six potential areas of difficulty pupils have when solving word problems:

1. Difficulty in reading the text
2. Difficulty in comprehending the text
3. Lack suitable strategies to handle the problem
4. Not able to transform information in the text into mathematical forms
5. Lack computational skills
6. Unable to use computation results to solve the problems

Phases of Problem Solution by Children Using the Model Method



Why Model Method?

Would you rather read a long description of ice cream?

Creamy yumm e cre n
chocolate nt ice c awberr am with
real chu wberr sug veet,
wonderfu great, c to eat
comfort un, d ific, a hot
day…

Or look at the picture?

The Model Method helps pupils to …

- visualise the situations described in word problems
- gain a deeper understanding of the operations they may use to solve problems
- see relationships between and among the variables in the problem

Features of Bar Models…

- The length of the rectangular bars should be drawn in proportion to each other
  - Captures constraints given in the problem
  - Shows the relationship between and among quantities
- The available information is recorded onto the models and question marks are used to indicate the computation needed to find unknown information

Model Drawing

Part Whole Model

Comparison Model

Before-After Model

Steps in Problem Solving (4-Step Polya Approach)

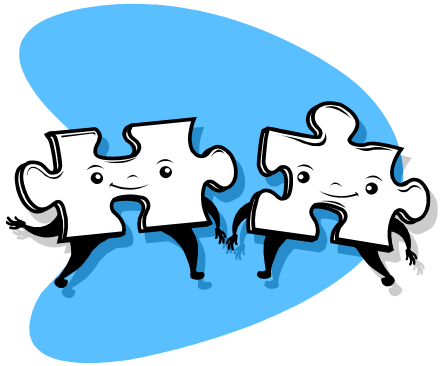
1. **Read & Understand the problem**
   Look for information given
   Visualize, organize and connect the information

2. **Devise a plan**
   Model-drawing

3. **Carry out the plan**

4. **Reflect/Check**

Part Whole Model



Level 1:

Peter had 160 stickers. He gave away $\frac{3}{4}$ of his stickers. How many stickers did he give away?

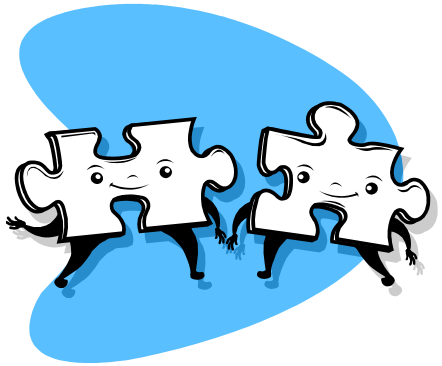
Level 2:

Peter gave away $\frac{3}{8}$ of his stickers and have 100 left. How many stickers does he have at first?

Level 3:

Peter had 160 stickers. After he gave 30 stickers to his friend and some to his sister, he had $\frac{3}{5}$ of his stickers left. How many stickers did he give to his sister?

Comparison Model



Level 1:

Raeann paid $243 for 2 pairs of jeans and 3 T-shirts. Each pair of jeans cost thrice as much as a T-shirt. How much did each pair of jeans cost?

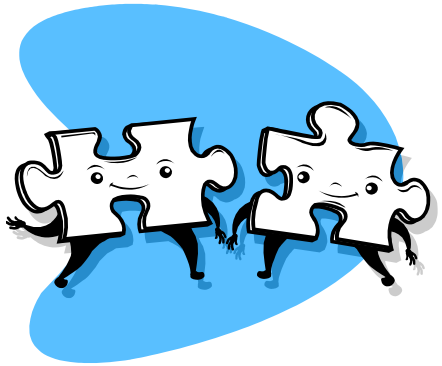
Level 2:

Jolene paid $252 for 2 dresses and 3 blouses. Each dress cost thrice as much as a blouse. How much did two blouses cost?

Level 3:

Mr Lee bought 2 flasks and 5 mugs for $60. Each flask cost 5 times as much as a mug. What was the difference in cost between a flask and a mug?

Before-After Model



Level 1:

Susan has 110 muffins.

Jane has 34 muffins.

How many muffins should Susan give to Jane so that they have the same number of muffins?

Level 2:
Susan has 110 muffins.
Jane has 34 muffins.
How many muffins should Susan give to Jane so that Susan has 3 times as many muffins as Jane?

Level 3:

Susan has 110 muffins.

Jane has 34 muffins.

How many muffins should Susan give to Jane so that the Susan has 20 more muffins than Jane?

- **More Problem-solving Heuristics Websites :**

http://www.onlinemathlearning.com/singapore-math.html

- **Video & worksheets on model-drawing**

http://www.thesingaporemaths.com/stratf.html

- **Ask and Learn Portal**

Q & A


thank
you