

MAWA Annual Primary Mathematics Conference

Igniting the Flames

19 November 2018 | Crown Convention Centre, Perth

Opening Keynote Address

Making Students Problem Solvers: Why and How?

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Anita
Chin

inspired
mathematics
teaching

Welcome and congratulations

IGNITING THE FLAMES

Data Chance
STEM Measurement
Mindset **Problem-Solving**
Reasoning Algebra Probability Practice Persevere
Inquiry **Number** Authentic Geometry Numeracy

Ready to fall in love with maths?



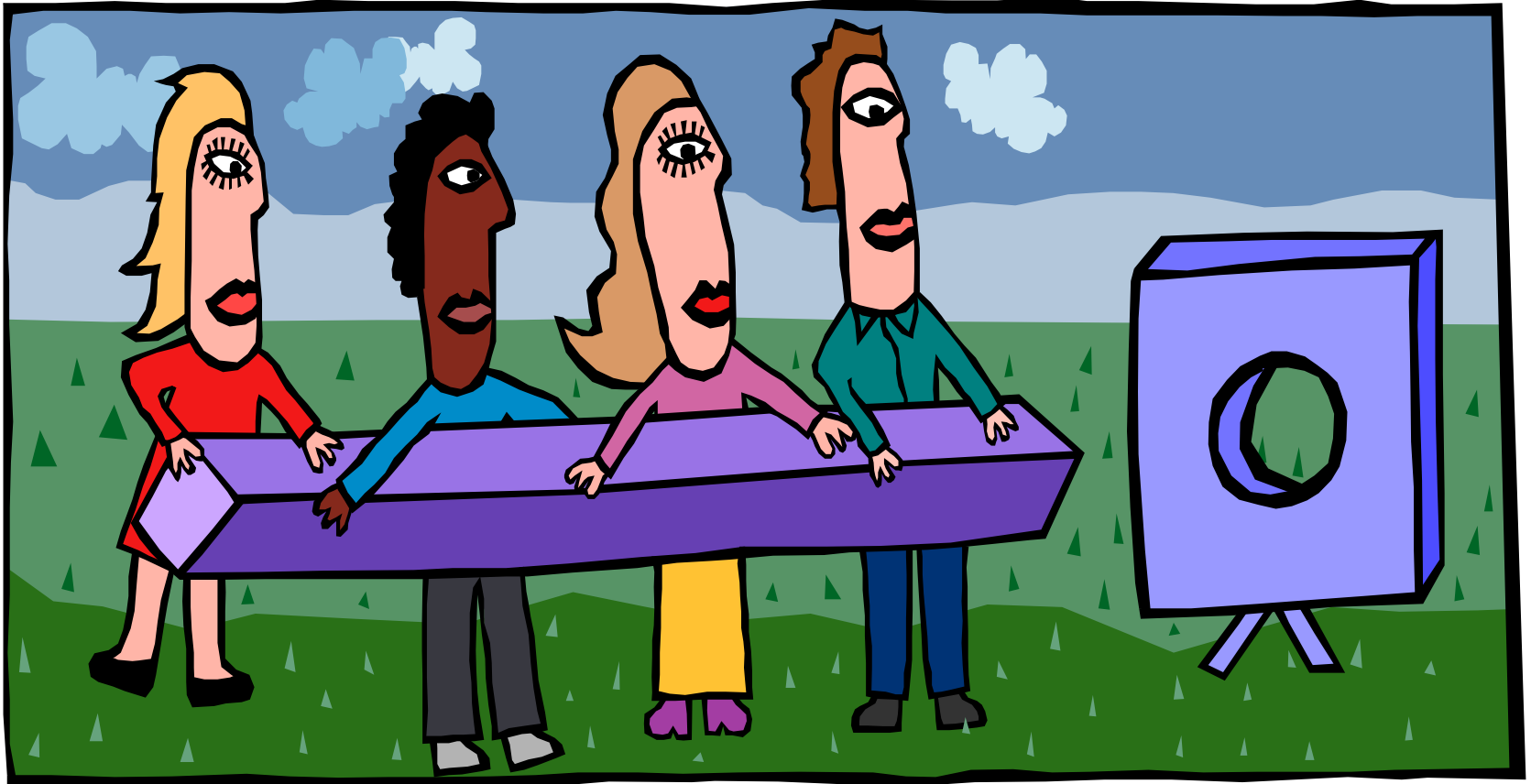
Anita is on a mission to create a generation of confident, inspired mathematicians.



Overview

1. WHAT is 'problem solving'?
2. WHY do we need our students to be problem solvers?
3. What CHALLENGES do we face?
4. HOW can we do this in the classroom?

STEP 1: What is problem solving?



Problem solving

How do you FEEL when
you hear the phrase
'problem solving'?



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Problem solving



Problem solving



A primary school team after a ChinUP PL event with Anita Chin.
Palmerston, ACT | 2017



Problem solving

What do you THINK when
you hear the phrase
'problem solving'?



Problem solving – responses

- I don't know where to find good tasks
- I just don't have time to plan for that
- I don't have time to teach problem solving
- Yeh right, you obviously haven't met my class
- Why do I have to teach problem solving?

Problem solving – responses

- I try to teach problem solving as best as I can
- My kids love maths when they have to think hard about something different
- My class now really enjoys having to convince each other why their reason makes sense.

What is problem solving?

- One of the Mathematics PROFICIENCIES in the Australian Curriculum.

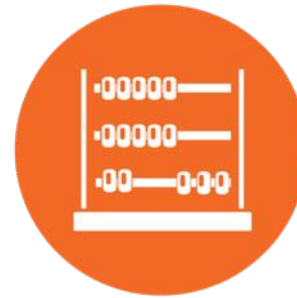
Mathematics proficiencies introduction video by Peter Sullivan
<https://www.australiancurriculum.edu.au/resources/mathematics-proficiencies/>



Mathematics proficiencies



Understanding



Fluency



Problem
Solving



Reasoning

What is fluency?

*Fluency is about being
able to perform calculations
readily and accurately.
It's not about speed.*

Peter Sullivan

Mathematics proficiencies introduction video by Peter Sullivan
<https://www.australiancurriculum.edu.au/resources/mathematics-proficiencies/>



Fluency

$$7 + 8 =$$

$$2 + 4 =$$

$$6 + 9 =$$

$$1 + 5 =$$



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Fluency and reasoning

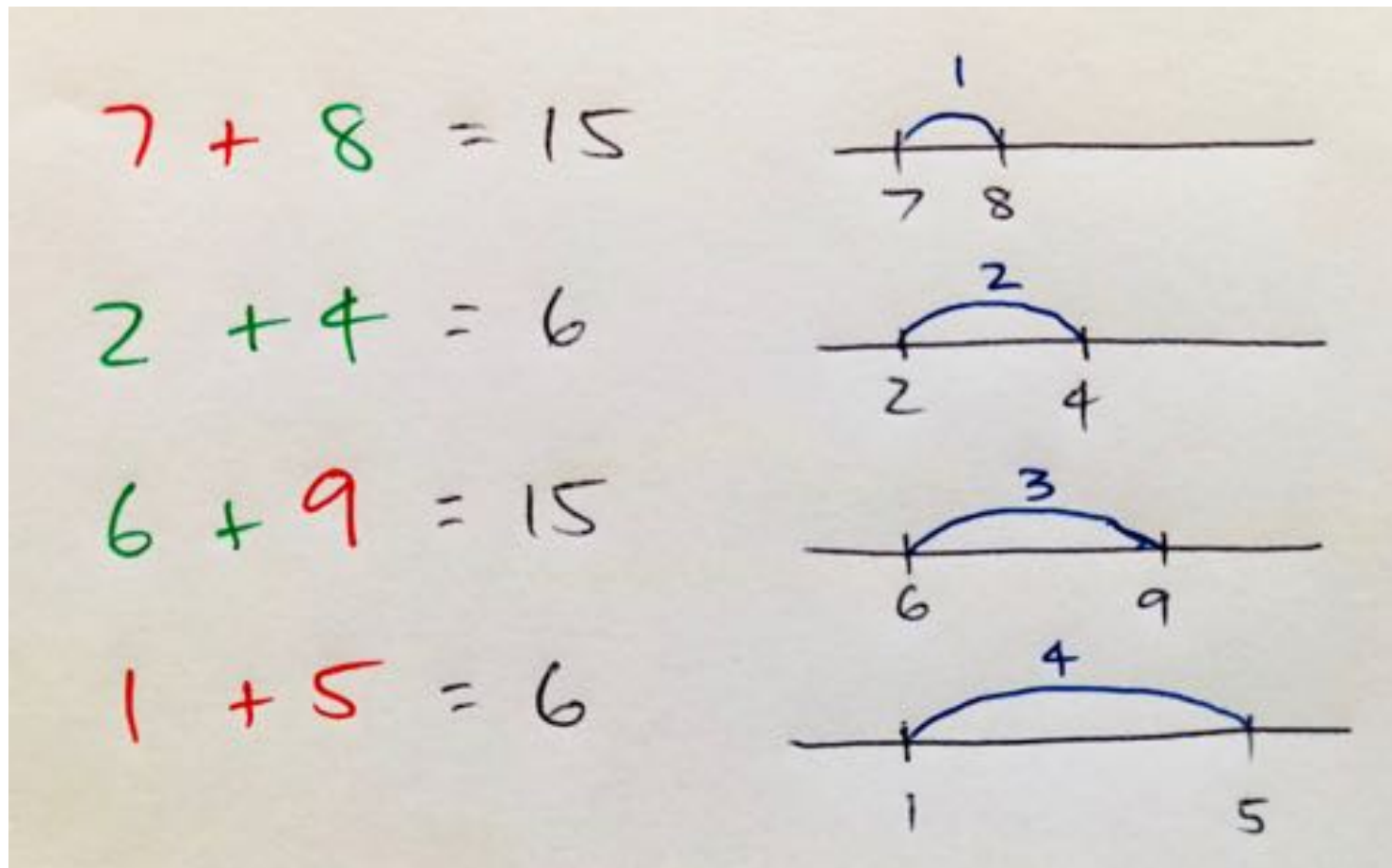
$$\begin{array}{rcl} 7 + 8 & = & 15 \\ 2 + 4 & = & 6 \\ 6 + 9 & = & 15 \\ 1 + 5 & = & 6 \end{array}$$

Fluency

Reasoning Eg. double 7 is 14 and 1 more makes 15

$$\underline{7 + \overset{8}{(7 + 1)}} = 14 + 1 = 15$$

What do you notice?



Human calculator or a thinker?

The study of mathematics provides opportunities for students to appreciate the elegance and power of mathematical reasoning (BOSNSW, 2012, p13).



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What is problem solving?

*Problem solving is about solving problems
that you don't know how to do.*

*It's not problem solving if you already
know how to do it.*

Peter Sullivan

What is problem solving?



What is problem solving?



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STEP 2. Why do students need to be problem solvers?

*Reasoning is essential to mathematics and
is what mathematics is about...*

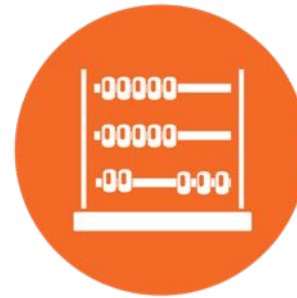
*It forms the foundation of mathematical
thinking and mathematical learning.*

Peter Sullivan

Proficiencies = student centred learning



Understanding



Fluency



Problem
Solving



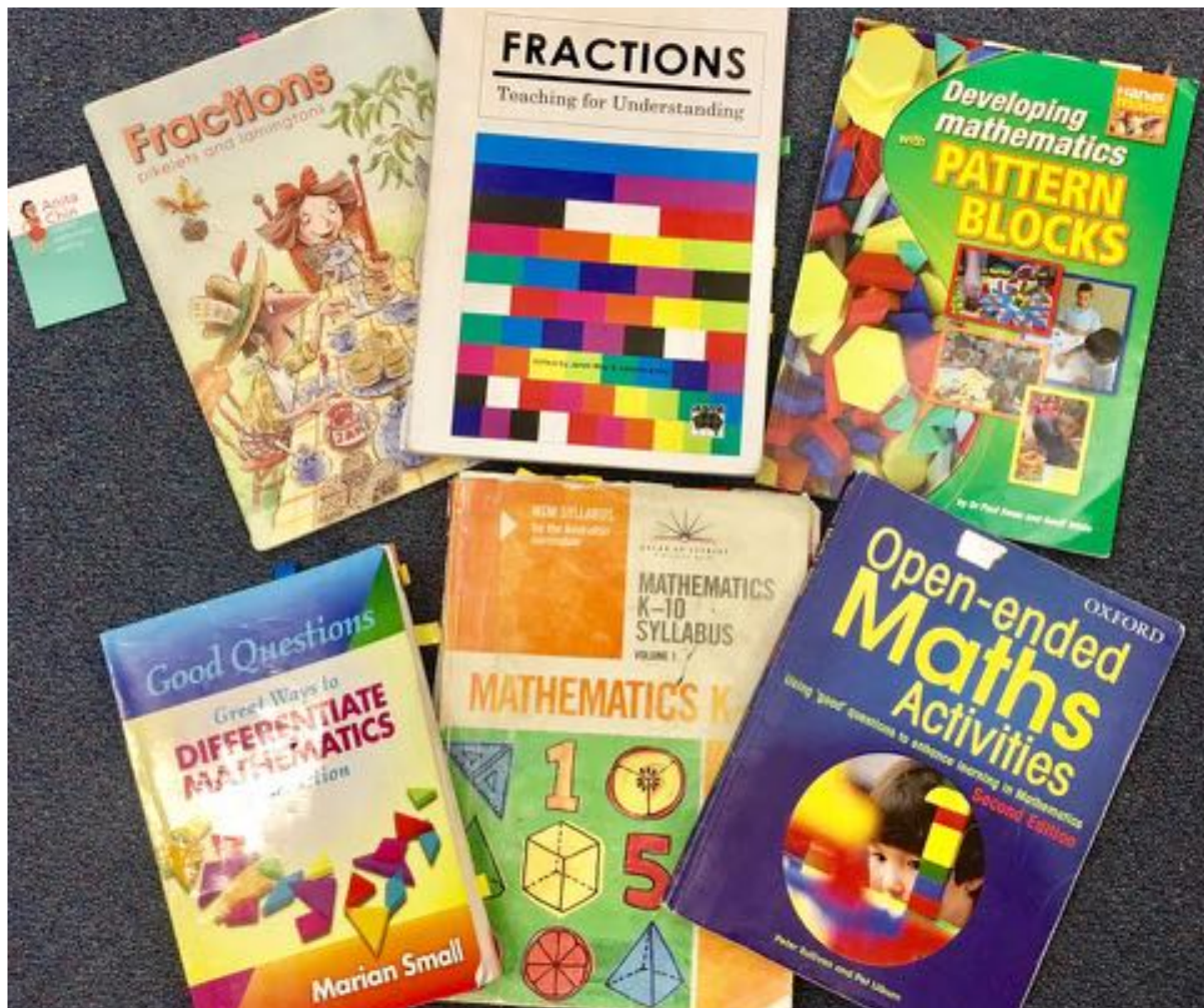
Reasoning

STEP 3. But...

- There's too much content to teach...
- I have a huge range of ability in my class...
- The kids don't know...
- We don't have enough equipment...
- I'm not confident teaching mathematics.

Some of the challenges we face every day in our classrooms!





Teacher reference books for teaching Fractions K-6: Research basis, the syllabus, good tasks, use of tools, open-ended questions for talk.





Equipment lists, packaging ideas, and tips for how to use equipment available from Anita's website www.anitachinmaths.com.au/resources



addition	subtraction
$2 + 4 = 6$	$6 - 2 = 4$
2 combined with 4 makes 6	6 take-away 2 is 4
2 add 4 is 6	6 subtract 2 is 4
2 plus 4 equals 6	6
the sum of 2 and 4 is 6	the difference
2 increased by 4 makes 6	6 decreased by 2 is 4
4 more than 2 is 6	2 less than 6 is 4
six is four greater than two	four is 6 less than 10

WORD WALL: Addition and subtraction language

© Anita Chin Ma

multiplication	division
$4 \times 3 = 12$	$12 \div 3 = 4$
3 groups of 4 makes 12	12 shared between 3 is 4
3 rows of 4 is 12	12 shared amongst 3 is 4
4 multiplied by 3 equals 12	12 divided by 3 is 4
the product of 4 and 3 is 12	the quotient of 12 and 3 is 4

WORD WALL: Multiplication and division language

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Mathematical language: Student scaffold sheets (used in plastic sleeves).



STEP 4. You can do it!



Task #1

Starting at the number that is neither prime nor composite, prove that the sum of the ten consecutive integers (in ascending order) is 55.

Task #1... worded differently

Starting at one, add the first ten counting numbers and show that altogether they total 55.



Task #1... with a visual model

Prove that the sum of the ten numbers in the first horizontal row is 55.

1 to 100 Number Chart

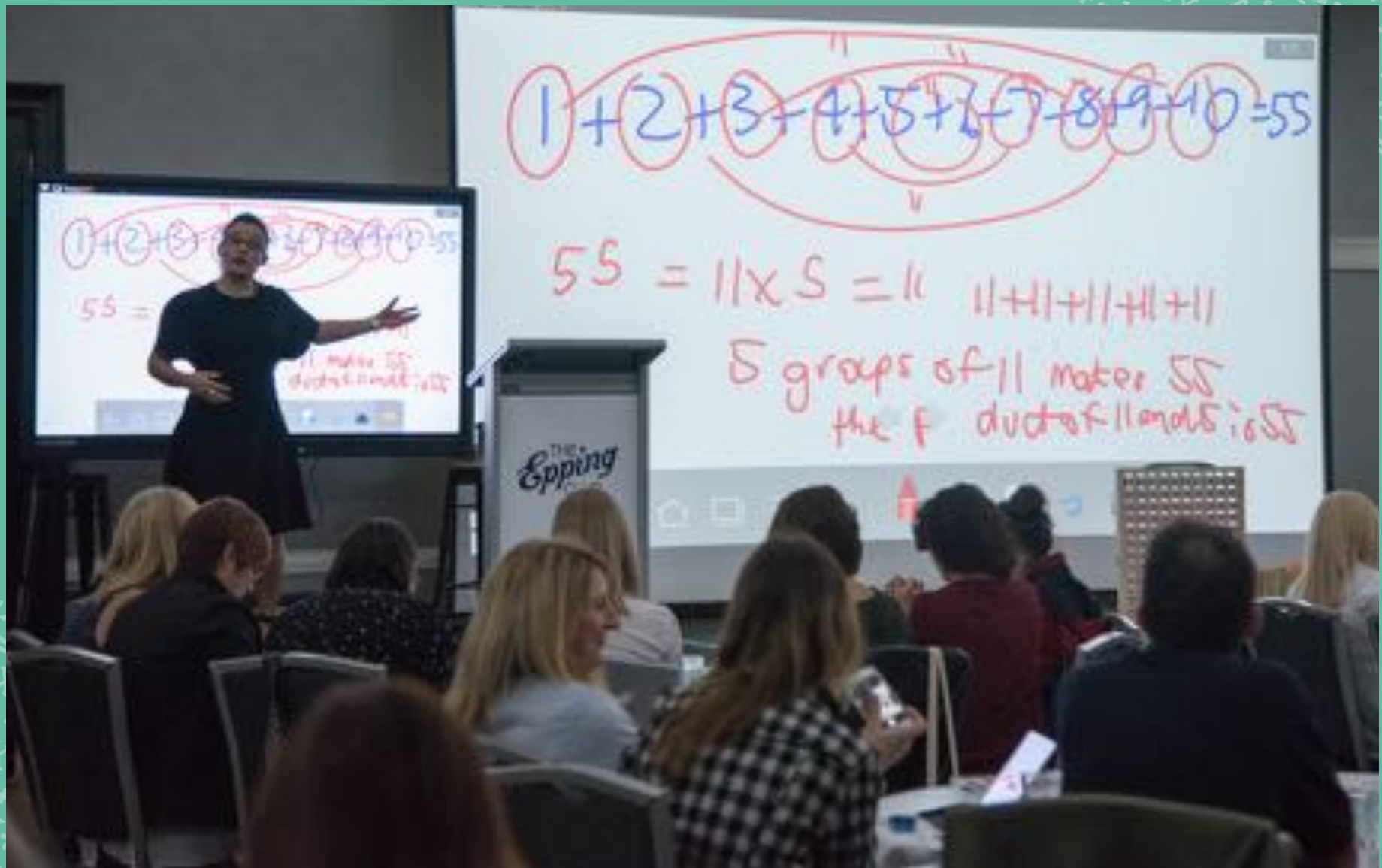
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

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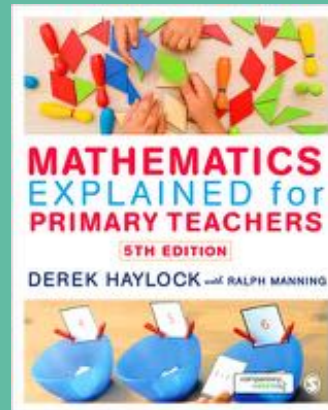


Student hundreds chart whiteboard inserts available to download from Anita's website www.anitachinmaths.com.au/resources





The 3 G's of problem solving



Haylock, D (2010). *Mathematics explained for primary teachers*. 4th Ed. Thousand Oaks, California: SAGE. Chapter 5, p57. [More details](#).

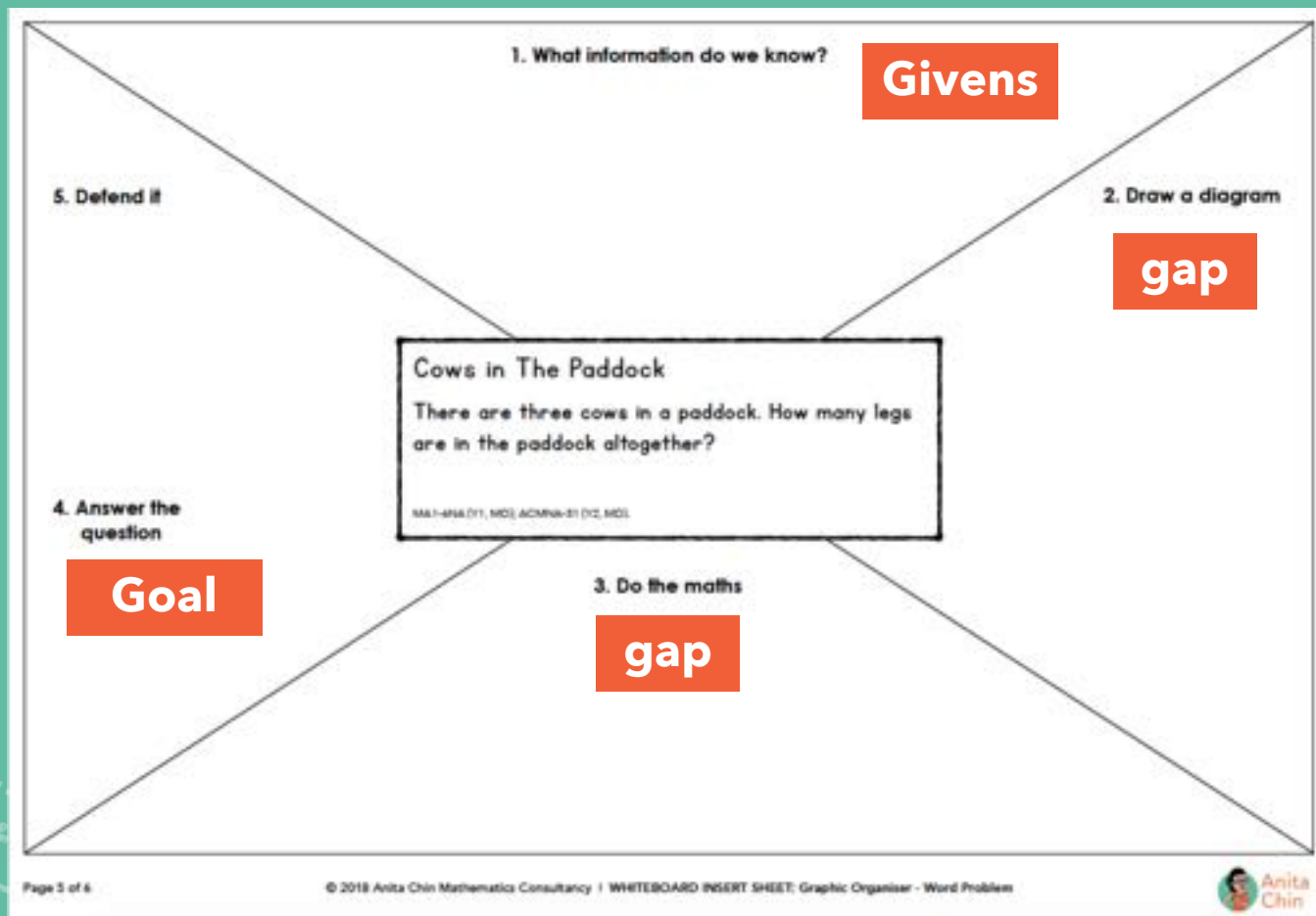


Task #2 – Worded problem

Cows in The Paddock

There are three cows in a paddock. How many legs are in the paddock altogether?

Introducing my 'Think Map'



BLM 'Graphic Organiser: Think Map (solving word problems using multiplicative thinking)' available to download from Anita's website www.anitachinmaths.com.au/resources



1. What information do we know?

GIVENS

Number of groups (cows) = 3

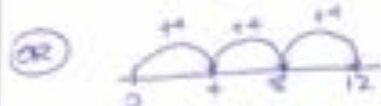
Number in each group (legs) = 4

How many legs altogether = ?

5. Defend it



$$4 + 4 + 4 = 10 + 2 = 12$$



4. Answer the question

GOAL

There are 12 legs
in the paddock
altogether.

Cows in The Paddock

There are three cows in a paddock. How many legs
are in the paddock altogether?

MAT 4NA (Y1, M2), ACORNABT (Y2, M2)

2. Draw a diagram

GAP



Cow 1



Cow 2



Cow 3

one leg is
a "x"

3. Do the maths

GAP

(B) $4 \times 3 = 12$

Known fact

(Y1) $4 + 4 + 4 = 8 + 4 = 10 + 2 = 12$

use of mental strategies

(Y1) $4 + 4 + 4 = 12$

use of known facts

(K) 1, 2, 3, 4 | 5, 6, 7, 8 | 9, 10, 11, 12

counts by ones

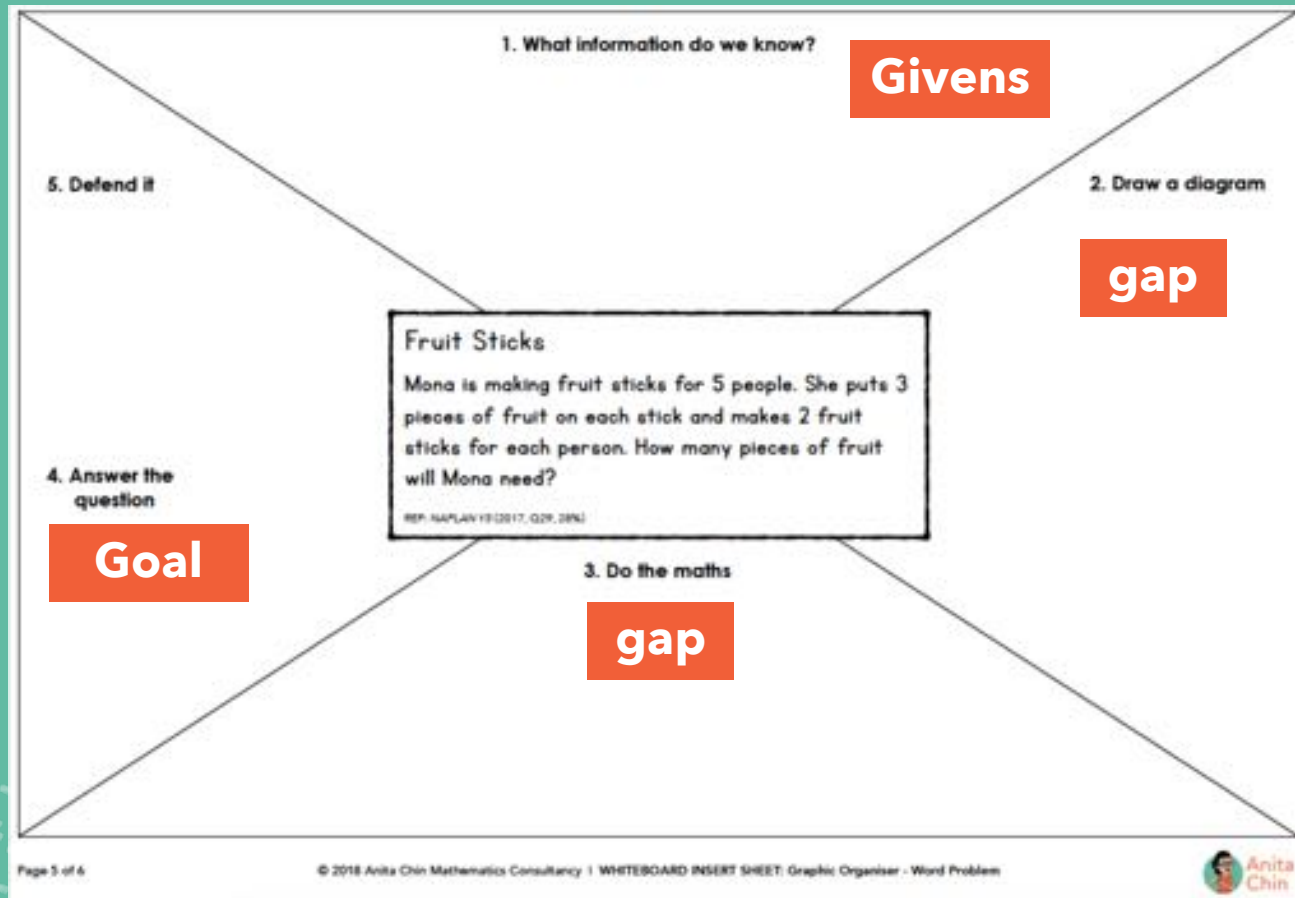


Task #3 – Worded problem

Fruit Sticks

Mona is making fruit sticks for 5 people. She puts 3 pieces of fruit on each stick and makes 2 fruit sticks for each person. How many pieces of fruit will Mona need?

Task #3 – What are the 3 G's?



BLM 'Graphic Organiser: Think Map (solving word problems using multiplicative thinking)' available to download from Anita's website www.anitachinmaths.com.au/resources



1. What information do we know?

GIVENS

Number of groups (people) = 5

Number in each group (pieces of fruit) = $3 + 3 = 6$

2 fruit sticks with 3 pieces on each

How much fruit altogether = ?

5. Defend it



$$6 + 6 + 6 + 6 + 6 = 6 \times 5 = 30$$

4. Answer the question

GOAL

Fruit Sticks

Mona is making fruit sticks for 5 people. She puts 3 pieces of fruit on each stick and makes 2 fruit sticks for each person. How many pieces of fruit will Mona need?

REF: NAPLAN Y3/2011, Q29, 38%

2. Draw a diagram

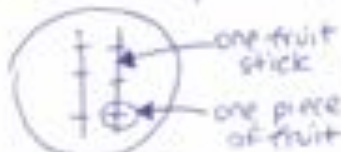
GAP



person 1



person 2



person 3



person 4



person 5

"5 groups of 6"

3. Do the maths

GAP

(43) $6 \times 5 = 30$ known fact

(y1) $6 + 6 + 6 + 6 + 6 = 12 + 12 + 6 = 24 + 6 = 30$

use of mental strategies

(K) 1, 2, 3 | 4, 5, 6 | 7, 8, 9 | 10, 11, 12 | 13, 14, 15 | 16, 17, 18 | 19, 20, 21 | 22, 23, 24 | 25, 26, 27 | 28, 29, 30

counts by ones



Changing practice

- Take ACTION, take RISKS, why wait?
- Implement what you already know
- COMMIT to colleagues





Team planning with the Instructional Leader and Year 4 teachers for an Anita Chin demonstration lesson | Gorokan PS, NSW | 2017



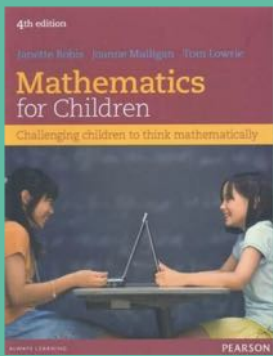
Changing practice

- Take ACTION, take RISKS, why wait?
- IMPLEMENT what you already know
- COMMIT to colleagues
- RESPECT learners needs



Kindergarten seated in an array to start a demonstration lesson with Anita Chin | OLPS PS, NSW | 2010



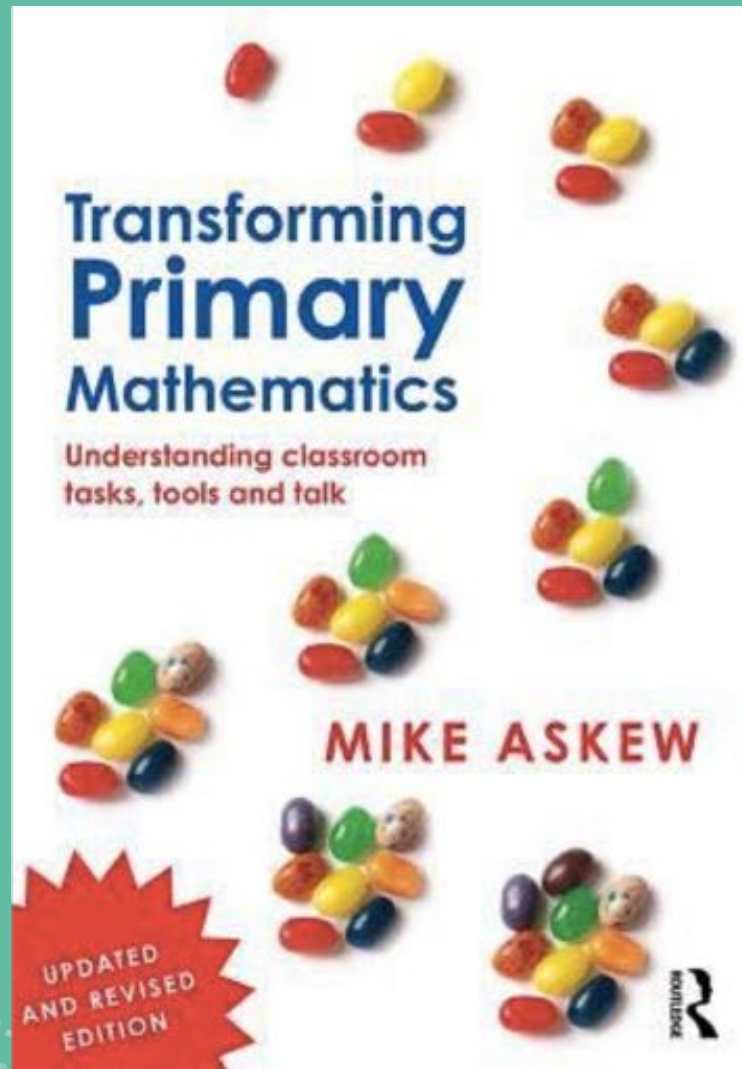


A teacher cannot teach what she or he does not know

Janette Bobis, 2013

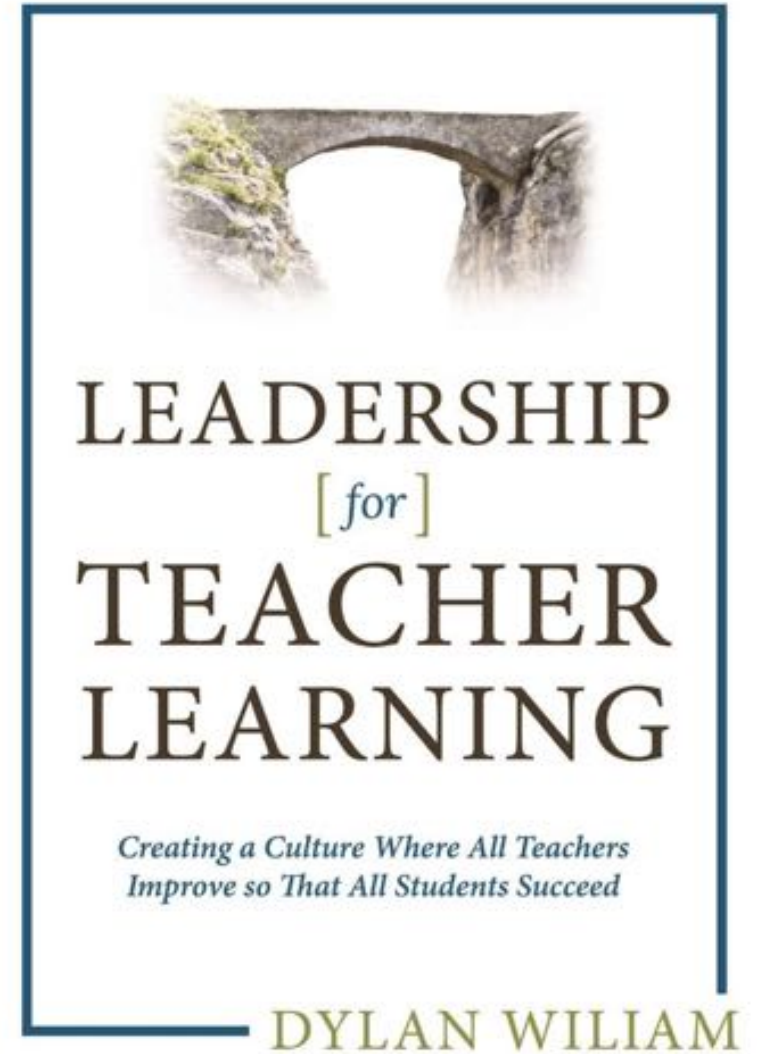
Bobis, J., Mulligan, J. & Lowrie, T. (2013). *Mathematics for children: Challenging children to think mathematically*. Sydney: Pearson.





Askew, M. (2016). *Transforming primary mathematics: Understanding classroom tasks, tools and talk*. London: Routledge. [More details](#).



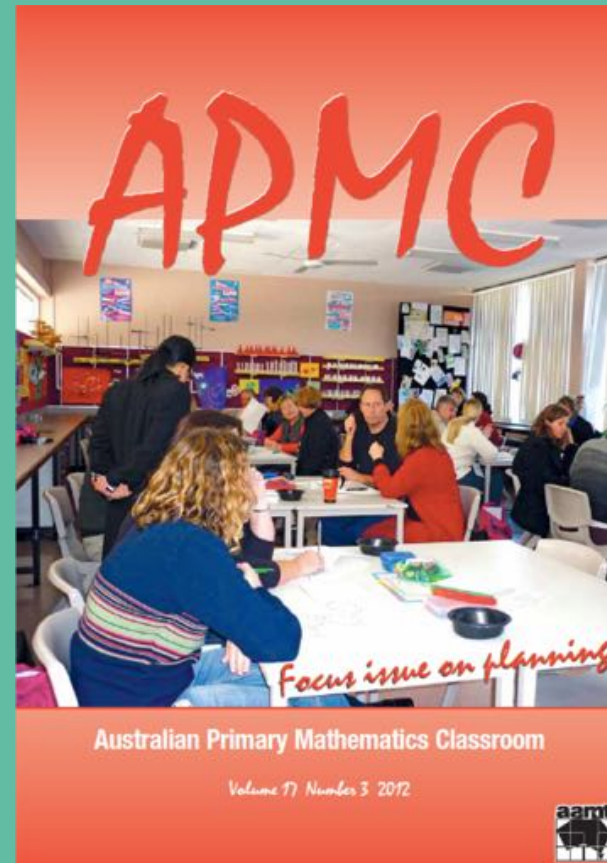


Wiliam, D (2016). *Leadership for teacher learning*. Florida: Learning Sciences International. [More details](#).



Journals for primary mathematics

Australian
Primary
Mathematics
Classroom



4 issues per annum. Further details from the Australian Association of Mathematics Teachers (AAMT) website <http://aamt.edu.au/Journals>

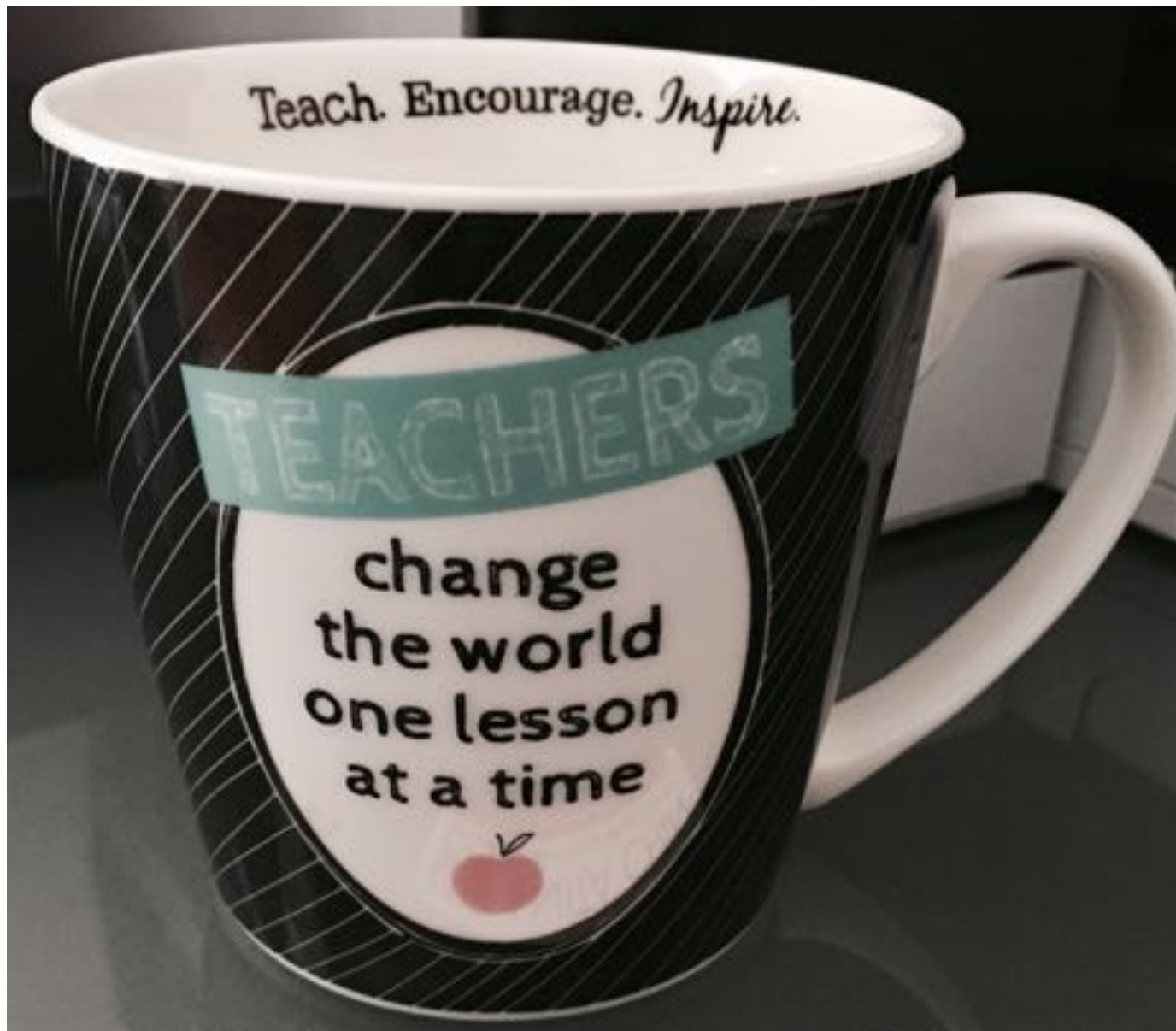


Creating flexible mathematical thinkers and problem solvers

What do classrooms look, sound and feel like?

- Students DOING the maths, not listening
- Visual, verbal and hands-on learning
- INNOVATIVE teaching techniques
- Teachers INSPIRING and delighting students.





From the desk of Anita Chin



Thank you

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teaching