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ASSOCIATION OF VICTORIA

2022 Primary
Mathematics
Education Conference
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Implementing a whole-school strategy for building teaching capacity in maths

Martin Holt

Quick Intro



- Educational consultant and sessional academic at ACU and Deakin
- Primary teaching & maths coordinating background in different sectors in Australia and overseas
- 4 main areas: pd, coaching, collaborative planning and developing a whole-school approach to teaching maths
- Worked as a maths coach with staff from Ivanhoe East Primary School 2017-2021.

Warm Up - Three In a Row

Play in pairs (choose a different coloured marker each)

- 1) Player rolls the 10-sided dice twice
- 2) Make a fraction (proper or improper)
- 3) Place it on the number line from 0 to 10
- 4) Explain your placement of the fraction
- 5) Next player repeats step 1 to 4



Keep playing until you have placed three fractions in a row of your colour with no fractions of your opponent in between.

In the game below, Blue won because it got 3 in a row with no Red in between.

BLUE WINS!



$\frac{3}{5}$ $\frac{3}{4}$ $\frac{5}{5}$

Overview



- Why we began
- First steps
- Did change happen?
- How did we measure progress?
- Which things had the biggest impact?
- Resources to get you started

DECIMAL NUMBER PATH

Michael Ymer Game

Big Mathematical Idea	Year Levels
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We can model, order and compare decimals to make sense of them.

[read more](#)

SPIRALLING DECIMALS

NRICH Game / Investigation

Big Mathematical Idea	Year Levels
-----------------------	-------------

We can model, order and compare decimals to make sense of them.

[read more](#)

3 IN A ROW

Martin Holt Game

Big Mathematical Idea	Year Levels
-----------------------	-------------

Benchmarks on number lines help us understand the relative magnitude of proper and improper fractions.

[read more](#)

FRACTION WARS DISCUSSION & RESOURCES

LESSON PLAN

[maththinkingseen.com](#)

Game / Investigation Carla Dawson

Big Mathematical Idea	Year Levels
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A fraction of a shape may not always be a single part but may be made up of lots of different sized small parts.

Why we began...

Why we began



- Responsive to school's 2017 Annual Implementation Plan (AIP) which identified ongoing professional learning as a key way to build teacher capacity in maths
- focused on increasing student engagement, empowering teachers to teach maths using research-informed strategies and improve student achievement
- also identified goals to establish a numeracy leadership team, peer observation process, feedback).
- MAV was approached.

“Students were passive observers of maths. They were fixated on right or wrong answers which wreaked havoc on a student's maths identity... it was important to break away from this mindset of maths people and non-math people.” *(IEPS Numeracy Leader)*

“We wanted to work with someone who would help us find new tasks that students could investigate, rather than procedural drills. As teachers, we could see the frustration with lower order thinking in classrooms from our students”. *(IEPS Numeracy Leader)*

How we started



- Term 4 2016 meeting involving curriculum leaders, the AP Jen Bowden and myself to discuss the school's needs in relation to the AIP
- Clear investment from the Leadership team
- A strong sense that stand-alone professional development was not going to be enough to drive the changes to the maths program that they envisaged.
- Established a numeracy leader in each team for 2017 to support the innovation.

Establishing a framework

Professional Development day on Jan 31. The case for challenge, enabling and extending prompts, launch, explore summarise and MAV resources.

1 coaching half day per fortnight - 90-minute session with 2 different teaching teams i.e. Preps then Y4

50-minute lesson study, 40-minute debrief, (observation protocol (pictured))

Challenging attitudes and beliefs about maths and their students' capacity

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Lesson observations

Today as you observe the lesson, keep in mind the lesson focus

Lesson Focus:
To Solve problems using addition

Launch
What strategies were used to engage students in the launch?
 'First to 22' - simple addition. (5 mins).
 Warm up game → engagement (pairs → discussion).
 Fish bowl to model game - mixed ability
 - use of whole space
 → Regroup to four.
 Problem (rich task) - place value. - Feedback (student voice).
 Hands on → cut up cards if needed. independent pair


Explore
How were students actively exploring?
 Brief $Q+A$ to clarify. - sharing strategies on board + int'l. - guess-check
 *discussing *open ended problem. - vertical algorithm strategies
 *multiple solutions? *whiteboard tables. *student voice ✓
 *trial+error). *collaborations ✓
 How were individual learning needs catered?
 - groupings (flexible) ✓
 - concrete materials ✓
 Ext - more than 1 possible answer! Clearly stated ✓
 Summary
 How did the summary reflect the learning intentions? What strategies were used?
 10 mins exploration time.
 VOCAB. Regroup
 Friends of 10. sharing strategies/tips. ↳ sharing possible solutions.
 tips for units. how many unique solutions? DISC. why is it challenging?
 solutions?

First steps

Lesson study



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Today as you observe the lesson, keep in mind the lesson focus

Lesson Focus: *connecting number bonds and understanding of how the number system works*

Launch - *Discussion about being challenged in mathematics*

What strategies were used to engage students in the launch?

Number fact - discussion over puzzle. Feedback that every one knows the other way says you had worked out / solution you had) makes an eye job check

strategies - "did we know you worked it out" "who used the method" who used a different way" "who is the one you did it"

asking to describe in mathematics, my making a reference to the by mathematical cases and my thoughts to have left

Explore

How were students actively exploring? - *working in groups - looking at different ways - using the number path & number chart*

How were individual learning needs catered?

- work with small / large numbers*
- work with images*
- small groups (not working independently)*
- number path & chart*

shifting to one - the other groups have done - see they had written the cards & the strategies they used

Summary

How did the summary reflect the learning intentions? What strategies were used?

"let's share our thinking" "we can be together in my opinion"

"thanks if"

"what did you do to solve this?" "this did you work it out?"

"the way you explained that was so interesting"

"the way you explained it"

Reflections

not tested

you - effort

to be used to

to be used to

Reflections

What are your thoughts about the lesson?

What surprised you?

At what point in the lesson were students learning the most? Why?

Implications

How might this lesson impact on your students learning?

What would you do differently to facilitate this lesson?

How will this experience impact on your planning or implementation of future lessons?

First steps



Initial questions around what is different - How do we start? Where are the resources? What does this mean for our students?

Numeracy leaders unsure how to best support staff. They noticed a stark difference in the attitudes and approaches taken by different members of staff.

“There was scepticism around the idea of challenging task or rich investigations “How are we going to create one rich task that would cast a wide enough net for our students to engage with when there are so many levels of abilities?” The belief held was that this was not possible.” (Numeracy Leader)

“Some staff were willing to take risks and embrace the change, while others were comfortable with what they already knew and were wary of the change.” (Numeracy Leader)

First steps

	STAGES OF CONCERN
SELF	STAGE 0 UNCONCERNED: The individual indicates little concern about or involvement with the innovation.
	STAGE 1 INFORMATIONAL: The individual indicates a general awareness of the innovation and interest in learning more details about it.
	STAGE 2 PERSONAL: The individual is uncertain about the demands of the innovation, his or her adequacy to meet those demands, and/or his or her role with the innovation.
TASK	STAGE 3 MANAGEMENT: The individual focuses on the processes and tasks of using the innovation and the best use of information and resources. Issues related to efficiency, organising, managing, and scheduling dominate.
IMPACT	STAGE 4 CONSEQUENCE: The individual focuses on the innovation's impact on students in their immediate sphere of influence; the relevance of the innovation for students and the changes needed to improve student outcomes.
	STAGE 5 COLLABORATION: The individual focuses on coordinating and cooperating with others regarding use of the innovation.
	STAGE 6 REFOCUSING: The individual focuses on exploring ways to reap more universal benefits from the innovation, including the possibility of making major changes to it or replacing it with a more powerful alternative.



Walking the walk



The ongoing follow-up gave teachers a balance of support and accountability to persevere.

Making mistakes was destigmatised – observed lessons were not perfect. Parts of lesson inevitably do not go to plan.

Focusing on one area for development seemed achievable.

*Through lesson study “Teachers were seeing for themselves that things are possible, which led to conversation shifts. Teachers were having light-bulb moments & making connections.”
(Numeracy Leader)*

Promoting Purposeful Noticing

Protocols for lesson study

1. resist the urge to teach!
2. pay attention to what the students make, say, do and write
3. ask questions
4. record significant observations (practicing teacher may ask for feedback on specific goal i.e., questioning)



Lesson observations

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To Solve problems using addition

Launch

What strategies were used to engage students in the launch?

'First to 22' - simple addition. (5 mins).
 Warm up game → engagement (pairs → discussion)
 Fish bowl to model game

visual display

- mixed ability
 - use of whole space

→ Regroup to four.

Problem (rich task) - place value.

- Feedback (student voice).

Hands on → cut up cards if needed.

Explore Brief Q+A to clarify.

independent pair

How were students actively exploring? - sharing strategies on board + individual.

* discussing options. * multiple solutions? (trial/err).

- guess-check
 - vertical algorithm strategies

How were individual learning needs catered? * whiteboard tables.

* student voice ✓
 * collaborations ✓

- groupings (flexible)
 - concrete materials

Ext - more than 1 possible answer!

clearly stated!

* 5 min - zone of confusion ✓

Summary

How did the summary reflect the learning intentions? What strategies were used?

VOCAB.
 friends of 10.
 tips for units
 columns.
 how many
 unique
 solutions?

sharing strategies/tips.

10 mins. exploration time.

Regroup
 sharing possible solutions.

DISC. why is it challenging?

Providing feedback: 2018 Report based on the AITSL professional standards

Ivanhoe East Primary School

Report prepared by Martin Holt

This report has been compiled for Ivanhoe East Primary School based on the observations from the MAV's Education Consultants. The AITSL Professional Standard for Teachers have been used to map areas of opportunity.

1. Know students and how they learn

AITSL standard	Description	Perceived current status	Proposed approach
1.2 Understand how students learn	Expand understanding of how students learn using research and workplace knowledge.	Teachers have varied understanding of how students learn (eg learning approaches, levels of knowing and learning experiences)	<p>Review HITS approaches and align teaching programs and activities to these where possible. http://www.education.vic.gov.au/Documents/school/teachers/support/highimpactteachstrat.pdf</p> <p>Hattie's surface and deep transfer model aligns itself well with HITS and could be a potential focus area in 2019 MAV professional learning.</p>
1.5 Differentiate teaching to meet the specific learning needs of students across the full range of abilities	Demonstrate knowledge and understanding of strategies for differentiating teaching to meet the specific learning needs of students across the full range of abilities.	<p>Tasks with multiple entry points are used in all teams. Some teachers are highly proficient at improving existing tasks by including enabling and extending prompts.</p> <p>There is ongoing interest in the notion of allowing students to struggle. There is a big discrepancy in teachers' willingness to try this within most teams. This is evident in the amount of time they spend working with "support groups" during the explore phase of the lesson.</p>	<p>Teachers discuss and write enabling and extending prompts in their planning for learning.</p> <p>Continue to prioritise tasks which, provide challenge and deal with big ideas in maths in planning, team teaching and peer lesson modelling.</p>

2018 Report based on the AITSL professional standards



<p>2.2 Content selection and organisation. Organise content into an effective learning and teaching sequence.</p>	<p>Organise content into an effective learning and teaching sequence.</p>	<p>All teaching teams have benefitted from greater access to excellent resources including Maths 300, ReSolve Maths by Inquiry, Sullivan's Challenging Mathematical Tasks, NRICH and Paul Swan's Check the Clues which have positively impacted student engagement and learning. Almost all teams recognise the structuring and sequencing of rich tasks/investigations is an area for continuing improvement.</p>	<p>Many teams feel that the school could improve its capacity to organise resources and make them known to teaching teams. It may be worth problem-solving this when maths leaders meet in early 2019? The sequencing of lessons in a given unit should be a key focus in 2019.</p>
<p>2.5 Literacy and numeracy strategies</p>	<p>Know and understand literacy and numeracy teaching strategies and their application in teaching areas.</p>	<p>The numeracy leaders at each year level have played a big role in driving the innovation. In particular, their commitment to their improvement of their own practice and their willingness to model lessons for their peers have helped make positive changes to attitudes and beliefs of teachers in their teams. Some highly effective team teaching practices have been observed.</p>	<p>Use DET Literacy and Numeracy Strategy http://www.education.vic.gov.au/Documents/school/teachers/support/schleadguide.pdf The structure of meeting twice a term with teams provides the opportunity to pursue specific focus areas. Continue with this model in 2019. Consider opportunities for teachers from different year levels to see team teaching in action.</p>

2018 Report based on the AITSL professional standards



4. Create and maintain supportive and safe learning environments

ATSIL standard	Description	Perceived current status	Proposed approach
4.1 Support student participation	Establish and implement inclusive and positive interactions to engage and support all students in classroom activities.	<p>Teachers have a range of strategies to support and encourage all students (behaviourally and mathematically). A key area for improvement is that most teachers rely on a "hands up" approach when seeking student responses. When this is the main approach, students can disengage from the thinking, either allowing others to offer responses or mentally shut down once they have responded once.</p> <p>There is a big difference in the ways that students interact in the learning spaces across different year levels.</p>	<p>Use of a name generator such as paddle-pop sticks or dice to determine random student responses - particularly at the beginning of the discussion. This will help students stay connected to the thinking knowing that they may be called at any time or even two/three times in a row.</p> <p>Ongoing focus on helping teachers develop a culture where students are the main drivers of their own learning. When given choice about where they work and who they work with, encourage honest reflection on the positive or negative impact their choices have made on their learning. Having high expectations of all learners is key to successful implementation of this. It would be of great benefit for teachers in other year levels to see how the Year 6 team utilise the space and resources in their room.</p>

5. Assess, provide feedback and report on student learning

ATSIL standard	Description	Perceived current status	Proposed approach
5.1 Assess student learning	Demonstrate understanding of assessment strategies, including formal and informal, diagnostic, formative and summative approaches.	<p>Year 5 have made formative assessment a goal focus this year. Their development of rubrics and formative assessment tools has positively impacted their classroom culture and students' sense of ownership of their learning.</p> <p>There is evidence of self/peer assessment practices in other year levels such as in Year 4 where the students consider how confident they are which ranges from I don't know how to do this yet, to I've got it, I'm ready to convince a skeptic.</p>	<p>Teachers increase their use of formative assessment tools like stacking cups, discs, show me in fingers, thumbs up/down to improve student and teacher communication in how they are tracking. The professional reading of Dylan William and his website http://www.dylanwilliam.org/ can support this.</p> <p>The Year 5 team could share some of their reflections on the assessment practices they have implemented.</p> <p>David Cook has developed a feedback model which could support this process. Marty will follow this up.</p>

Did change happen?

Did change happen?



The Numeracy Leadership team listed a number of observable changes to the attitudes, beliefs and practices of teachers

Move away from ability
grouping - to flexible grouping

Specific goals in each teaching team; teaching
challenging tasks and using enabling and
extending prompts, launch, explore, **summarise**
instructional model, questioning, 4 proficiencies,
formative assessment and student engagement.

Shift to greater teacher
responsibility in lesson study.

“At one point, the Year 4 team
recognised that the summary phase
of the lesson was an area they
wanted to focus on and improve
upon. Our peer observations were
focused on this, and our maths
planning focused on the summarise
phase.” (Y4 Numeracy Leader)

More open-ended tasks.
Encouragement of different
strategies and solutions.

Did change happen?



The Numeracy Leadership team listed a number of observable changes to the attitudes, beliefs and practices of teachers

Move away from ability grouping - to flexible grouping

Greater emphasis on student discourse.

Specific goals in each teaching team; teaching challenging tasks and using enabling and extending prompts, launch, explore, **summarise** instructional model, questioning, 4 proficiencies, formative assessment and student engagement.

“At one point, the Year 4 team recognised that the summary phase of the lesson was an area they wanted to focus on and improve upon. Our peer observations were focused on this, and our maths planning focused on the summarise phase.” (Y4 Numeracy Leader)

More open-ended tasks.
Encouragement of different strategies and solutions.

Shift to greater teacher responsibility in lesson study.

Finding Equivalent Fractions (Peter Sullivan Challenging Task)

Curriculum Links

Y4: Investigate equivalent fractions used in contexts (VCMNA157)

Materials

- Concrete materials for comparing fractions e.g. fraction tiles
- Post-its (1 per student) for warm up [game](#).

Launch

- Warm up. [Sticky Labels](#).
- Introduce the learning target "Every fraction has many other fractions that are equivalent to it."
- Discuss the formative assessment arrow. Explain to students that our goal is to move along that line from left to right.
- Write the fraction $\frac{?}{8}$. Introduce the notion of the ? being a missing number. One part of this fraction $\frac{?}{8}$ is missing. Invite the students to come up with some examples of what that number might be.
- Focus on $\frac{4}{8}$. What is that equivalent to? What other numbers are equivalent to $\frac{1}{2}$? Write some examples on the board.
- **Show the problem $\frac{1}{2} = \frac{?}{?} + \frac{?}{16}$. Tell the students that i wrote out an equation with fractions but forgot some of the numbers. What might the missing numbers be? Give as many possible combinations as you can.**

Explore

- Allow time for students to explore this problem individually or with a partner.
- Monitor the strategies students are using.
- Use enabling/extending prompts where needed.
- If needed, stop the class to get some insights as to how the problem is being tackled.
- Take note of different strategies to call upon in the summary.

Enabling Prompts

- Provide concrete materials.
- Make the missing denominators a 16th.
- Get students to work on this problem: $\frac{1}{2} = \frac{?}{?} + \frac{?}{16}$

Extending Prompts

- $\frac{1}{2} = \frac{?}{?} + \frac{?}{14} + \frac{?}{140}$



Summarise

- Invite students to share strategies and solutions.
- Record responses on the board and invite students to recognise equivalence and make connections to the different fractions.
- Revisit the central idea. Get students to place another x on the line to indicate their understanding of the big mathematical idea in the learning target.

Key Questions

- What advice would you give to a friend on how to answer a question like this?

Considerations

- This task works really well when students have the freedom of choice to work independently, in pairs or in small groups.

Assessment

Key Terms

- Numerator, denominator, equivalence.

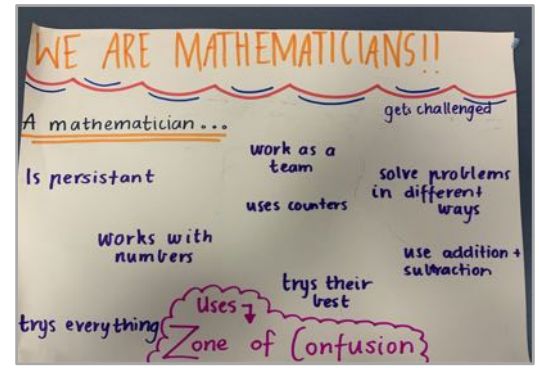
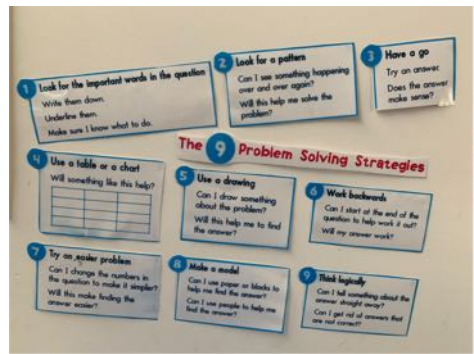
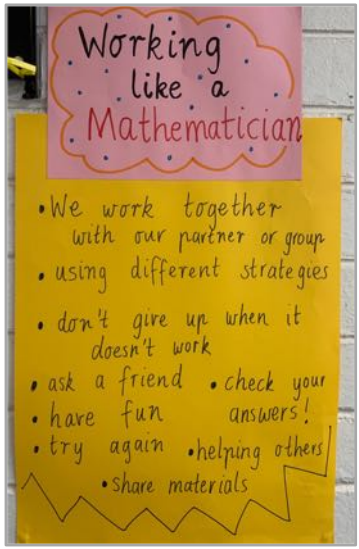
Solutions

- $\frac{1}{2} = \frac{7}{16} + \frac{1}{16}$ is one example.

Did change happen?

Use of feedback tools

Encouragement of productive struggle



Observable changes

Emphasis on formative assessment

Strategies to promote discourse (beyond 'hands up')



SUCCESS WITH NUMBER TALKS TOP 5 TIPS FOR TEACHERS

A Number Talk is an opportunity for students to communicate mathematically to learn from each other and to gain insight into an array of strategies used to solve problems.

TEACHER ROLE 1. Teachers should pose a math problem of interest, support the conversation, but not direct it, give students thinking time to work on the problem and provide powerful prompts to promote thinking.

STUDENT ROLE 2. The student's role is to think and create a response. After the teacher poses the problem, students should think about solutions before engaging in discussion. They could be thinking:

- Which strategies can be used to work on the problem?
- How does the problem make sense to me?
- How can I add other students' strategies?
- Why may disagree or agree with a solution, strategy or idea?

TALK LESS, HEAR MORE 3. This is the time for teacher talk, handling misconceptions or errors, broadening students to provide feedback by challenging and supporting each other's thinking.

CONVINCE ME 4. Try using this language when introducing or discussing a Number Talk:

- convince yourself
- convince a friend
- convince a skeptic

PLANNING 5. When planning a number talk, the problem selected is important:

1. Select a problem that will encourage different strategies for solving the problem and/or highlight the types of strategies students may use.
2. Choose how well you understand each of these strategies (and who will present).
3. Plan the questions you will ask to fully understand and represent a student's thinking and/or strategies.
4. Reflect on the Number Talk idea, what thinking you want students to develop, and what problem(s) you do want and why (Strategic Competence, 2012).

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Maths Goals: Addition

- I can use counting on.
- I can use 10s and 20s frames.
- I can use number lines.
- I can use friends of ten.
- I can use doubles.
- I can use the build to ten strategy.
- I can identify the mental strategy I have used.

One is Snail Group Assessment Rubric (F-2)
Focus: critical and creative thinking, connecting names, numerals to 10, addition strategies and partitioning.

Descriptor	Went beyond	Made it	Getting there	Not there yet
Content Knowledge	We have found every way to make 10 using addition.	We can demonstrate more than 10 ways to make 10 using addition.	We can demonstrate more than 5 ways to make 10 using addition.	
Reasoning	We have organised our thinking to convince a skeptic that we have found every way to make 10 using addition.	We have convinced a skeptic that all of our solutions make 10.		Not all members of our group are convinced that all our solutions make 10.
Range of ideas	We can go beyond addition to demonstrate ways to make 10.		We can demonstrate more than 5 ways to make 10 using addition.	We can demonstrate less than 5 ways to make 10 using addition.
Originality		Our group came up with one unique solution.	Our group came up with a solution that only one other group thought of.	Our group haven't thought of a unique solution yet.

Learning Focus: Calculate the perimeter and area of rectangles and the volume and capacity of prisms using familiar metric units (VCMGM196)
Name: _____

	I'm not convinced that I can do this yet.	I've convinced myself that I can do this.	I've convinced a friend that I can do this.	I've convinced a skeptic that I can do this.	I'm ready for the next challenge.	I'm not convinced that I can do this yet.	I've convinced myself that I can do this.	I've convinced a friend that I can do this.	I've convinced a skeptic that I can do this.
I can show more than one way to calculate the perimeter of rectangles.		▶		▶	I can show two or more ways to calculate the perimeter of some 2D shapes such as triangles and pentagons.				
I can show more than one way to calculate the area of rectangles.			▶		I can show more than one way to calculate the area of some other regular and irregular shapes.		▶		
I can find two different ways to measure the volume and capacity of prisms.	▶	▶			I can show two ways to demonstrate the connection between millilitres and cubic centimetres.				

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How did we measure progress?

How did we measure progress?

Component 1: Uses challenging tasks in the classroom: (frequency, engagement, skills, knowledge)

(a)	(b)	(c)	(d)	(e)	(f)
Regularly innovates to improve, adjust and create challenging tasks and shares these with colleagues. Eg. by conducting peer observation, professional development that allows for collaboration with other schools.	Models lessons to support team/individual goals. Engages in sourcing and implementing challenging mathematical tasks. Students access the Working Mathematically framework without being asked and uses it independently. Teachers seek support from each other to upskill their teaching of challenging tasks. Students take risks and demonstrate a growth mindset when challenged.	Consistent use of challenging tasks from a range of sources. Students expect to be challenged, recognise the importance of struggle and expect to have to find two or more ways to show the answer. The Working Mathematically framework is available and used by students when appropriate. Toolbox lessons provide skills and knowledge to apply to challenging tasks.	Experiments with challenging tasks. Students have access to the Working Mathematically framework for problem solving. Students say the task is too hard OR Most students aren't challenged by the task.	Problem solving happens at the end of the week. Aware of the working Mathematically framework but haven't used it. Students are mainly unsure how to approach the task and have no resources to assist them. Success is perceived as getting to the answer as quickly as possible. Teachers are not confident in identifying and sourcing challenging tasks.	Knows about challenging tasks but reluctant to start using them. Preference for tasks that will keep students busy.

Creating expectations for continuous improvement and risk taking

Creating time, space, dispensation and support for innovation

Component 4: Plans for and uses enabling and extending prompts (EEPs) as a form of intervention to ensure that every student gets to learn something new. (Frequency, skills, student engagement)

(a)	(b)	(c)	(d)	(e)	(f)
Builds capacity in the use of EEPs outside of the teaching team. Innovates and finds an even more effective way to use EEPs.	Supports teaching team in their use of EEPs, eg. by modelling lessons or leading in planning meetings. Students are actively involved in seeking intervention.	Consistent use of EEPs which are documented in planning. Most students understand and respond positively to intervention.	Experimented using EEPs to adjust tasks. A mix of positive and negative responses to interventions from students.	Knows what EEPs are. Interested in learning more about their use. Students are unsure of the interventions being presented to them.	EEPs are not used in the classroom.

2021 NAPLAN data



- 98.1% of students working at or above age expected standards in Maths (4% higher than similar schools)
- Above benchmark growth was 32% (23% in 2020)
- Below benchmark growth was 13% (24% in 2020)

Learning Gain Year 3 (2019) to Year 5 (2021)

	Low Gain	Medium Gain	High Gain	High Gain (Similar Schools)
Reading:	23%	51%	26%	29%
Numeracy:	17%	45%	38%	29%

Numeracy Year 3	Latest year (2021)	4-year average
School percent of students in top three bands:	88.9%	84.9%
Similar Schools average:	84.9%	86.1%
State average:	67.6%	69.1%

Numeracy Year 5	Latest year (2021)	4-year average
School percent of students in top three bands:	89.0%	83.8%
Similar Schools average:	80.1%	79.4%
State average:	61.6%	60.0%

Which things had the
biggest impact?

The wins (based on staff feedback)



Culture: - attitude of continuous improvement - next time I would try this...

- listening without judgement
- cross-pollination of ideas i.e. - Prep planning document began a planning revolution

Process:

- Ongoing commitment and follow up from nominated school leader (AP).
- coaching format: seeing teams two weeks later
- ongoing MAV support
- intro pd for new/returning staff at start of each school year

My 2 cents – teachers seeing imperfect lessons and thinking “I can do that!”

The wins! No more mass photocopying

Lemonade Problem Enabling Prompts



For students who cannot proceed with the task with the explicit intention that they work on the initial task in time.

Reduce the number of steps
How much lemonade could you squeeze in one minute?

simplify the complexity of the numbers/
language used - It takes 5 minutes to squeeze 2 cups of lemonade. How much could I squeeze in 30 minutes?

provide access to concrete materials ie
number lines, measuring cups, fraction
blocks/tiles.

questions/reminders: recall previous tasks, draw
attention to an important word in the problem - how
are the numbers 2 and 16 related?

grouping: share ideas, reason, see other strategies at work - work with a partner but make sure both of you understand the strategy that you are attempting. Or, "come and have a look at how Lucy is tackling this problem."

Lemonade Problem Extending Prompts



change the range of numbers

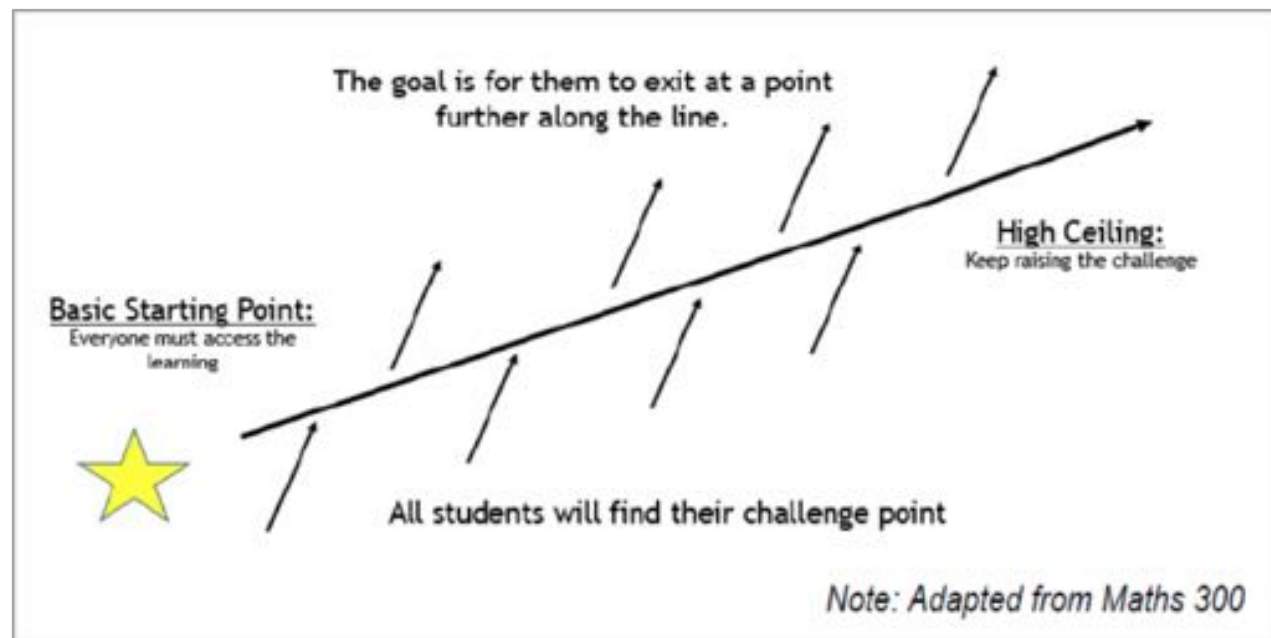
It takes 5 minutes to squeeze $1\frac{1}{2}$
of a cup of lemonade. How much
could I squeeze in $2\frac{1}{2}$ hours?

encourage students to form generalisations -
How much time would you need to provide
lemonade for the whole class?

encourage students to defend their
solutions: Convince yourself, a friend, a
skeptic. Can you prove it?

give the student an opportunity to engage
with the task for themselves - Create
their own related problem or pursue a
hypothesis formed.

move from concrete to abstraction - A new
juicer will allow you to make the lemonade
 $3\frac{1}{2}$ times faster. How much juice could you
make in 16 minutes now?



The Wins! Time & space to act upon documented evidence



Ivanhoe East Primary School Annual Report on Teaching Mathematics - November 2019

Report prepared by Martin Holt

This report has been compiled for Ivanhoe East Primary School based on the observations from the MAV's Education Consultants. The ATSIL Professional Standard for Teachers have been used to map areas of opportunity.

1. Know students and how they learn

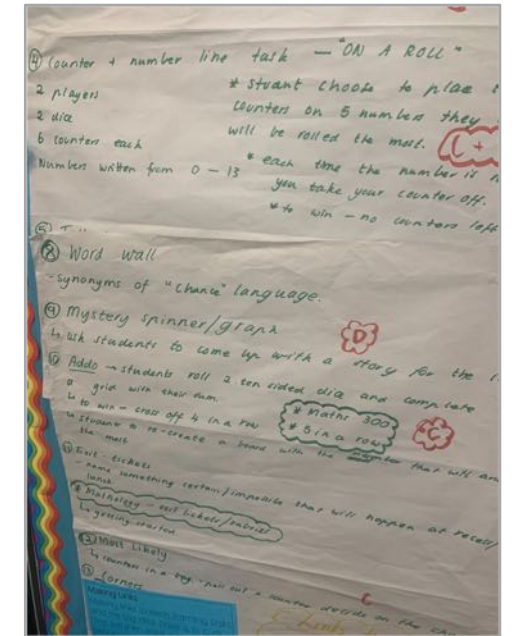
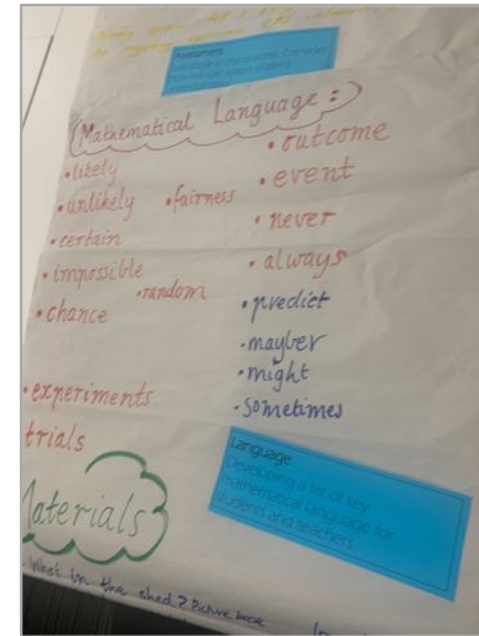
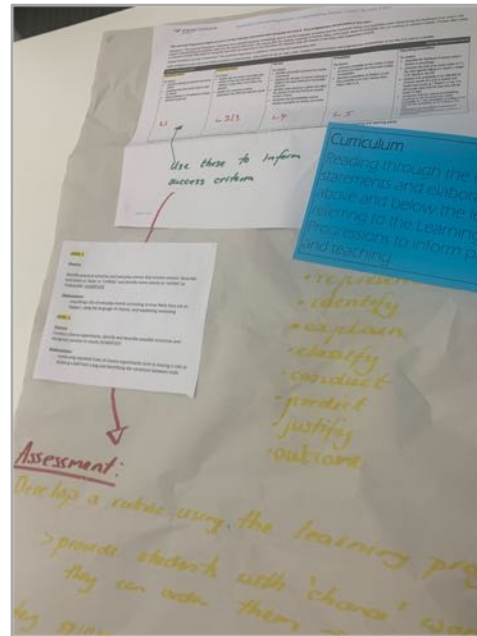
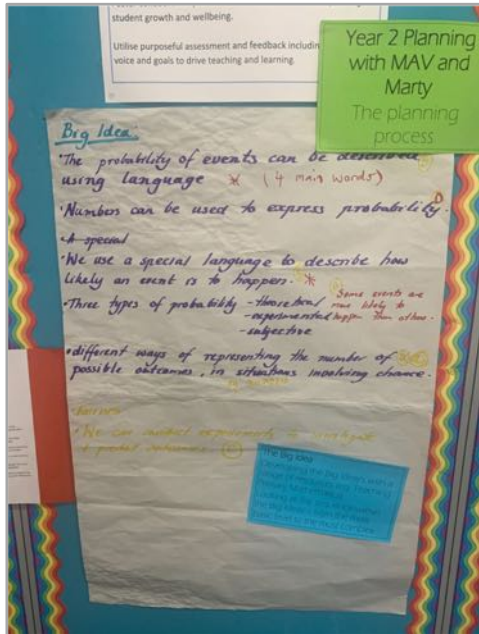
ATSIL standard	Description	Perceived current status	Proposed approach
1.2 Understand how students learn	Expand understanding of how students learn using research and workplace knowledge.	There is some physical evidence of HITS in teaching offices etc. Most teams have set goals that work towards one of the HITS though this has been less apparent in Semester 2. While teachers nominally accept the importance of struggle, there is still some reluctance to making this a common practice.	Numeracy leaders work with teams to set goals to build their capacity with one of the 10 HITS (this could be something we can discuss in our T1 meeting next year?)
1.5 Differentiate teaching to meet the specific learning needs of students across the full range of abilities	Demonstrate knowledge and understanding of strategies for differentiating teaching to meet the specific learning needs of students across the full range of abilities.	All teams have adopted the use of enabling and extending prompts to differentiate tasks in planning and teaching. There are times in lessons when extending prompts could be used earlier in the lesson to ensure that more able students spend more time in their ZPD.	Advise teams to have a copy of Sarah Ferguson's enabling and extending prompts in planning documentation. Encourage teams to use a formative assessment tool like the coloured discs to give students an ongoing way of showing the teacher how they are tracking with the task.

Lesson study: Gradual release of responsibility from maths coach to numeracy leaders to teachers.

Teams setting specific goals for focused coaching and peer observation

Current Challenges

Shift to developing learning sequences



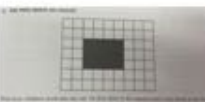
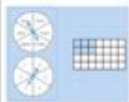
Learning Sequence Planner	1. Find 1-2 key readings/research to discuss with team.	2. Brainstorm and articulate key messages, big ideas and maths language.	3. Review/highlight Vic curriculum content inc preceding and following levels.
4. Use VCAA learning progressions to articulate a hierarchy of ideas based on student actions and behaviours.	5. Identify and adapt tasks to support learning focus. Use multiple representations to explore each idea.	6. Develop a sequence that builds in mathematical complexity.	7. Design assessment practice for the unit. Find/create assessment to capture learning.

“A big focus was on connecting challenging tasks, toolbox lessons and investigations with the big ideas and then developing the learning sequence.”
(Numeracy Leader)

Shift to developing learning sequences

“On the back of a curriculum day focus on developing learning sequences, Numeracy AIP team considered how we might formalise the process and ensure that the work teams did in developing learning sequences was not lost. This is something we are continuing to develop.” (Numeracy Leader)

Ivanhoe East Primary School: Year 2 Multiplication			
Key Language	Array, groups of, add, together, multiple, equal groups, each, altogether, total		
Materials	Unifix cubes, counters, dice		
Victorian Curriculum Content Descriptors	Level 1	Level 2	Level 3
		<p>Recognise and represent multiplication as repeated addition, groups and arrays (VC2MA1.04)</p> <ul style="list-style-type: none"> representing array problems with available materials and explaining reasoning visualising a group of objects as a unit and using this to calculate the number of objects in several identical groups 	<p>Recall multiplication facts of two, three, five and ten and related division facts (VC2MA1.34)</p> <ul style="list-style-type: none"> establishing multiplication facts using number sequences using strategies to recall the multiplication and related division facts for the twos, threes, fives and tens <p>Represent and solve problems involving multiplication using efficient mental and written strategies and appropriate digital technologies (VC2MA1.35)</p> <ul style="list-style-type: none"> writing simple word problems in numerical form and vice versa using technology to check the solution and reasonableness of the answer
		<p>Figurative (imagined units)</p> <p>The student:</p> <ul style="list-style-type: none"> relies on perceptual markers to represent each group uses equal grouping and counting without individual items visible but need to represent the groups before determining the total counts by twos, fives and tens, matching the count to groups of the corresponding size. <p>Repeated abstract composite units</p> <p>The student:</p>	<p>Coordinating composite units</p> <p>The student:</p> <ul style="list-style-type: none"> coordinates two composite units (mentally) as an operation (that is, both the number of groups and the number in each group are treated as composite units) represents multiplication in various ways (arrays, factors, 'for each') represents division as sharing division and measurement or grouping division. <p>Flexible strategies for multiplication</p> <p>The student:</p>
VCAA Learning Progressions (A sequence of observable indicators of increasingly sophisticated understanding of and skills in key)	<p>The student:</p> <ul style="list-style-type: none"> shares collections equally by dealing (that is, distributing items one to one until they are exhausted) makes equal groups and counts by ones to find the total. <p>Perceptual multiples</p> <p>The student:</p> <ul style="list-style-type: none"> uses groups or multiples in perceptual counting and sharing (rhythmic or skip counting with all items visible). 		

Big Mathematical Idea 3: Multiplication can be represented as an array.			
Warm up	Toolbox	Investigation	Assessment
<p>Number talks multiplication cards</p> <p>How many squares are covered?</p>  <p>Number facts and Arrays (open ended maths) Show students an array. Write as many number facts from this array as possible.</p>	<p>Array game (Challenging tasks Sullivan p.g. 29) Players roll two dice - one shows the number of rows, the other show the number in each row. On a 10 x 10 grid, students colour in the array shown by the dice. They can play on separate grids to count the number of squares coloured after 10 rolls. Or, they can play on the same grid, with the person who completes the grid as the winner.</p> <p>How close to 100? https://www.youcubed.org/texts/how-close-to-100/ This game is played in partners. Two children share a blank 100 grid. The first partner rolls two number dice. The numbers that come up are the numbers the child uses to make an array on the 100 grid. They can put the array anywhere on the grid, but the goal is to fill up the grid to get it as full as possible. After the player draws the array on the grid, she writes in the number sentence that describes the grid. The game ends when both players have rolled the dice and cannot put any more arrays on the grid. How close to 100 can you get?</p>	<p>The Arrays Game (Booker 274) Using two spinners & 1cm grid paper students play in pairs. Each player in turn spins the spinners and colours in the area on their grid indicated by the spinners. The first player to colour all the squares on their grid wins.</p>  <p>Cookie Monster: View the video of the cookie monster eating some cookies: https://wefactsby.com/the-cookie-monster/ What do you notice? What do you wonder? How big do you think the biscuit packet/tray was? Write an estimate you know is too high - too low. Can you draw what it might look like? How many cookies did the cookie monster eat? How many cookies came in the package? How many cookies were left in the package?</p> <p>Arrays Chocolate Bar (Challenging tasks Sullivan p.g. 32). I had a full box of chocolates, but someone ate some of the chocolates. The box now looks like this. What are 2 ways I</p>	<p>Bulletin Board (Maths Essentials by Andrea Becker) Students are given a bigger single number eg: 40. They are asked to show this number using repeated addition and arrays.</p>

Future goals



- Continue developing the Innovation Configuration Maps and linking them to staff goals and peer observations
- Numeracy learning walks
- Develop challenging moderation tasks across the school
- Use multiple sources of data to inform our teaching and learning (NAPLAN, student goals, work samples)
- Provide PD and ongoing support for new and returning staff

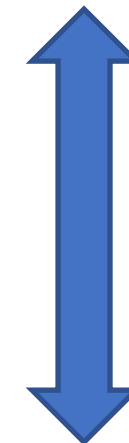
What I would do
differently

What I would do differently

- Avoid global pandemics
- Develop a shared vision at the beginning
- Actively involve the students in the process
- Make lesson observation protocols explicit
- As a coach, share strategies to support Numeracy Leaders i.e.,



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Numeracy Leaders

	STAGES OF CONCERN	INTERVENTION CONSIDERATIONS
SELF	STAGE 0 UNCONCERNED: The individual indicates little concern or involvement with the innovation.	At this stage the types of interventions that may be appropriate certainly depend on context. For example, is it the very beginning of a change process, or are many others already using the innovation? Also, is use of the innovation required or even desirable?
	STAGE 1 INFORMATIONAL: The individual indicates a general interest in learning more details.	Interventions should be designed to provide general descriptive information. Too much detail will not be useful. "Buying them the book" will not lead to their reading all of it. Interventions for this stage should be spread over time and through varied medium and context.
	STAGE 2 PERSONAL: The individual is unsure of demands and adequacy to meet those demands.	Change facilitators need to be extra sensitive in working with persons who have intense Personal concerns. It is quite easy to further raise their Personal concerns. Also, frequently intense Personal concerns are not innovation related. They could be job related (Will I have a job next year?) or non-work related (My daughter is going through a divorce). The key to resolution of Personal concerns is to have more information. However, when people have intense Personal concerns, they are not open or trustful of the information that is provided. When Personal concerns are clearly innovation related, the following types of interventions may be helpful.
TASK	STAGE 3 MANAGEMENT: The individual focuses on the processes and tasks of using the innovation and the best use of information and resources.	Interventions should focus on the "how-to-do-its." All-day, full group trainings may not be the most effective method since many Task concerns are idiosyncratic. At one research site, the leaders created informal after school "comfort and caring" sessions, during which experienced innovation users could provide advice and assistance that addressed specific Management concerns.
IMPACT	STAGE 4 CONSEQUENCE: The individual focuses on the innovation's impact on students in their immediate sphere of influence.	Facilitators enjoy persons with Consequences concerns. The concerns of such individuals are targeted toward Impact and how quality of use of the innovation can be enhanced. Persons with Impact concerns appreciate recognition and encouragement for their efforts to improve outcomes.
	STAGE 5 COLLABORATION: The individual focuses on coordinating and cooperating with others.	The arousal and sustaining of Impact concerns about working with one or more colleagues in relation to the use of the innovation is the ultimate. Leaders should do all they can to facilitate the arousal of Collaboration concerns and to support innovation implementers working together.
	STAGE 6 REFOCUSING: The individual focuses on exploring ways to reap more universal benefits from the innovation.	Individuals at this Stage of Concern are self-starters and certainly have their own goals in mind. They have strongly held ideas about ways that the change process and/or the innovation should move in new directions. If the institutional change effort is moving in a direction antagonistic to their opinions and concerns, some fairly directive actions may be necessary to outline limits within which they may deviate from the mainstream. If their ideas are consistent with furthering use of the innovation and vision of the organisation, then encouragement to "go ahead" is appropriate. However, there also should be regular monitoring for unexpected creative adaptations.

The case for coaching



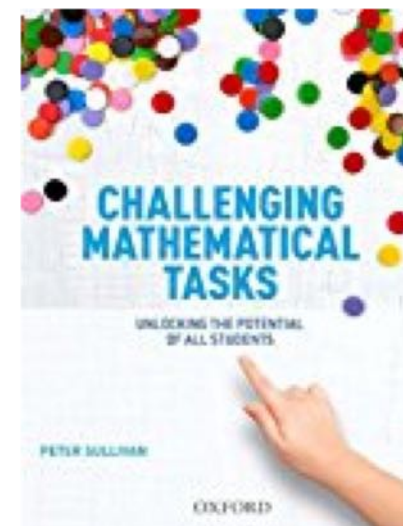
- deeply embedded classroom context (Russo, 2004) “As opposed to stand-alone pd, the maths coach becomes another member of the team.” (IEPS Numeracy Leader)
- longer term focus on implementation and ongoing follow up (Sparks, 2002; Loucks-Horsley, 2010)
- collaboration and open feedback (Sparks, 2002; Tunks, & Weller, 2009; Hay Group, 2014; Hord et al, 2014)
- observation of student success (Loucks-Horsley, 1995; Sparks, 2002; Tunks & Weller, 2009).

Resources to get you started

Some key resources



SEDL.org [Innovation Configuration Mapping Resources](#)



MAV In-school Consulting

section 5

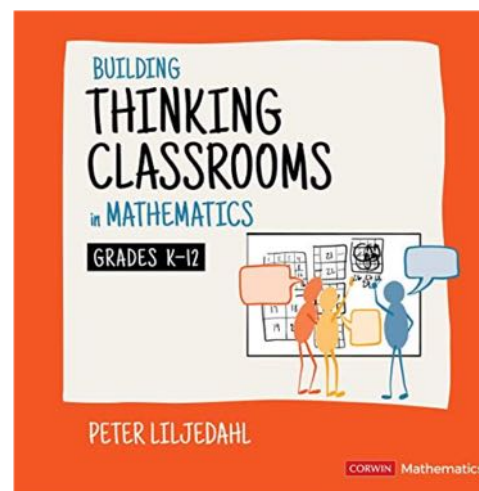
Six key principles for effective teaching of mathematics

This section follows on from the discussion of the goals of teaching mathematics and the data available on the mathematical achievement of Australian students. Having established the personal and social value of having mathematical understanding and some skills current to the cohort of Australian mathematics students, the discussion focuses on what schools and teachers need to know and be able to do in order to address the shortfall between the required/desired and the demonstrated learning outcomes.

This section draws on research findings and other sets of recommendations for teaching actions, to present a set of six principles that can guide teaching practice. As the title of the *Teaching Mathematics* Make it count conference indicates, there is the conviction that teaching mathematics well, in such a way as to make it count, is a worthwhile and reasonable proposition. This section presents a set of six principles of teaching mathematics which are specific to mathematics, but which are also based on sound general pedagogic principles that can relate to all curriculum areas. These principles are reinforced by much of the research and the advice that follows in this paper. Overall, the review paper points that they should be the focus for teacher education and professional learning in mathematics, which is addressed in Section 9.

The development of this review paper's six principles was partly motivated by the various lists of recommended practices from Australian education systems such as *Productive Pedagogies* (Department of Education and Training, Queensland, 2010) and *Principles of Learning and Teaching* (Department of Education and Early Childhood Development, Victoria, 2011) which are intended to inform teaching generally. Such lists are long and complex, and the author suspects that mathematics teachers experience difficulty in extracting the key recommendations for their particular practice. For example, one such set of recommendations is the South Australian *Teaching for Effective Learning Framework* (Department of Education and Child Services, South Australia, 2010), which lists four domains and 18 sub-domains. Some of the sub-domains are helpful, such as: build on learners' understandings; connect learning to students' lives and aspirations; communicate learning in multiple modes; support and challenge students to achieve high standards; and build a community of learners. There are others that are less clear, such as: explore the construction of knowledge; negotiate learning; and, teach students how to learn. It is suspected that such recommendations provide general rather than specific support for mathematics teachers, and do not seem likely to prompt or motivate improvement in mathematics teaching practices.

While informed by such frameworks, the six principles for teaching mathematics defined and described in this review paper draw on particular national and international research reviews and summaries of recommendations about mathematics teaching. For example, this



Lemonade Problem



It takes 2 minutes to squeeze 1L of a cup of lemons.

- 1. How much lemonade could I squeeze in 16 minutes? (Can you give me an estimate that is too high? too low?)
- 2. How long would it take to squeeze 4 cups of lemonade?

Show 2 different ways to find the answers.

Maths tasks - Multiplying/Dividing by 10

Sheep-pen



I have been given 20 equal lengths of fencing to make a rectangular sheep pen.

Which rectangular pen will hold the most sheep?

Extending Prompt: Could I increase the area of my sheep pen if I used a different shape?

Math Primary Maths Resource

Fay's Nines



Arrange the nine digits 1 to 9 in the spaces to make three 3-digit numbers whose sum is 999.

9	9	9

How many unique solutions are there?

Fay's class is 20 years old investigate

1,2,3,4 Problem



Given only the digits 1, 2, 3 and 4 (using each number once) and any of the four basic operations, which numbers from 1 to 10 can you make?

Mathematical Minders - 3-4 Investigation

TASKS TO GET YOU STARTED

www.200hours.com.au

Believe donuts

I ordered two donuts. One had 10 sprinkles on it and the other had 1. I know the first donut had 10 sprinkles almost straight away. But I had to count the 1 sprinkle donut. Draw what the donuts might have looked like.



James Russo

Bakery Challenge



Charlie bakes eight trays of different flavoured cakes each day. How many cupcakes does Charlie bake each day?



Find 4 different ways to calculate the solution.

Maths tasks by Inquiry

3 Blocks Towers

NRICH

Age 5-7+

You have three different colour blocks, (red, yellow and blue). Make a tower using one of each colour. Here's one with red on top, blue in the middle and yellow on the bottom.



How many different towers will you be able to make with a different colour on top? How many different towers can you make?

When you are sure you have found them all, try it with four colours.

How will you Sort?



How can you sort these numbers?

24	34	27	40
47	207	140	2
142	7	70	374
72	37	42	4

Maths tasks - Year 1-2 Number Order, Place Value and Addition and Subtraction of 1 and 10

Believe Maths by Inquiry

Follow-up session



- Develop a shared vision
- Develop IC Mapping Resources
- Additional resources to monitor the innovation

Implementing a whole-school strategy for building teaching capacity in maths



Thanks to the curriculum leaders at IEPS
Val Zenel, Kym Seng and Adrienne Dudley.

We need to create time and space for teachers to reflect on their practice in a structured way, and to learn from mistakes. Bransford, Brown & Cocking (1999)

Thanks :)

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2022 Primary
Mathematics
Education Conference
June 2022

Innovation
configuration
mapping for
building school-
wide teaching
capacity.

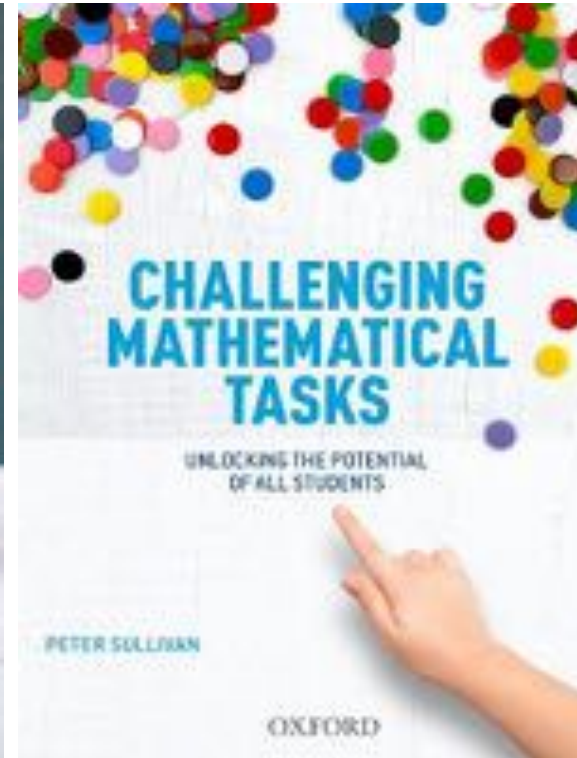
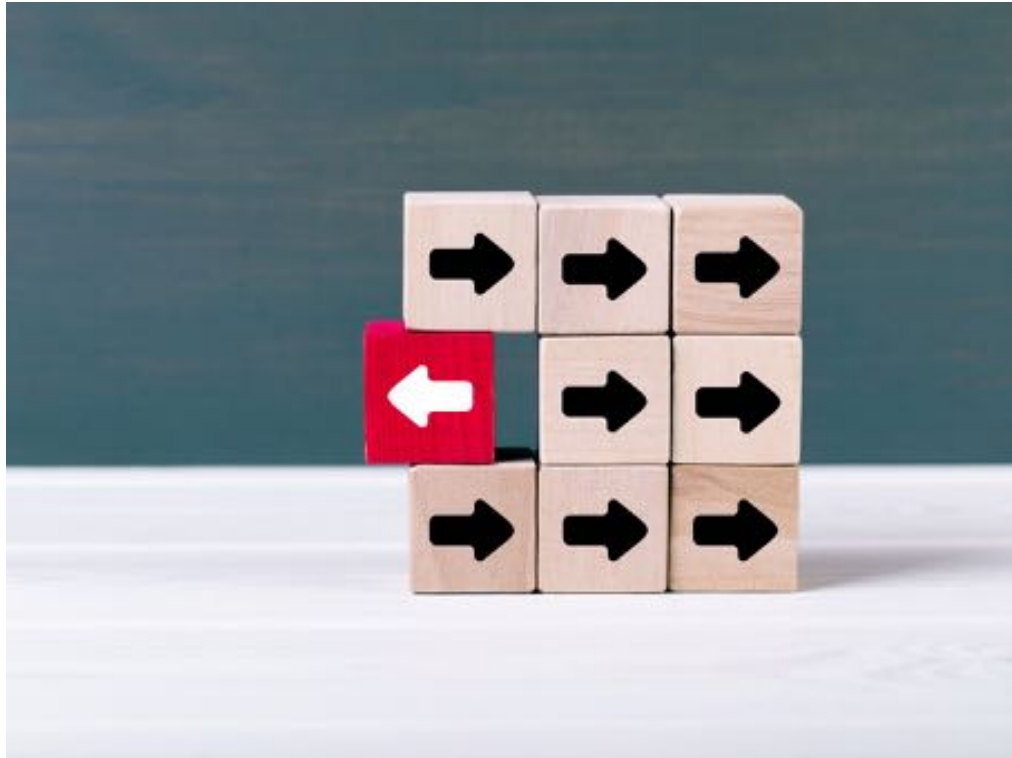
Martin Holt

Quick Intro



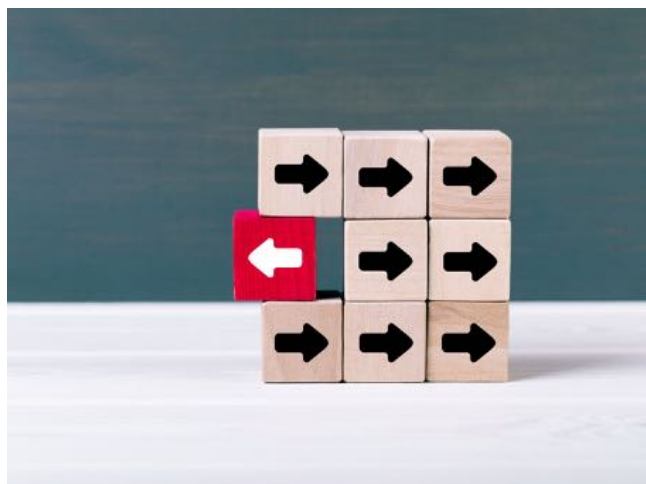
- Educational consultant and sessional academic at ACU and Deakin
- Primary teaching & maths coordinating background in different sectors in Australia and overseas
- 4 main areas: pd, coaching, collaborative planning and developing a whole-school approach to teaching maths
- Worked as a maths coach with staff from Ivanhoe East Primary School 2017-2021.

Warm-up - Directions



Warm-up - Directions

- whole numbers forwards or backwards from different starting points 7 14 21 28 35
- simple fractions $2\frac{1}{2}$, 3, $3\frac{1}{2}$, $4\frac{2}{3}$, $2\frac{2}{3}$, 3, $3\frac{1}{3}$, $3\frac{2}{3}$,
- mixed numbers backwards $7\frac{3}{4}$, $6\frac{1}{2}$, $5\frac{1}{4}$, 4, $2\frac{3}{4}$, $1\frac{1}{2}$
- time 12pm, 1:30pm, 3pm, 4:30pm



Victorian Curriculum Links

F	Establish understanding of the language and processes of counting by naming numbers in sequences, initially to and from 20, moving from any starting point (VCMNA069)
Year 1	Develop confidence with number sequences to and from 100 by twos, fives and tens starting from zero (VCMNA086) Investigate and describe number patterns formed by skip counting and patterns with objects (VCMNA093)
Year 2	Investigate number sequences, initially those increasing and decreasing by twos, threes, fives and ten from any starting point, then moving to other sequences (VCMNA103) Describe patterns with numbers and identify missing elements (VCMNA112)
Year 3	Describe, continue, and create number patterns resulting from performing addition or subtraction (VCMNA138)
Year 4	Investigate number sequences involving multiples of 3, 4, 6, 7, 8, and 9 (VCMNA154) Count by quarters, halves and thirds, including with mixed numerals. Locate and represent these fractions on a number line (VCMNA158) Explore and describe number patterns resulting from performing multiplication (VCMNA161)
Year 5	Describe, continue and create patterns with fractions, decimals and whole numbers resulting from addition and subtraction (VCMNA192)
Year 6	Continue and create sequences involving whole numbers, fractions and decimals. Describe the rule used to create the sequence (VCMNA219)

Promoting productive dispositions



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Directions	Buzz
Small groups - different paces - regular opportunities to respond	Whole class activity - one pace - occasional opportunity to respond
Direction of the count unpredictable - students need to stay switched on to the count.	Direction of the count predictable - students can switch off until their turn comes around
Inclusive: mistakes are local and inconsequential, students stay in throughout the games, providing opportunities to learn and amend.	Exclusive: mistakes are consequential - students who make an error are removed from the game leaving no opportunity to amend mistakes.
Collaborative: students support each other to respond correctly	Competitive: success comes from allowing others to make mistakes

Lofty goal



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You will gain practical experience developing a whole-school strategy for building teaching capacity in maths and feel confident to implement this strategy in your school setting.

<u>STICKY LABELS</u> Maths Association of Victoria Warm-up	<u>DIRECTIONS</u> Peter Sullivan Warm-Up Activity																																
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Preparing to innovate



- Change is an individual process not a group event
- Frequent problem – teachers who are expected to implement new practices are not clear about what they are being asked to do.
“What does engagement mean?” - Ryan Dunn
- All of the teachers may call it the same thing but in practice it may look very different

What does the ideal maths classroom look like? What is the teacher doing? What are the students doing?

Mathematics Vision - Planning for Balance

Charles Lovitt

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1. **Happy Healthy Cheerful Productive Classrooms:** For our maths program to be 'healthy' it **must** be built around a common set of agreed principles and features. A possible list:

1. contain a vision of what it means to "work investigatively (mathematically)"
2. develop thinking reasoning and communication skills
3. seek to highlight interdisciplinary connections
4. seek genuine understandings - fewer "rules without meanings"
5. develop a toolbox of algorithmic content skills
6. lead towards notions of "informed citizenship"
7. effectively use IT support
8. cater for varied learning styles (visual, kinesthetic, concrete...)
9. employ a large repertoire of teaching strategies (open-ended investigative, cooperative group, estimation, concept lessons, role plays, modeling...)
10. use of meaningful contexts
11. cater for the whole of "the 7-year-gap" of student diversity - multiple entry and exit points, multiple levels of success
12. learning is multi-dimensional (not linear)

Any unit of work or set of lessons should be measured against the above list. Do our lessons 'really' achieve these features or do they just 'pretend'. Do our lessons really value **all** of these features? And how will we know when they are all 'in balance'.

2. **Illustrative lessons:** In order for us to have clear shared understandings what the above list looks like in practice, the following sample set of illustrative lessons have been selected as touchstones, reference points and templates to assist us in selecting or creating similar learning experiences. Taken as a whole they illuminate the 'spirit' of the program features listed above

Temperature Graphs
Mirror Bounce
Barbie Bungy Jumping
Garden Beds
Number Churn
The Architects Puzzle

Win at the Fair
Soft Drink Crates
Hunting for Stars
Fraction Estimation
First Principles Percentage
Cube Nets

3. **Seeking Balances:** There are several balancing acts we need to perform in creating a healthy curriculum. Skills, problem solving, catering for diversity, learning styles, multiple intelligences, concept and application lessons, the degree of technology - all these and more need to be in harmony and balance.

How will we know when we have 'got the balances right'? We don't want to settle for mediocrity - we want to be confident that what we are doing is 'the best' and be able to justify our actions to ourselves and all interested parties.

Through what lenses can we look to ensure our work really does have all the features, qualities the balances we seek?

Systematic use of the following "lenses" is one way to scrutinize our work - a process which can justify but also recognize 'missed opportunities'.

A Content lens	A Pedagogy lens	A Policy lens
A Learning Theory lens	An Equity lens	A Context lens
A Technology lens	An Assessment lens	A Professional Growth lens



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Our vision for Numeracy at Rosanna Golf Links Primary School

We aim to develop an excellent, meaningful Numeracy program that is based around best practise and current research to enable our students to be prepared to apply mathematical knowledge in the real world to solve problems.

We recognise that our Numeracy teachings need to include 'real world' links, where students have the opportunity to model their understanding using a range of learning materials. By allowing students to manipulate materials throughout all year levels, they are able to better understand mathematical concepts. These experiences will be open-ended investigations where possible and the practice of concepts and skills will be facilitated through games.

We value that we, like our students, learn best when we are curious, take risks, have explicit instruction and scaffolded experiences.

Teachers will endeavour to link tasks to the 'real world' and encourage students to lead their own learning. We will use data from pre/post testing and the Victorian curriculum to inform our teaching and assess individual student growth. We will work collaboratively with our colleagues, share our learnings and celebrate our achievements.

We understand and value our students' knowledge and experience, and will build upon it through real-life (where possible), hands-on, open-ended investigations.

Students will take responsibility for identifying opportunities within and directing their own learning, asking questions, taking risks and being curious learners to achieve great results and build important knowledge to be able to use concepts to solve real world problems.

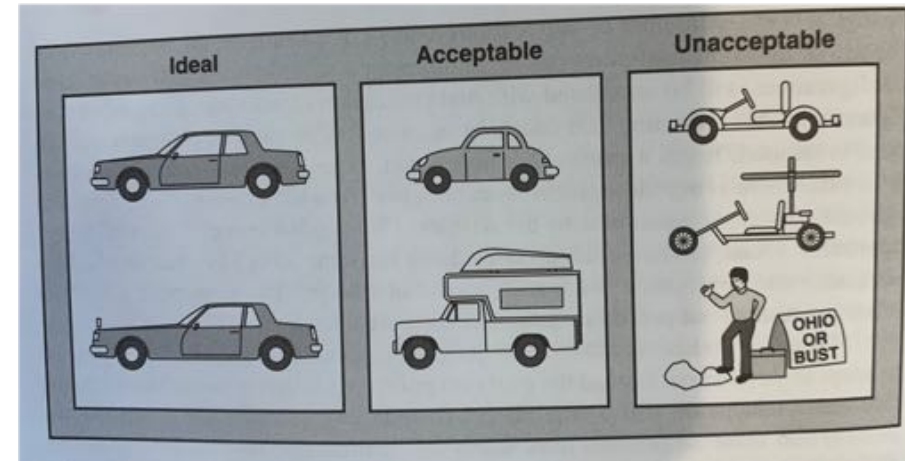
We will strive to improve educational outcomes and foster a love of Numeracy.

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Preparing to innovate

- Innovation configuration mapping addresses idealised versions of an innovation and the various operational forms that can be observed
- Number of components range depending on the complexity of the innovation

“precise specifications of practice.” (Dreyfuss Model of Skill Acquisition)



Write a short description of the component.

Innovation Configuration Map Template

The purpose of an Innovation Curriculum Map (Hall, & Hord, 2006) is to present carefully developed descriptions of different ways of doing the innovation. It is most effective when completed collaboratively, helping teams develop a consensus about what the innovation should look like when it is in use.

add 2-3 dimensions which will determine how you measure the level of implementation eg. frequency, time, engagement, skills, knowledge...

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Component 1:					
(a)	(b)	(c)	(d)	(e)	(f)

When writing descriptions, consider what will you see in classrooms when it is used well (and not used well)? What will teachers and students be doing when the innovation is in use?

This column has thick safety lines which indicate the acceptable level of implementation.



MARTIN HOLT
EDUCATIONAL CONSULTANT



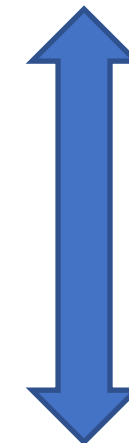
Component 2: Use of the launch explore summarise (LES) instructional model (A 50-minute lesson = launch 15 mins, explore 20 mins, summarise 15 mins approx) (frequency, engagement, skills, knowledge)

(a)	(b)	(c)	(d)	(e)	(f)
I have come up with a way to improve and/or increase the impact of the LES. I share implementation ideas with wider-school staff e.g. by offering colleagues opportunities to observe a lesson, professional development and/or by engaging and collaborating with partner schools.	I support my team to build their capacity to use the LES. This may include sourcing professional reading, sharing ideas in planning or by modeling lessons that showcase some of the practices that enhance and inhibit student learning in each phase.	I consistently use LES as the framework for my lessons. I spend approximately 15-20 minutes for each of the three phases. I am aware of a number of teacher practices that enhance and inhibit student learning in each phase. I keep the LES resource sheet handy so that I can 'brush up' occasionally.	I sometimes use LES as the framework for my maths lesson. I plan to use it more frequently. I often run out of time to effectively teach the Summarise phase of the lesson. I have read the LES resource sheet and I know some of the teaching practices that enhance and inhibit student learning in each phase.	I am interested in learning more about LES. I have experimented with some of the ideas in my practice. I have a copy of the reading materials but I haven't delved into them yet.	I don't know what the LES lesson framework is. I am not interested in learning more about it.





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Numeracy Leaders

	STAGES OF CONCERN	INTERVENTION CONSIDERATIONS
SELF	STAGE 0 UNCONCERNED: The individual indicates little concern or involvement with the innovation.	At this stage the types of interventions that may be appropriate certainly depend on context. For example, is it the very beginning of a change process, or are many others already using the innovation? Also, is use of the innovation required or even desirable?
	STAGE 1 INFORMATIONAL: The individual indicates a general interest in learning more details.	Interventions should be designed to provide general descriptive information. Too much detail will not be useful. "Buying them the book" will not lead to their reading all of it. Interventions for this stage should be spread over time and through varied medium and context.
	STAGE 2 PERSONAL: The individual is unsure of demands and adequacy to meet those demands.	Change facilitators need to be extra sensitive in working with persons who have intense Personal concerns. It is quite easy to further raise their Personal concerns. Also, frequently intense Personal concerns are not innovation related. They could be job related (Will I have a job next year?) or non-work related (My daughter is going through a divorce). The key to resolution of Personal concerns is to have more information. However, when people have intense Personal concerns, they are not open or trustful of the information that is provided. When Personal concerns are clearly innovation related, the following types of interventions may be helpful.
TASK	STAGE 3 MANAGEMENT: The individual focuses on the processes and tasks of using the innovation and the best use of information and resources.	Interventions should focus on the "how-to-do-its." All-day, full group trainings may not be the most effective method since many Task concerns are idiosyncratic. At one research site, the leaders created informal after school "comfort and caring" sessions, during which experienced innovation users could provide advice and assistance that addressed specific Management concerns.
IMPACT	STAGE 4 CONSEQUENCE: The individual focuses on the innovation's impact on students in their immediate sphere of influence.	Facilitators enjoy persons with Consequences concerns. The concerns of such individuals are targeted toward Impact and how quality of use of the innovation can be enhanced. Persons with Impact concerns appreciate recognition and encouragement for their efforts to improve outcomes.
	STAGE 5 COLLABORATION: The individual focuses on coordinating and cooperating with others.	The arousal and sustaining of Impact concerns about working with one or more colleagues in relation to the use of the innovation is the ultimate. Leaders should do all they can to facilitate the arousal of Collaboration concerns and to support innovation implementers working together.
	STAGE 6 REFOCUSING: The individual focuses on exploring ways to reap more universal benefits from the innovation.	Individuals at this Stage of Concern are self-starters and certainly have their own goals in mind. They have strongly held ideas about ways that the change process and/or the innovation should move in new directions. If the institutional change effort is moving in a direction antagonistic to their opinions and concerns, some fairly directive actions may be necessary to outline limits within which they may deviate from the mainstream. If their ideas are consistent with furthering use of the innovation and vision of the organisation, then encouragement to "go ahead" is appropriate. However, there also should be regular monitoring for unexpected creative adaptations.

Resources



Component 1:					
<u>(a)</u>	<u>(b)</u>	<u>(c)</u>	<u>(d)</u>	<u>(e)</u>	<u>(f)</u>

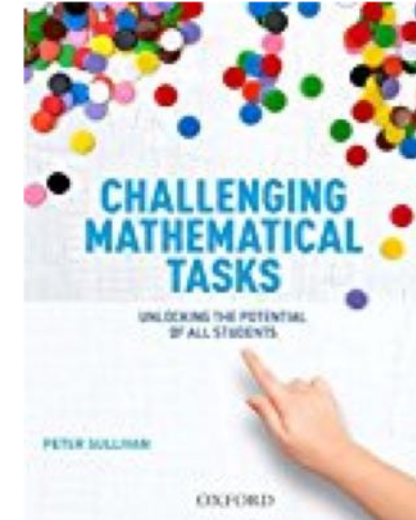
Additional resources



SEDL.org [Innovation Configuration Mapping Resources](#)



MAV In-school Consulting



section 5

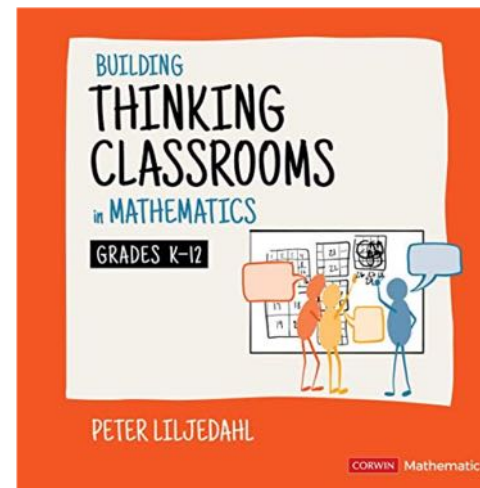
Six key principles for effective teaching of mathematics

This section follows on from the discussion of the goals of teaching mathematics and the data available on the mathematical achievement of Australian students. Having established the personal and social value of having mathematical understanding and some skills current to the cohort of Australian mathematics students, the discussion of teaching what schools and teachers need to know and be able to do in order to address the shortfall between the required/desired and the demonstrated learning outcomes.

This section draws on research findings and other sets of recommendations for teaching actions, to present a set of six principles that can guide teaching practice. As the title of the *Teaching Mathematics? Make it count* conference indicates, there is the conviction that teaching mathematics well, in such a way as to make it count, is a worthwhile and reasonable proposition. This section presents a set of six principles of teaching mathematics which are specific to mathematics, but which are also based on sound general pedagogic principles that can relate to all curriculum areas. These principles are reinforced by much of the research and the advice that follows in this paper. Overall, the review paper points that they should be the focus for teacher education and professional learning in mathematics, which is addressed in Section 9.

The development of this review paper's six principles was partly motivated by the various lists of recommended practices from Australian education systems such as *Productive Pedagogies* (Department of Education and Training, Queensland, 2010) and *Principles of Learning and Teaching* (Department of Education and Early Childhood Development, Victoria, 2011) which are intended to inform teaching generally. Such lists are long and complex, and the author suspects that mathematics teachers experience difficulty in extracting the key recommendations for their particular practice. For example, one such set of recommendations is the South Australian *Teaching for Effective Learning Framework* (Department of Education and Child Services, South Australia, 2010), which lists four domains and 18 sub-domains. Some of the sub-domains are helpful, such as: build on learners' understandings; connect learning to students' lives and aspirations; communicate learning in multiple modes; support and challenge students to achieve high standards; and build a community of learners. There are others that are less clear, such as: explore the construction of knowledge; negotiate learning; and, teach students how to learn. It is suspected that such recommendations provide general rather than specific support for mathematics teachers, and do not seem likely to prompt or motivate improvement in mathematics teaching practices.

While informed by such frameworks, the six principles for teaching mathematics defined and described in this review paper draw on particular national and international research reviews and summaries of recommendations about mathematics teaching. For example, this



Lofty goal



You will gain practical experience developing a whole-school strategy for building teaching capacity in maths and feel confident to implement this strategy in your school setting.

T

is for thoughts - what are your thoughts about the content shared?
How might the ideas impact your future practice?

The TQE protocol

Q

is for questions - what questions have been raised for you?

E

is for epiphanies - what connections have you made with your own beliefs and experience?

Innovation configuration mapping for building school-wide teaching capacity.



“Unless you can define practice and make it common, you can’t improve the quality of teaching.”
(David Hopkins, 2009)

Thanks :)

martinbholt@gmail.com



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