Wedge Park Primary School

Building Teacher Capacity through PLT's- a problem solving based approach

Dr Sara McKee

Focus of Today's session:

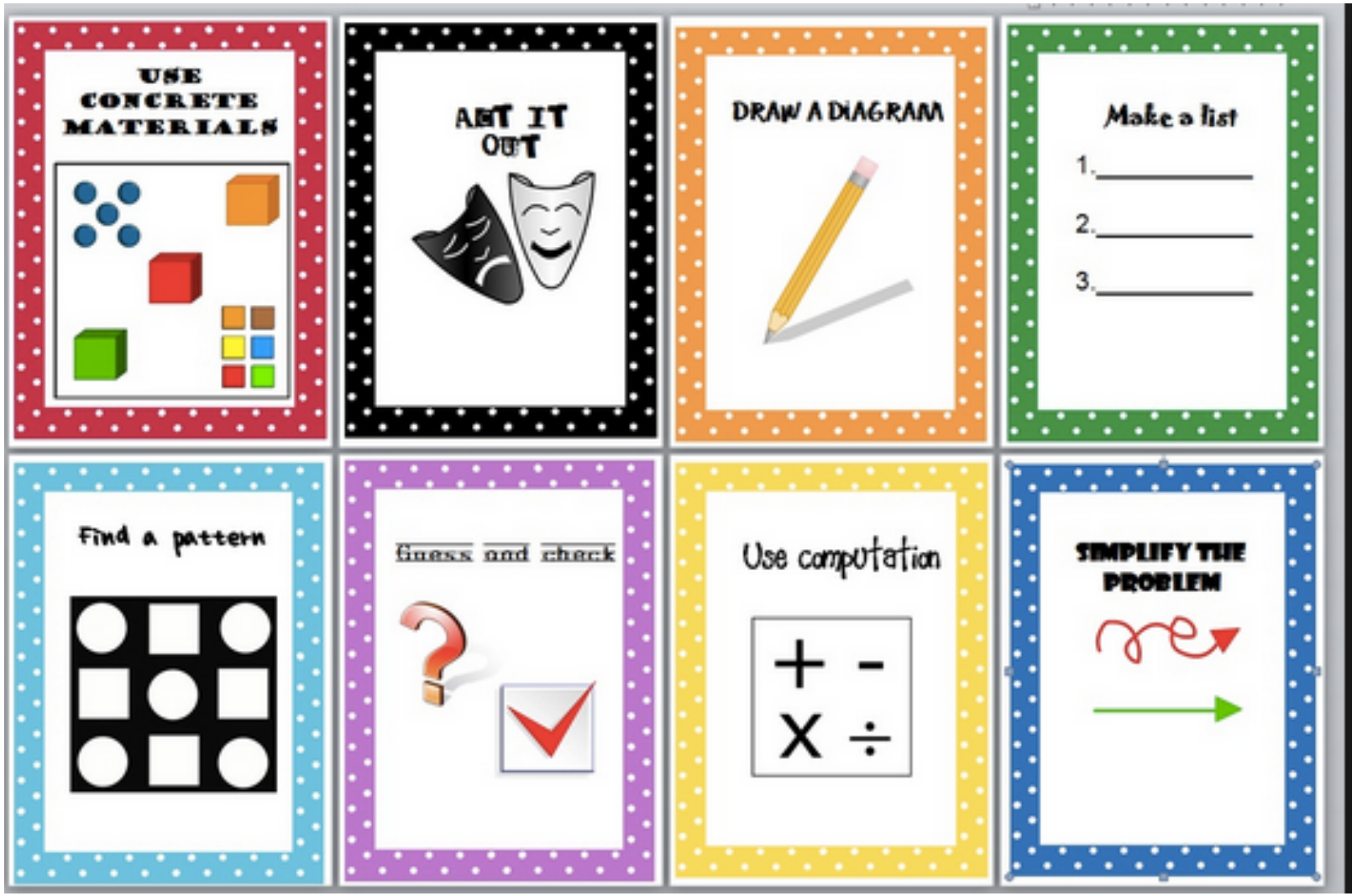
- How Professional Learning Teams can work collaboratively to build teacher capacity, through the implementation of problem solving tasks
- Identify strategies which school leaders can implement in their PLT's and as part of their whole school curriculum plan.
- Demonstrate how a problem solving lesson is run, and how student learning and strategies from a lesson can then be used in a Professional Learning Team to identify student understandings and misconceptions, and how this can then inform future planning and teaching.

A bit about me..

- Primary Teacher
- Secondary (7-9 Teacher)
- Maths Coach P-9
- University Tutor/Lecturer
- Assistant Principal
- Master of Numeracy
- Doctor of Education- (Numeracy focus)

A bit about Wedge Park..

- 908 students
- 39 classrooms
- 9 members of the leadership team
- Coaching and curriculum team



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- We have moved away from the 'Problem Solving' posters and focus more on the 'mathematical' strategy rather than the 'organizational' strategy

What is the Japanese Method of PS?

- Structured Problem Solving which is planned collaboratively
- A challenging problem is presented to students, where they use their own mathematical knowledge to solve it
- Students are not told how to solve the problem!! This is important!
- Students can solve the problem using multiple strategies
- The teacher then leads the class in a whole-class discussion to share strategies and solutions
- This is where the learning happens- 'flipped' lesson structure

What are the benefits of Problem Solving?

- When solving problems students are exploring the mathematics within a problem context rather than as an abstract- it can be used at the beginning of a unit!
- Problem solving provides ongoing assessment information that can help make instructional decisions. The discussions and recording involved in problem solving provide a source of information about students' mathematical knowledge and understanding.
- Good problem solving activities provide an entry point that allows all students to be working on the same problem- within reason. Because the focus is not limited to a specific answer students at different ability levels can experience both challenges and successes on the same problems
- Problem solving is enjoyable. It allows students to work at their own pace and make decisions about the way they explore the problem.

Problem Solving or Worded Problem?

- Any worded problem could potentially be a Problem Solving question- as long as there are multiple ways a student can solve the problem.

- It's not how it is worded- it's how the lesson is structured!

- If a student is given a problem to work on independently with no sharing back or discussion with the class- this is a worded problem.

Harvey's dog houses

Learning Intention

We are learning to problem solve using our own strategies.

I am successful if I can.....

- solve a problem by myself
- show my working out
- share my strategies with the class

This is Miss McKees dog Harvey!

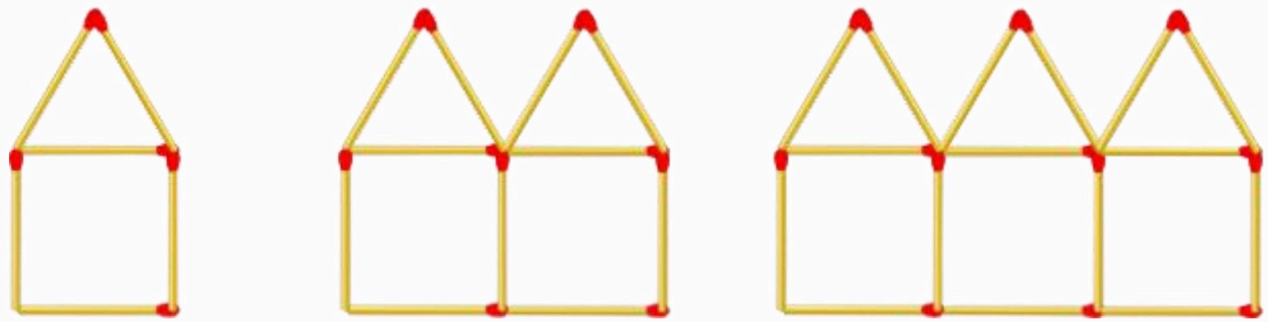
He’s a very funny dog!

As you can see!

He has lots of friends that he made at Greyhound School, and he likes having them over to play.

She decided to make dog houses like this one!

Miss McKee was making dog houses, for when Harvey's friends come over. She used 6 pieces of wood on the front of one dog house. She used 11 pieces of wood on the front of two dog houses. If she needs to make 7 dog houses, how many pieces of wood would she need for the front of them?



Process of Planning and Administering a Problem Solving Lesson

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Prior to the lesson

- ☐ PLT planning of the problem collaboratively
- ☐ Identifying the specific teaching/learning goals of the PS question
- ☐ Solve the problem individually
- ☐ Identifying the range of students strategies, including misconceptions
- ☐ Identifying how strategies could be compared and contrasted
- ☐ Ensuring the problem is in a relatable context- how are we going to get students engaged in the problem? What back story are we using to ensure students understand vocab?
- ☐ Identifying Differentiation- 'what if?' (support and extension) based on the same problem

Anticipated Responses

- Developing the Anticipated Responses is a really important part of developing the problem solving task as a PLT- It builds teacher capacity and ensures all teachers understand the problem and what the students may be thinking

- There should be robust conversation about ordering the strategies from least to most efficient

- This becomes ongoing assessment and assessment reviewed weekly so explicit teaching can be planned from it and further problem solving tasks. It needs to be viewed as a form of assessment.

Harvey's Doghouse 36					
Draw All		Count All		Skip Counting 6, 11, 16, 21, 26, 31, 36	
Incorrect	Correct	Incorrect	Correct	Incorrect	Correct
Repeated addition of 2s (roof) + repeated addition of 3s (house structure) + 1		6 + 5 + 5 + 5 + 5 + 5 +5		7 x 2 (roofs) 7 x 3 (house structure) + 1	
Incorrect	Correct	Incorrect	Correct	Incorrect	Correct
6 x 5 + 6		7 x 5 + 1		(h x 5) + 1 Algebraic rule with some letter representing no. of houses	
Incorrect	Correct	Incorrect	Correct	Incorrect	Correct

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Mr Hughes has a cute daughter, however she's only 5 months old which means she goes through a lot of smelly nappies.
Mr Hughes had to figure out how many nappies he needed for his daughter in a fortnight.
In the first week Sadie went through 138 nappies and in the second week she used 139 nappies.

How many nappies did Sadie go through over the entire fortnight?

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During the lesson

Refer to Problem Solving Lesson Structure

- ☐ Roving around and identifying student strategies on the strategy sheet
- ☐ Identifying which strategies will be compared/contrasted
- ☐ Providing questioning prompts for students who require support
- ☐ Extending students with differentiation questions
- ☐ Taking photos of student work for sharing
- ☐ Sharing strategies- comparing and contrasting
- ☐ Summarising the Learning

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INTRODUCE THE PROBLEM

Read through the problem with the students, ensuring you make a real life connection to the problem.

It is important not to tell students how to solve the problem.

Why is context/background important?

- Student life experiences- do they understand the problem?
- Student vocabulary- have they heard those words before?
- Evens the playing field- all students have the same understanding of the problem
- Students can see the relevance of solving a problem!
- Teachers are having FUN planning the problem!

Camp Toast Problem – At camp there was a lot of toast cooked! The kitchen asked for Mr. Hughes and Miss. Kinder to put 8 pieces of toast in a basket for each table. There were 14 tables to be served each day. How much toast was consumed by the students over the 2 days of camp?

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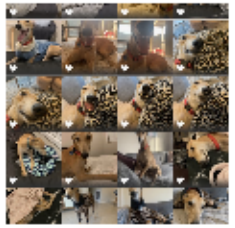
Miss McKee's Camera Roll Problem



Miss McKee has way too many photos of Handsome Harvey on her phone which makes it hard to find the ones she likes.

She can sort them into folders to make it easier to find them. Her phone will let her put 10 photos in each folder.

She has 173 photos on her phone. Show me the different ways Miss McKee can sort her photos.

Miss Webster bought a new fish tank on the holidays! She went shopping to buy fish for her tank. On Monday, she bought 4 gold fish. On Tuesday she bought 26 guppies. On Wednesday, she bought 10 catfish. How many fish did she buy?

Mr Schwartz cooked 6054 sausages for the family BBQ.
He dropped 100 sausages. How many sausages does he now have?

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INDEPENDENT SOLVING

Students work independently to solve the problem using their own strategy or strategies. Work with students who require assistance.

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RECORDING THINKING

Encourage students to record their thinking and to justify their thought process. This will make it easier for them to share with the class.

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SHARING OF STRATEGIES

Whilst students are working, identify the different strategies students are using and decide how to structure the sharing of these strategies.

Encourage students to share their strategy with the class , and allow others to ask questions of their work.

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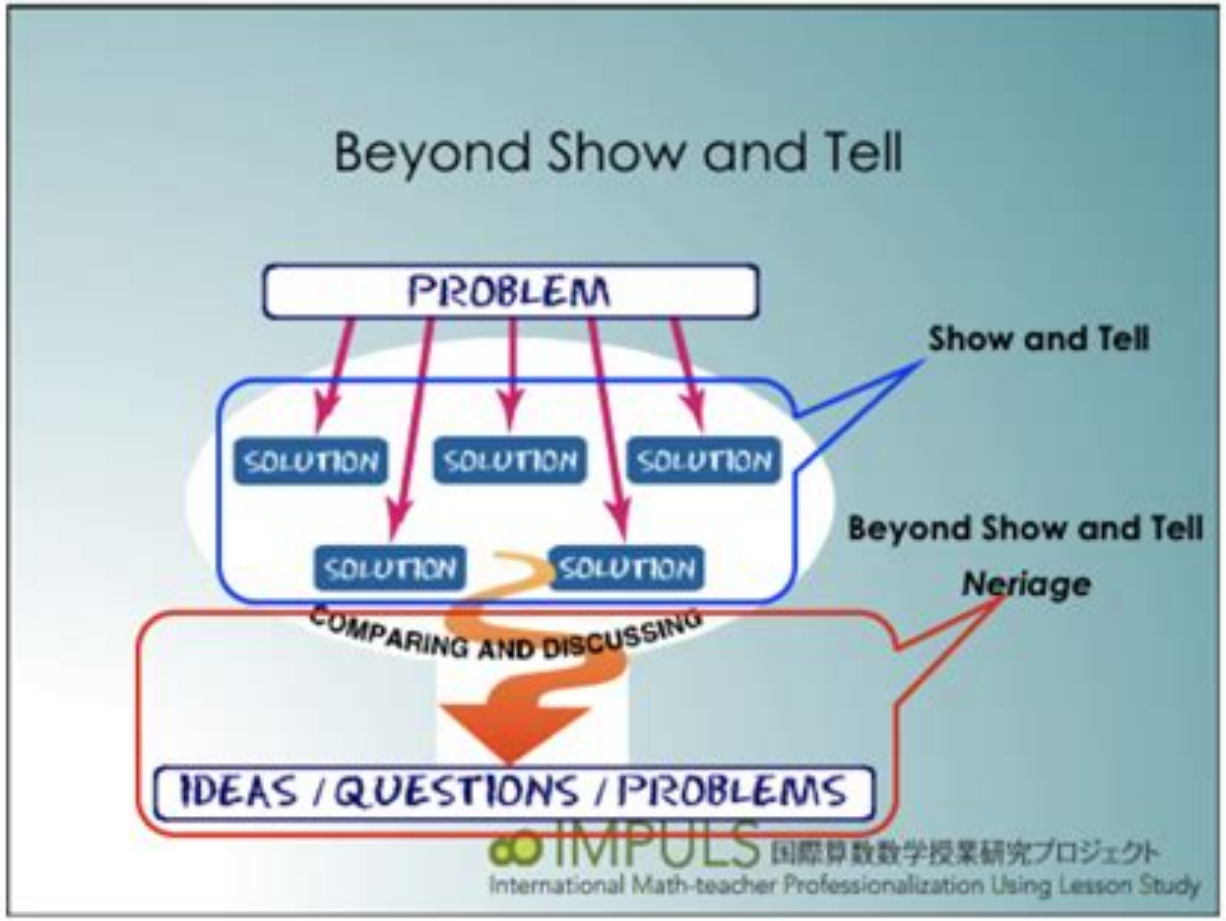
COMPARE AND CONTRAST

Highlight similarities and differences between students strategies, and encourage students to reflect on the different strategies used.

Neriage- Beyond Show and tell



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REFLECT ON LEARNING

Allow students to reflect on the learning which has taken place during the lesson, and to identify the efficient strategies they have seen.

Cupcake Problem Years 1-6

Miss McKee was baking cupcakes for her friends Birthday party. She lined them all up to display on the table at the party, but she couldn't remember how many she made! What is the best way she could count these cupcakes?

What are the anticipated responses for this question?

Prior to the lesson

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Teaching and Learning goal of this lesson is to see if students choose to solve the problem multiplicatively, or revert to counting/repeated addition

Differentiation
Support: How many cupcakes are there? How could you work this out?

Extension: If Miss McKee had made 78 Cupcakes, could she still make it in the same display? Why/Why not?

Anticipated Responses

Count all (54)	Count by 2's	Count by 4's	Count in groups of 8
Count by 12's	4+4+4+ … 3+2+1	Sort into groups of 10	Attempt to find ½ then double
12+13+14+15	Upside down pyramids (10) +4	12x4+6	

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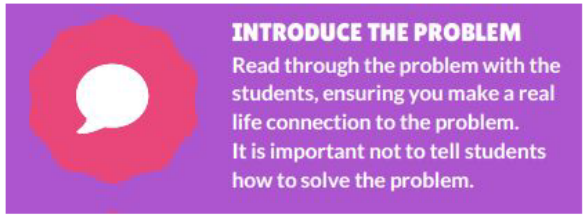
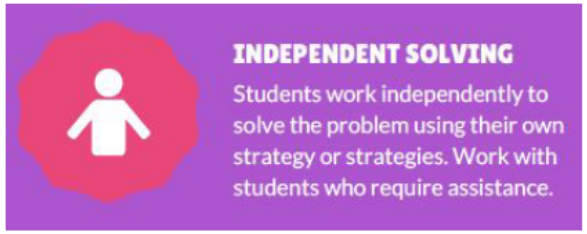
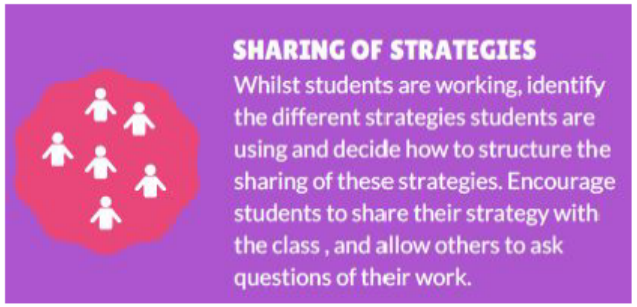
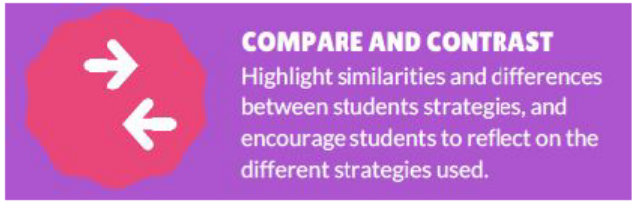
Problem Solving Lesson Structure		
Learning Intention: We are solving a problem using our own strategies **Success Criteria:** - I can solve a problem by myself - I can show my working out - I can explain my thinking to a partner - I can explain my thinking to the class		
Lesson Structure		Resources
	**10 mins** Keynote: Go through background information and set the scene of the story Problem: *Miss McKee was baking cupcakes for her friends Birthday Party. She lined them all up to display on the table at the party, but couldn't remember how many she made! What is the best way she could count these cupcakes?*	Keynote Problem on sheet
	**15 mins** Rove around and take note of strategies being used Identify which strategies will be shared during share time- take photos Does anyone require support? Does anyone require extension? Provide 'What if' questions for these students. Ensure these names are documented for reference	Strategy sheet iPad to take photos

	**5 mins** Students share their strategy with the person next to them- explain if/how their thinking changed throughout solving the problem.	Student work on TV
	**25 mins** Sharing of strategies on TV, using the developmental sequence of strategy sheet to guide this. Which strategies will be compared and contrasted based on the learning goals of the lesson? Flick back through strategies to highlight similarities and differences	
	**5 mins** If you were to do this problem again, which strategy would you use? Why? Was there a more efficient way to solve the problem than the strategy you used?	Student work on TV

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After the lesson

- [ ] Keep the list of student strategies
- [ ] Use student strategies as form of assessment
- [ ] Moderating student strategies during PLT
- [ ] Identifying which strategy most students are using- how do we move students to a higher level of thinking?
- [ ] Identifying teaching points based on strategies used as a PLT
- [ ] Identifying focus for planning next Problem Solving lesson

Questions?

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Problem solving open day possibility