Wedge Park
Primary School

Problem
Solving

Why is Problem Solving Important?

- Problem solving places the focus on the student making sense of mathematical ideas. When solving problems students are exploring the mathematics within a problem context rather than as an abstract.

- Problem solving encourages students to believe in their ability to think mathematically. They will see that they can apply the maths that they are learning to find the solution to a problem.

- 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 questions provide an entry point that allows all students to be working on the same problem.

- Problem solving is enjoyable. It allows students to work at their own pace and make decisions about the way they explore the problem.

- 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

- Students can experience success when sharing their strategies with the rest of the class. They can also learn from their peers.

Why is the context of the Problem 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!

- Students engage with the problem if it is of relevance to real life

- It's a great way to build positive relationships by letting the students learn more about you as a teacher.

Problem solving lesson planning at Wedge Park

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

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

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

STRUCTURING A PROBLEM SOLVING LESSON

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.

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

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.

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.

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

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.

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**
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.	**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
INDEPENDENT SOLVING Students work independently to solve the problem using their own strategy or strategies. Work with students who require assistance.	**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 Support: How many cupcakes are there? How could you work it out? Extend: If Miss McKee had made 78 cupcakes, could she still make it in the same display? Why/Why not?	Anticipated Response sheet iPad to take photos
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.	**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
COMPARE AND CONTRAST Highlight similarities and differences between students strategies, and encourage students to reflect on the different strategies used.	**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	
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.	**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

Problem Solving 'Rules'

Have a go!

Don't rub out your work- you can do your Maths in texta

When your thinking changes, the colour of your texta changes

I need to be able to read your mind! Put as much detail as possible

Be prepared to be proud! You might share your work with the class

Problem Solving Question (Given to students on A3 Sheet)

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?

Anticipated Response Sheet (For teacher use during lesson)

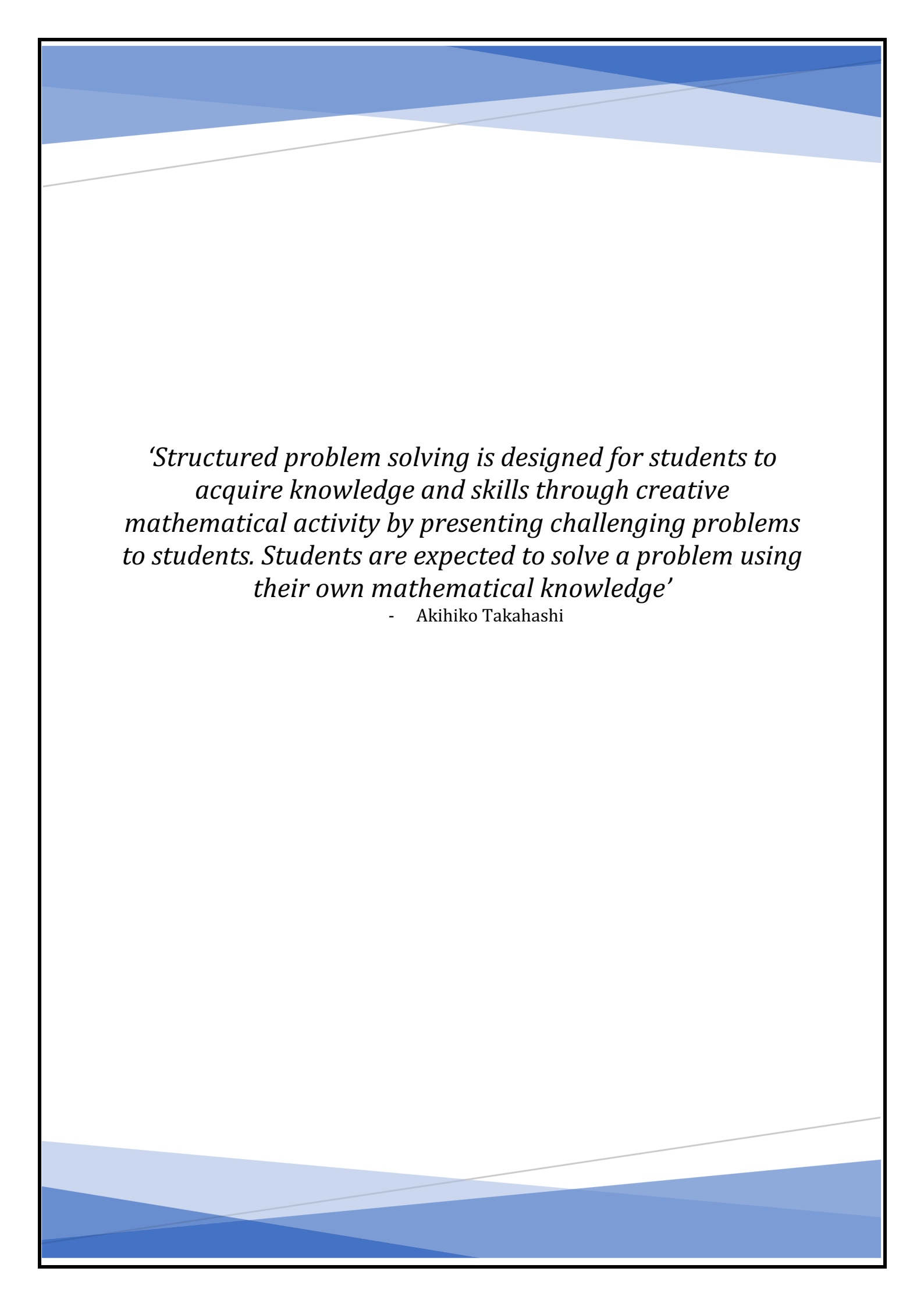| Count all (Incorrect)	Count all (54)	Count by 2's	Count by 4's
Count in groups of 8	Count by 12's	4+4+4+….. 3+2+1	Sort into groups of 10
Attempt to find ½ then double	12+13+14+15	Upside down pyramids (10) +4	12x4+6

Problem Solving Question (Given to students on A3 Sheet)

Miss McKee loves travelling! She especially likes staying in high rise hotels. On her last holiday to Hong Kong, she was trying to work out how many windows there were at the Hong Kong Hotel. She counted seven floors of hotel rooms, and each floor had 8 rooms. Each room had 3 windows. How many windows were there at the Hong Kong Hotel?

Anticipated Response Sheet (For teacher use during lesson)

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Make a model	Draw all (picture of hotel)	Draw all (dots/squares to represent)	Identify each floor (3+3+3+3+3+3+3) and then total floors (24+24+24….)
48+48+48+24	50+50+50+25=175 175-7=168	Identify how many rooms in total (8+8+8+…) then additive the amount of windows (50+50+50) Then (6+6+6)	Identify how many rooms in total (8+8+8+…) then additive the amount of windows (56+56+56)
Identify each floor (8x3) and then total floors (24x7)	7x8x3	FloorxRoomsxWindows	
*compare and contrast- efficient to draw dots instead of actual hotel *compare and contrast- additive thinking and multiplicative – which is more efficient			

'Structured problem solving is designed for students to acquire knowledge and skills through creative mathematical activity by presenting challenging problems to students. Students are expected to solve a problem using their own mathematical knowledge'

- Akihiko Takahashi