

Lesson Plan Session 1

Using technology to present a problem solving activity - practical session

General Aspects:

1. Learning Goals:

To develop an understanding of the opportunities that technology can afford teachers in presenting problem solving activities

To reflect on the appropriate use of technology when teaching and learning problem solving skills

To develop problem solving skills

2. General Strategy:

Working on 5 key problems, alongside discussion of appropriate teaching and learning strategies

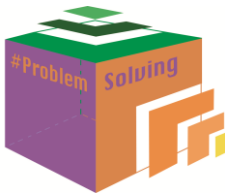
3. Structure:


Lesson segments include: an introduction, 5 key problem solving activities (including, reflection time, individual work, small group work and whole group discussion of strategies), demonstration and discussion segments (including exposition and discussion of key ideas) and a conclusion.

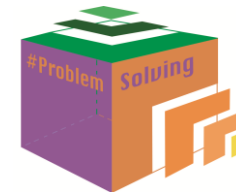
4. Resources:


PowerPoint presentation, squared paper, envelope with instructions for one activity, measuring equipment such as rulers and tape measures, mobile device and GeoGebra may be useful for students but this is not essential

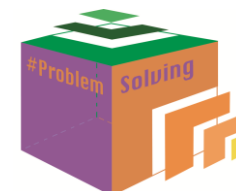
Development of the Lesson:



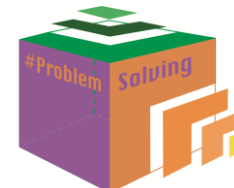
Task and Learning Activities	Expected Duration	Class Activity (potential difficulties)	Instructor Support	Goal and Assessment
<p><i>Introduction</i></p> <p>Bob the builder – how much do we save if we buy the offer?</p> <p>Discussion: What different strategies are effective in solving the problem?</p>	10 mins	<p>Participants solve through using mental maths strategy before, sharing with neighbour and then discussing as whole group.</p> <p>Compare and contrast different strategies used by participants</p> <p>Whole group discussion on using photographs of real life scenarios to engage students in problem solving</p>	<p>Allow reflection time before discussion of solution</p> <p>Suggest other possibilities for solving the problem</p> <p>Include ideas for supporting students to share their strategies with whole group</p> <p>Facilitate discussion on using photographs of real life scenarios to engage students in problem solving</p>	<p><i>Goal</i></p> <p>To develop an understanding of the opportunities that technology can afford teachers in presenting problem solving activities</p> <p>To develop problem solving skills</p> <p><i>Assessment</i></p> <p>Group discussion</p>
<p><i>Problem 1</i></p> 	15 mins	<p>Small groups work on solving problem</p> <p>Split class. Half of class should work on scenario 1 and the other half should work on 2nd scenario</p>	<p>Explain that customers may choose different packages of lessons. Caitlin wants to find the most cost effective way of learning to drive. David wants to maximise his earnings.</p>	<p><i>Goal</i></p> <p>To develop an understanding of the opportunities that technology can afford teachers in presenting problem solving activities</p>




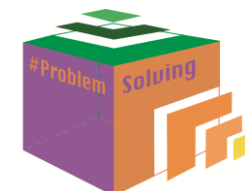
<p>Scenario 1 Caitlin is buying driving lessons. Consider different scenarios and advise her accordingly.</p> <p>Scenario 2 Review David's pricing structure and advise him accordingly.</p>		<p>Groups feedback to class their solutions and justify their reasoning</p> <p>Who would this activity be suitable for?</p>	<p>Allow ample time to explore various options.</p> <p>Facilitate whole group discussion.</p>	<p>To develop an appreciation that problems may have more than one optimal solution.</p> <p><i>Assessment</i> Peer assessment, group discussion</p>
<p><i>Demonstration and Discussion</i></p> <p>Begin discussion on how photographs may be used</p> <ul style="list-style-type: none"> To engage the learners in the task To show how maths is relevant to real life To promote the use and discussion of different strategies for finding solutions <p>Demonstrate spreadsheet</p> <ul style="list-style-type: none"> Would this be helpful to the problem solving process? <p>Review Pólya's approach to problem solving</p> <ul style="list-style-type: none"> Introduce the idea of evaluating the effectiveness of technology for teaching/learning? 	10 mins	Reflect on effective use of technology for teaching and learning	Explanation and facilitation of group discussion	<p><i>Goal</i></p> <p>To reflect on the appropriate use of technology when teaching and learning problem solving skills</p> <p><i>Assessment</i> Group discussion</p>
<p><i>Problem 2 - Socks and matching pairs</i></p> 	25 mins	Whole group introductory activity	Introduce problem using 2 pairs of socks and a bag. If we take 2 socks out at random, what is the probability that we shall have a pair of socks?	<p><i>Goal</i></p> <p>To develop an understanding of the opportunities that technology can afford teachers in presenting problem solving activities</p>




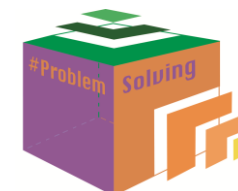
<p>Emily's dad is in a rush to get dressed. Without looking, he grabs 2 socks from the drawer.</p> <p>What is the chance that he grabs a matching pair?</p>		<p>Individuals consider the problem for short time.</p> <p>Small groups work on solving problem</p> <p>Groups to reflect on what steps they have considered and the strategies they have used to solve the problem.</p> <p>Are there alternative approaches that are effective?</p> <p>Explore sample student responses. Do these demonstrate errors or misconceptions?</p> <p>How might teachers address these in order to promote deeper learning?</p>	<p>Show problem on PowerPoint</p> <p>Emphasise how we should not only encourage students to take time to understand the problem before attempting to solve it but that teachers should also model this behaviour.</p> <p>After 15 minutes, show sample responses from students – facilitate whole group discussion</p>	<p>To reflect on the appropriate use of technology when teaching and learning problem solving skills</p> <p>To develop problem solving skills</p> <p><i>Assessment</i> Peer assessment, group discussion</p>
<p><i>Problem 3 - Triangles and squares</i></p>	<p>30 mins</p>	<p>Individuals consider problem for short time.</p> <p>Small groups work on solving problem</p> <p>Groups to reflect on what steps they have considered and the strategies they have used to solve the problem.</p>	<p>Allow for individual reflection</p> <p>Allow for group interactions</p> <p>After 10 minutes, explore some possible different patterns to explore –</p>	<p><i>Goal</i></p> <p>To develop an understanding of the opportunities that technology can afford teachers in presenting problem solving activities</p>



 <p>In patchwork terminology this quilt is made up of half square triangles.</p> <p>How many squares can you see?</p> <p>Explore the relationship between squares and triangles.</p> <p>Plan how you will approach this problem.</p>		<p>Are there alternative approaches that are effective?</p> <p>What about the use of GeoGebra?</p> <p>Groups share their learning and solutions with whole group</p>	<p>facilitate group discussion.</p> <p>Allow groups to develop their ideas further.</p> <p>After 20 minutes facilitate group discussion.</p>	<p>To reflect on the appropriate use of technology when teaching and learning problem solving skills</p> <p>To develop problem solving skills</p> <p><i>Assessment</i> Peer assessment, group discussion</p>
<p><i>Demonstration and Discussion</i></p> <p>Following the last 2 activities:</p> <ul style="list-style-type: none"> • How might we present problems to engage students? • What technology is appropriate for the teacher/practitioner to use? • What technology is appropriate for the student to use? • Will the technology enhance the learning? • When will technology enhance/detract from learning? 	10 mins	<p>Reflect on effective use of technology for teaching and learning</p>	<p>Explanation and facilitation of group discussion</p> <p>Include discussion on the appropriate use of manipulatives</p>	<p><i>Goal</i></p> <p>To reflect on the appropriate use of technology when teaching and learning problem solving skills</p> <p><i>Assessment</i> Group discussion</p>
<p><i>Problem 4- Flags</i></p>	25 mins	<p>Individuals consider problem for short time.</p>	<p>Allow for individual reflection</p>	<p><i>Goal</i></p>



 <p>How many different ways could we arrange the flags in the photograph?</p>		<p>Small groups work on solving problem for short time</p> <p>Small groups work on new problem</p> <p>Once find solution, consider extension of problem.</p> <p>Groups to feedback to whole group.</p>	<p>Allow short time for group interactions</p> <p>The problem is very challenging for students who are not familiar with factorial numbers – draw out the importance of the strategy to simplify problems – change problem to 3 flags</p> <p>Facilitate group discussion. Discuss extension to problem</p>	<p>To develop an understanding of the opportunities that technology can afford teachers in presenting problem solving activities</p> <p>To develop problem solving skills</p> <p><i>Assessment</i> Peer assessment, group discussion</p>
<p><i>Problem 5 - Crime Scene Investigation</i> A crime has been committed. The only evidence of the perpetrator is a footprint. A crime scene investigator claims that this is an important clue because, “the length of a footprint is 15% of a person’s height”. Collect data from your group and use this to support or refute this claim.</p> <p>One group to receive an envelope with the following instructions: Collect a 30 cm ruler, tape measure and sheet of squared paper. Draw a table to record each person’s information. Include: first name; foot length (cm); and height (cm).</p>	<p>25 mins</p>	<p>Individuals consider problem for short time.</p> <p>Small groups work on solving problem</p> <p>Groups to reflect on what steps they have considered and the strategies they have used to solve the problem.</p> <p>Groups to reflect on the learning from structured problems and unstructured problems</p>	<p>Tell story of crime and the footprint.</p> <p>Provide various measuring tools.</p> <p>Give envelope with instructions to one group. They should not share these instructions with any other group.</p> <p>Allow ample time for groups to explore the claim.</p>	<p><i>Goal</i> To develop an understanding of the opportunities that technology can afford teachers in presenting problem solving activities</p> <p>To develop problem solving skills</p> <p><i>Assessment</i> Peer assessment, group discussion</p>



<p>Measure each person's left foot in cm (shoes on). Use a 30 cm ruler. Record the length of each person's foot in the table. Measure each person's height in cm. Record in table. If your footprint is 15% of your height, calculate what height you should be. Compare your answers to the claim made by the crime scene investigator. Was the claim true?</p>			Facilitate whole group discussion. Draw out the learning from structured and unstructured problems	
<p><i>Conclusion</i> Final points and allow for questions</p>	5 mins	Group discussion/questions on problems and strategies	Facilitate discussion	<p><i>Goal</i> To recap ideas of the day</p> <p><i>Assessment</i> Group discussion</p>

