Booragul Public School NSW Syllabus for the Australian Curriculum – Measurement and Geometry

Volume and Capacity 2			
Outcome	**Teaching and Learning Activities**	**Notes/ Future Directions/Evaluation**	**Language / Date**
A student: › describes mathematical situations and methods using everyday and some mathematical language, actions, materials, diagrams and symbols **MA1-1WM** › uses objects, diagrams and technology to explore mathematical problems **MA1-2WM** › supports conclusions by explaining or demonstrating how answers were obtained **MA1-3WM** › measures, records, compares and estimates volumes and capacities using uniform informal units **MA1-11MG** **Syllabus Content Note:** 1st content outcome relates to measuring and compare the capacities of pairs of objects using informal units **Syllabus reference:** Hardcopy page: 99 Digital: 103		**Background information** The order in which volume and capacity appear in the content is not necessarily indicative of the order in which they should be taught. Calibrating a container using uniform informal units is a precursor to students using measuring cylinders calibrated in formal units (litres and millilitres) at a later stage. An object displaces its own volume when totally submerged. **Refer also to background information in Volume and Capacity 1.**	• capacity, • container, • volume • measure.

Activities		
Explicit Mathematical Teaching Volume is an extremely complex concept because of its different forms and the different ways of measuring it. The complexity of volume concepts means that many students are unlikely to develop conservation of volume until they have had experiences of measuring volume in a range of contexts, and with both types of units, liquid and cubic. One aspect of volume is capacity (the term usually used for liquids measured in kilolitres, litres and millilitres) and means the amount a container can hold. A second aspect of volume is the volume of a model made with blocks. This aspect enables comparisons to be made easily—which model has more or fewer blocks—by counting the blocks. However, students may focus on counting and not associate this activity with volume. Nevertheless, it provides practice with stacking and layering, and may assist students to consider that not all blocks are visible when a model is built. A third aspect of volume is the capacity (interior volume) of containers, when measured in cubic centimetres. The cubic units make this aspect of volume measurement more difficult than liquid measure. Students have to first learn to pack rectangular containers systematically. For example, students could measure and compare the volumes of their lunchboxes using informal cubic units, such as blocks. Packing activities develop knowledge of how the units are packed. A fourth aspect of volume is exterior volume, or the amount of space a container takes up. Cosmetics containers are a good example. The amount the container holds (its interior volume) is often far less than the volume of the container (its exterior volume). Exterior volume of an object or irregularly shaped container is quite difficult to determine and would usually be found by displacement. **Volume** refers to the amount of space occupied by an object or substance. **Capacity** refers to the amount a container can hold. Students should experience filling containers with both continuous material [water] and with discrete objects. [marbles ,blocks]		
Whole Class Teaching **Is it full?** Students fill a container with marbles, peas or beads and discuss whether it is full or not full, and whether there are any spaces. Students discuss that some materials fill or pack without gaps. Students select an appropriate type of object and predict if it		

will fill a container without leaving spaces. They are then asked to explain why they think this. **How Could I Measure?** Students suggest different materials that could be used to measure different containers, e.g. sand, water for cylindrical containers, blocks for rectangular boxes. Record what happened when different materials were used. **Dump or Pack? Sample units of work page 74** In small groups, students fill an ice cream container with plastic cubes by each of two methods: ▮ picking up the cubes in handfuls and dumping them into the container ▮ packing the cubes into the container by placing them neatly next to each other and building up the layers. Students record the number of cubes used for each method. Possible questions include: ▮ which method of filling gives you more items? ▮ what products do you buy at the supermarket that are packed/loosely bagged? ▮ which shaped item gives you more product if it is packed?		
<u>Guided Group/Independent Activities</u> **Pour and Order** Students are asked to compare and order the capacities of containers eg a cup, a jug and a pan. Students are encouraged to use their own methods. Students may fill one container and pour the contents into another container, or pour the contents of each of the containers into a third larger container and mark each level. Possible questions include: ▮ how did you estimate the capacity? ▮ what can you use to measure and compare the capacities of two containers? ▮ can you order the capacities? **Different Cups** The teacher collects cups of different shapes and sizes and icecream containers of the		

same size. Each pair of students has a different cup and an ice cream container. Students are asked to fill the ice cream container with water using repeated cupfuls and record how many cups it took to fill the container. Possible questions include: ▮ why did we all get different numbers of cups? ▮ whose cup needed the most cupfuls to fill the container ? ▮ whose cup needed the least cupfuls to fill the container? ▮ can you explain and record your findings? ▮ does this container have the same capacity as that one? Students record the activity on a picture graph showing the different types of cups. **Tower Twist** In small groups, students build two towers using the same number of interlocking plastic cubes. Groups then exchange towers and remake the tower by moving cubes to change the shape. The towers can be passed through a number of groups, each making changes. Towers are displayed next to each other. Students compare the towers and describe how they are different. Students draw their construction and record the number of cubes used for each of the towers.		
Macaroni Match - units of work page 74 Students are asked to pack three or more different containers with macaroni, and then order the capacities of the containers by: ▮ packing the contents of each container into another container separately ▮ swapping the contents of each container. The activity can be repeated using other items eg by packing lunch boxes into cartons, marbles into cups, or cubes into boxes.		
Different Cups - units of work page 74 The teacher collects cups of different shapes and sizes and icecream containers of the same size. Each pair of students has a different cup and an ice cream container. Students are asked to fill the ice cream container with water using repeated cupfuls and record how many cups it took to fill the container. Possible questions include: ▮ why did we all get different numbers of cups?		

▮ whose cup needed the most cupfuls to fill the container ? ▮ whose cup needed the least cupfuls to fill the container? ▮ can you explain and record your findings? ▮ does this container have the same capacity as that one? Students record the activity on a picture graph showing the different types of cups.		
Filling with Prisms and Spheres – units of work page 74 In small groups, students fill containers with rectangular prisms eg blocks, boxes and cubes. Students then fill containers with spheres eg marbles, golf balls and tennis balls. Students record the results for each material and discuss the difficulties they had in packing spheres. The teacher could suggest containers that would be suitable for packing spheres. Possible questions include: ▮ how can you fill this box? What will you use? Why? ▮ which shapes will pack and stack without leaving spaces?		