

## Rationale

According to Blooms Taxonomy, levels of cognition are divided into six categories. The lowest (sometimes called broadest) level is **Knowledge/Remembering**: this is the most basic type of intellectual skill. The next is **Comprehension** wherein one's own interpretation and understanding of a concept is developed. The third category is **Application**, in which the acquired knowledge is used in practice in a new situation. **Analysis** follows because the gathered information needs to be broken down into parts so that its organisational structure may be understood. **Synthesis/Creating** is the second to last category. It involves putting parts together to form a whole, with emphasis on creating a new meaning or structure. Finally, the highest form of intellectual skill is **Evaluation**; it is the judgement about the value of ideas and materials in order to accept or reject it. These categories can be visualised as a pyramid or hierarchy of knowledge, with each level building on the foundation of the previous - one cannot jump into next level of skill without perfecting or mastering the lower level first.

The group agreed to use Three-Dimensional Shapes (Geometry) as our topic, as we found it well suited to the theory of Blooms Taxonomy. The six building blocks of knowledge can be followed reasonably systematically, with the penultimate exercise being the construction (Creation) of a solid using nets to physically represent student understanding of the concepts of solids and their properties. VELS Levels Four and Five in the domain of Shape states a range of skills and knowledge that students should attain in regard to solids and three-dimensional shapes. This includes classifying and sorting shapes and solids, following instructions to draw shapes and nets, and constructing simple three-dimensional objects such as prisms and platonic solids. We have consulted these VELS and this also supported our choice of the topic, as well as our choice of the lesson being planned for Year Eight students.

A review of the differentiation between two-dimensional and three-dimensional shapes is to be discussed as an introduction to the topic. A toy object shall be presented to the class to support the discussion. Remembering will involve development as a class of a mind map on the board, with students contributing ideas about three-dimensional shapes and their properties. Comprehension and understanding will be assisted with the use of a handout, including exercises to correctly name, identify and compare shapes. Application will see the students using their knowledge to work through a variety of problems involving the properties of solids, with all formulae provided. Analysis will involve playing a game of shape bingo. We are hoping this will mix up the lesson a little and make it a little more fun. Creating and synthesis will include students using two-dimensional nets to construct three-dimensional shapes in small groups. This should bring together the different elements of knowledge gained throughout the lesson into a tangible example of the properties of three-dimensional shapes. Finally, Evaluation will be conducted by the groups swapping their solids, and scoring another group for accuracy with the assistance of a simple rubric, followed by discussion.

## Lesson Plan

Teaching to Year 8 (HGES Approaches to Teaching and Learning class)  
Mathematics – Three-dimensional shapes using **Blooms Taxonomy**

Learning Outcomes	Students will explore and expand their knowledge of three-dimensional shapes and their properties. Students will familiarise themselves with two-dimensional nets that form into solids and in groups develop or complete a solid. Students will use a rubric to evaluate the solids.
Activities/Procedures	<b>Section 1: Introduction (IVY)</b> (2 to 3 minutes) Brief welcome to the class, discussion of the difference between two-dimensional and three-dimensional shapes
Activities/Procedures	<b>Section 2: Remembering (ASIYA)</b> (10 minutes) Make a mind map on the board about what students know about 3D shapes. Get students to each come up and write one thing they understand about 3D shapes. End with a definition of a 3D shape and distribute the handouts. Examples of what we want the students to say are; cube, cuboid, pyramid, cone, cylinder, prism, sphere. Definition of 3D shape– A 3D shape is a solid which encloses a volume and has length, breadth and height. It has a vertex (plural: vertices), face and edge. A vertex is a corner, edge joins one vertex with another and face is an individual surface
Activities/Procedures	<b>Section 3: Comprehension / Understanding (LUKE)</b> (6 to 8 minutes) Groups of 3-5. Demonstrates understanding of facts and ideas of 3D shapes by 1. Organising the shapes and names together correctly. 2. Comparing the different 3D shapes and give brief descriptions of each shape. 3. Estimate which shape has the largest 3D area. (Figure 1) All same scale.
Activities/Procedures	<b>Section 4: Application (LUKE)</b> (10 minutes) Groups of 3-5. Solve problems to new situations by applying acquired knowledge, facts, techniques, and rules in a different way. A worksheet that contains problems for 3D shapes surface area. <ul style="list-style-type: none"> <li>• Cone, cylinder, rectangular prism, triangular pyramid are the shapes.</li> <li>• Students have a formula sheet and need to solve the problems stated on the sheets.</li> <li>• Formulas are all stated on sheet provided.</li> <li>• Work in groups to solve the equations.</li> </ul>
Activities/Procedures	<b>Section 5: Analysis (IVY)</b> (10 minutes) In small groups students will correctly match descriptions of three-dimensional shapes with their names (on small cards), and lay the matched pairs on the table. This will be a competition, first table to correctly present their solution will be awarded a prize.

Activities/Procedures	<p><b>(OPTIONAL)</b> (3 minutes) Video illustrating Platonic Solids and their formation from two-dimensional nets (stop video at approximately 1:50) <a href="http://www.youtube.com/watch?v=UIWFZw-8yag">http://www.youtube.com/watch?v=UIWFZw-8yag</a></p>
Activities/Procedures	<p><b>Section 6: Creating/Synthesis (ASIYA)</b> (10 minutes) In small groups the students design a net and put together a simple 3D shape. Students will be given incomplete 3D solid shapes and are asked to complete them by using the equipments (scissors, cardboard, sticky tape) given.</p>
Activities/Procedures	<p><b>Section 7: Evaluation (LISS)</b> (5 to 7 minutes) Each table group swaps their created solid with another table, and gives that solid a score based on a simple rubric covering various aspects relating to accuracy. Students will be asked to note where improvement is required and why. As a class gather each table's scores and briefly discuss the reasons for the highest and lowest scores (others if time allows) Overall performance in all activities will be judged and a prize awarded to the winning table group.</p>
Activities/Procedures	<p><b>Section 8: Conclusion (LISS)</b> (2 to 3 minutes) Brief review and summary of the activities and concepts covered in the lesson. Opportunity for students to ask questions.</p>
Assessment Strategies	<p>Throughout the lesson handouts will be provided to the students that include exercises for completion. Assessment will include a review of these exercises as the students are working on them, teachers will circulate throughout the room observing and providing assistance where necessary. At the end of the lesson an activity on evaluation of a solid will be undertaken. This should underscore students learning throughout the lesson and strengthen their grasp of the core concepts.</p>

**Materials/Equipment:**

Paper/cardboard, scissors, tape, glue sticks  
Examples of solids and nets

**References/Sources:**

- <http://www.senteacher.org/wk/3dshape.php>
- [www.teachers.ash.org.au](http://www.teachers.ash.org.au)
- [www.greatmathsgames.com.au](http://www.greatmathsgames.com.au)
- [www.learner.org](http://www.learner.org)
- <http://www.nwlink.com/~donclark/hrd/bloom.html>
- [http://www.is93.org/blooms\\_math.htm](http://www.is93.org/blooms_math.htm)
- <http://www.youtube.com/watch?v=UIWFZw-8yag>

## Evaluation of a three-dimensional shape made from a net

Please score the shapes for accuracy, based on the criteria below. You are to use a scoring scale from 1 to 5, where 1 is poor and 5 is outstanding.

<b>Criteria</b>	<b>Score out of 5</b>	<b>Areas for improvement</b>
Recognisable shape		
Clean edges		
Sharp vertices OR rounded curves		
Uniform OR accurate faces		
<b>Overall Total</b>	<b>/ 20</b>	