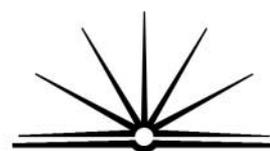
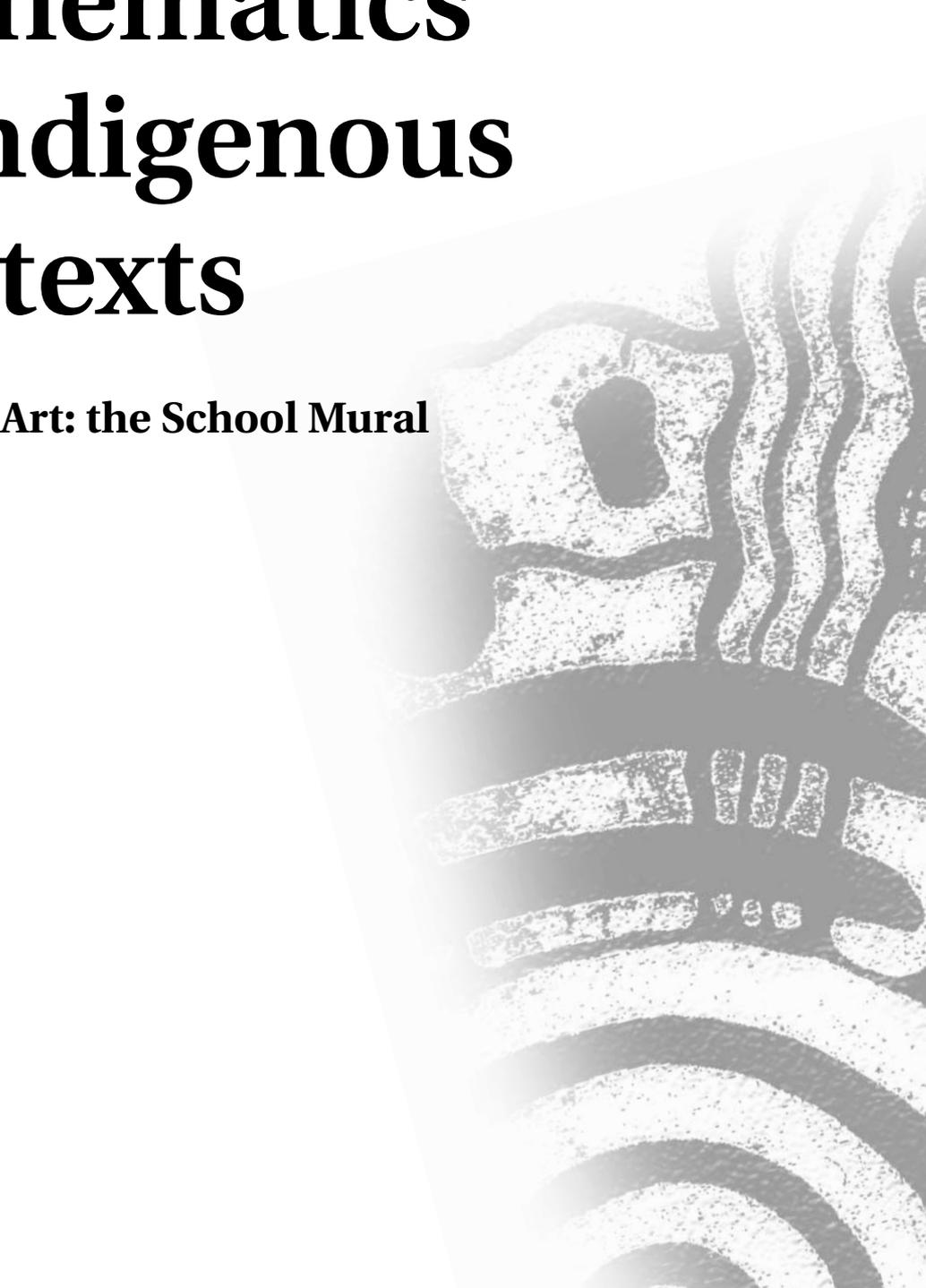


Mathematics in Indigenous Contexts

Aboriginal Art: the School Mural



BOARD OF STUDIES
NEW SOUTH WALES

Planning of Unit

- Purpose- How Crawford Public School is now. This will be used for 25th anniversary of school. 20th of September.

Possibilities- Mural

- Mathematical focus areas- 3D/2D
Length

The strand I am looking at is Space and Geometry with an overlap into Measurement.

- Possible lesson organisation-
 - Whole Class- pose open-ended question.
 - Group work.
 - Whole class- discuss finding and evaluate.

Resources-

- Paintings and artefacts, these resources will hopefully link past and present;
- Daphne (AEA);
- Aboriginal community;
- Local artist;
- Students.

Planning timeline

1. *Pre-assessment (Week 1, Term3)*
2. *Decide what the needs of students are and outcomes to address (Week 2, Term3)*
3. *Design activities using open ended questions (in consultation with Daff-AEA (Week 2, Term3)*
4. *Implement activities (Weeks 3-9, Term 3)*
5. *Evaluate learning. What worked? etc*

N Kazakos-Tomczyk

Mural

The snake will start at the bottom gate of Area D. It will wind around to the amphitheatre. Leo Wright, a local Aboriginal artist will assist with the snake. Each student in the school will have their feet traced and painted by senior students and Aboriginal community. "Cappers", local hardware shop, will donate paint, and have worked out that we will need about 2 ten-litre cans of yellow and 1 ten litre of black paint.

This project will be part of the mathematics undertaken in classroom.

Scope & Sequence

Strand Week	Space and Geometry	<u>Measurement</u>
One-Two	Pre Assessment and programming of appropriate activities.	
Three-Four		Length MS2.1
Five-Six	2D SGS2.2 (a) & SGS2.2 (b)	Length MS2.1
Seven-Nine	3D SGS2.1	

Mathematics

Term: Three

Week: One

Pre Assessment activity for Term 3 unit.

Working Mathematically Focus:

Questioning

- WMS2.1: Asks questions that could be explored using mathematics in relation to Stage 2 content.

Space and Geometry

Pre assessment activity 1:

What is in the Bag?

Using five groups for this activity. Each group will have a bag with an artefact in it.

Each student in the group will take a turn at feeling the unknown object, while the others may ask questions using mathematical language to help them find out what it is. This process will continue until all members in the group have had a chance to feel the unknown object. Then all students will draw what they think it looks like and write a short description.

From this activity, the information of current mathematical language and perceptions of space will be identified.

A checklist will be used for assessing the work samples. These will be indicators from the syllabus.

Mathematics

Term: Three

Week: One

Pre Assessment activity for Term 3 unit.

Working Mathematically Focus:

Questioning

- WMS2.1: Asks questions that could be explored using mathematics in relation to Stage 2 content.

Measurement

Pre assessment activity 2:

Who has the longest feet in each group?

Using five groups for this activity. Each group will have to use the equipment given to measure. (Ruler and string). Each student in the group will take a turn at measuring.

Then all students, using mathematical language, record the results.

From this activity, the information of current mathematical language and perceptions of length will be identified.

A checklist will be used for assessing the work samples. These will be indicators from the syllabus.

Mathematics

Term: Three

Week: One

Pre Assessment activity for Term 3 unit.

Working Mathematically Focus:

Communicating

- WMS2.3: Uses appropriate terminology to describe, and symbols to represent, mathematical ideas.

Space and Geometry- Position

Pre assessment activity 3:

Where is our school?

Using five groups for this activity. Each group will have a map of the area. The groups will be given a list of instructions to follow and their responses will be recorded using the mathematical language appropriate to position.

From this activity, the information of current mathematical language and perceptions of position will be identified.

A checklist will be used for assessing the work samples. These will be indicators from the syllabus.

Instructions that will be displayed on board for students:

1. Describe the location of our school using the coordinates.
2. What symbol is used to represent a school?
3. Describe the route from Doonside station to Crawford.

Measurement - Sub strand: Length Weeks 3-4 & 6 Term 3,2002	
Outcome: MS2.1- Estimates, measures, compares and records lengths, distances and perimeters in metres, centimetres and millimetres.	
Knowledge & Skills Students learn about: <ul style="list-style-type: none"> estimating, measuring and comparing lengths or distances using metres and centimetres. recording lengths or distances using decimal notation eg. 1.25 m. using a tape measure, ruler or trundle wheel to measure lengths or distances. 	Working Mathematically Students learn to: <ul style="list-style-type: none"> explain strategies used to estimate length or distance eg. by referring to a known length. (Communicating & Reflecting) select and use an appropriate device to measure lengths or distances. (Applying strategies)
	Assessment Strategies for using a criterion based checklist <ul style="list-style-type: none"> Students' journals Observation of students' during learning activities. Student produced work examples.
Indicators The student, for example: <ul style="list-style-type: none"> records lengths or distances using decimal notation to 2DP, eg. 1.23 m estimates, measures & compares the lengths of objects in metres, centimetres and millimetres. reads and interprets calibrations on measuring devices, eg. ruler, measuring tape. 	Key ideas <ul style="list-style-type: none"> Estimate, measure, compare and record lengths and distances using metres, centimetres and/ or millimetres. Record lengths using decimal notation to 2DP.
	Language Metre, centimetre, millimetre, length, measuring device, decimal point, measure, longest shortest, trundle wheel, ruler, estimating.
Activity #1 Our school mural Students are informed about the outside mural, based on Aboriginal artwork, which is going to be created for Crawford's 25 th anniversary. The students will also be told that the activities for this unit will show them how we use measurement to help create this Aboriginal artwork. The following activities are will have this focus in mind. <ul style="list-style-type: none"> (W) Pose problem to students: "How many pairs of feet, lined up, will fit in a metre?" The teacher will show the students the equipment they will have to solve this problem. (Metre ruler and paper) Encourage students to record their results. <ul style="list-style-type: none"> (G) The students will then work in their already established grouping to solve this problem. (W) What did you discover? Participation of all groups is needed for this part of the lesson. In turn each group will report to the rest of the class, showing their working out. <ul style="list-style-type: none"> (W) Pose second problem to students: " Using the results you already have, estimate length if all 4K lined up?" <ul style="list-style-type: none"> (G) The students will then work in their groups to solve this problem, recording their working out. (W) What did you discover? Participation of all groups is needed for this part of the lesson. In turn each group will report to the rest of the class, showing their working out. <ul style="list-style-type: none"> (I) Students then record the activity and their findings in their journal. 	
*Activity #2 Will we fit? <ul style="list-style-type: none"> (W) Pose problem to students: "On our Aboriginal mural of a snake, we want to put all Crawford's students foot prints on it. How can we make sure that everyone will fit? We are using 170m of pathways. Teacher documents all ideas on board. Students may need to be redirected to activities already undertaken. <ul style="list-style-type: none"> (G) Students will estimate, measure and compare feet from students of other grades. (W) Teacher records their findings on a table. (G) Students are then instructed to use this information together with their previous results to work the problem out. Recording their workings. Participation of all groups is needed for this part of the lesson. In turn each group will report to the rest of the class, showing their working out. <ul style="list-style-type: none"> (I) Students then record the activity and their findings in their journal. (G) Students then construct an artwork using their findings. (W) What did you discover? Each group reports back to class Students are then taken outside to where the mural is painted. Each group will be given measuring devices such as trundle wheels and measuring tapes. <ul style="list-style-type: none"> (W) Compare actual length of snake with the path length. How accurate were we? / What did we discover? / Why is there a difference in the length of the snake compared to the path? (I) Students then record this in their journals. 	

Key (W) Whole class/(G) Group work/(I) Individual work/* Assessment

Space and Geometry -Sub strand: Two-dimensional Space		Weeks5-6	Term 3,2002
Outcome: S6S2.2(a) Manipulates, compares, sketches and names two dimensional shapes and describes their features. S6S2.2(b) Identifies, compares and describes angles in practical situations.			
Knowledge & Skills <i>Students learn about:</i> <ul style="list-style-type: none"> making representations of 2D shapes in different orientations using a variety of materials and drawings. making tessellating designs by reflecting (flipping), translating(sliding),and rotating (turning) a 2D shape. finding lines of symmetry for a given shape. identifying angles with two arms in practical situations eg corners. drawing angles of various sizes by tracing along adjacent sides of shapes and describing the angle drawn. 	Working Mathematically <i>Students learn to:</i> <ul style="list-style-type: none"> select a shape from a description of its features.(Applying Strategies, Communicating) describe objects in the environment that can be represented by 2D shapes.(Communicating, Reflecting) describe designs in terms of reflecting, translating and rotating.(Communicating) identify examples of angles in the environment and as corners of 2D shapes.(Applying Strategies) identify angles in 2D shapes and 3D objects.(Applying Strategies) 		
	Assessment Strategies for using a criterion based checklist <ul style="list-style-type: none"> Students' journals. Observation of students' during learning activities. Student produced work examples. 		
Indicators <i>The student, for example:</i> <ul style="list-style-type: none"> describes the properties of special groups of quadrilaterals. groups 2D shapes using multiple attributes eg shapes with parallel sides and right angles. identifies all lines of symmetry for a given shape. identifies an angle with two arms in practical situations eg corners. identifies angle in 2D shapes and 3D objects. 	Key ideas <ul style="list-style-type: none"> Make tessellating designs by reflecting, translating and rotating. Find all lines of symmetry for 2D shape Recognise openings, slopes and turns as angles. Describe angles using everyday language and the term "right". Compare angles using informal means. 		
	Language Square, rectangle, triangle, circle, irregular shapes, quadrilaterals, parallel lines, symmetry, infinite, tessellations, two-dimensional, angles,.		
Activity #1 <p style="text-align: center;">Dreaming stories and 2D shapes</p> <ul style="list-style-type: none"> (W) Teacher reads an Aboriginal story to students. Showing the illustrations. After reading the story, revisit the Aboriginal artwork. Ask students questions to focus the students on the shapes used. <p><i>Question 1: What 2D shapes can you see in this artwork?</i></p> <p><i>Question 2: Are there any shapes with multiple attributes? eg Parallel lines and right angles.</i></p> <p><i>Question 3: Can you see any lines of symmetry in any of the shapes?</i></p> <p><i>Question 4: Can you see any tessellations?</i></p> <ul style="list-style-type: none"> (G) Each group is given a copy of another Dreaming story that has aboriginal artwork. Students record the 2D shapes present and features about them. (W) The students report back to class what shapes they found and any attributes these shape had. Teacher documents all responses on the board. (G) Each group is then given on paper the main symbols used in Aboriginal paintings to identify any special groups of quadrilaterals, groups of 2D shapes, lines of symmetry and angles in 2D shapes. (W) The students then report back to class what they discovered. Teacher then adds to the responses already on board. *(I) The students then use this information to create their own Aboriginal painting, using as many 2D shapes and related attributes as they can. eg 2D shapes, symmetry angles and tessellation. (W) Students walk around and look at the different Aboriginal painting that have been created. (I) Students then record the experience in their journals. <p>Activity #2 Artefacts and angles</p> <ul style="list-style-type: none"> (W) Brainstorm: Where there are angles in our environment? Focus on Aboriginal artefacts. Make sure there is a selection of artefacts in the classroom for children to observe. Organise for some Aboriginal parents to come and talk to the students about the different types of artefacts. <p>Use questions to prompt students.</p> <p><i>Question 1: Can you see any angles in these artefacts?</i></p> <p><i>Question 2: Do the angles serve a purpose?</i></p> <p><i>Question 3: Why do spears have sharp angles?</i></p> <ul style="list-style-type: none"> *(G) Students then classify the artefacts into different groups depending on the angles. Recording on paper. (W) Each group reports back why they have grouped the artefacts the way they have (I) Students then record the experience in their journals. 			

Key: (W) Whole class/(G) Group work/(I) Individual work/* Assessment

Outcome:

SGS2.1 *Makes, compares, describes and names three-dimensional objects including pyramids, and represents them in drawings.*

Knowledge & Skills

Students learn about:

- *comparing and describing features of prisms, pyramids, cylinders, cones and spheres.*
- *identifying and naming groups of three-dimensional objects as prisms, pyramids, cylinders, cones and spheres.*
- *recognising similarities and differences between prisms, pyramids, cylinders and spheres.*
- *identifying three-dimensional objects in the environment and from drawings, photographs or descriptions.*
- *making models of prisms, pyramids, cylinders, cones and spheres given a three-dimensional object, picture or photograph to view.*
- *sketching prisms, pyramids, cylinders and cones, attempting to show depth.*
- *sketching three-dimensional object from different views, including top, front and side views.*
- *recognising that prisms have a uniform cross-section when a section is parallel to the base.*

Working Mathematically

Students learn to:

- *describe groups of three-dimensional objects using everyday language and mathematical terminology. (Communicating)*
- *recognise and describe the use of three-dimensional objects in a variety of contexts eg buildings, packaging. (Reflecting, Communicating)*
- *compare features of three-dimensional objects and two-dimensional shapes. (Applying Strategies, Reflecting)*
- *compare own drawings of three-dimensional objects with other drawings and photographs of three-dimensional objects.(Reflecting)*

Assessment Strategies for using a criterion based checklist

- *Students' journals.*
- *Observation of students' during learning activities.*
- *Student produced work examples.*

Indicators

The students, for example:

- *describes the differences between prisms, pyramids, cylinders, cones and spheres.*
- *identifies and name groups of three-dimensional objects as prisms, pyramids, cylinders, cones and spheres and identifies them in the environment, drawings or photographs.*
- *makes models of three-dimensional objects.*
- *sketches a three-dimensional model, attempting to show depth.*

Key ideas

- *Name, describe, sort, make and sketch prisms, pyramids, cylinders, cones and spheres.*
- *Describe cross-sections of three-dimensional objects.*

Language

Prisms, cones, cylinders, spheres, cross sections, three-dimensional objects, looking down, looking from the side, front view, viewpoint, face, edge, curved, circular, base, corner.

Activity #1

Sculpture walk

- (G) Each student in the group draws one view of a 3D object (Aboriginal artefact) on a separate piece of paper.

When each group has completed their drawings, they are then put in a pile next to the Aboriginal artefact.

- (G) Each group rotates around the other groups' work and cooperatively puts each view drawn with the right caption. These captions are pre-made by teacher- top, side and front.
- (W) Discuss what they discovered from their own drawings and drawings of other groups. Each group takes this in turns.
- (I) Students then record their experiences in their journals.

Activity #2

Feely bags

- (G) Each group is given a bag with an artefact inside. Each student in the group will take a turn at feeling the unknown artefact, while the others may ask questions using mathematical language to help them find out what it is.
- (I) Each student then sketches what they think is in the bag.

The artefacts are then removed from bags.

- (W) A discussion about what they found out about the artefact before it was removed from the bags. Also do their sketches match the Artefact. Teacher shows examples of sketches that represent 3D objects.

Question 1: How does this sketch show that a 3D object is being represented?

- *(I) Student re-sketches the artefact, this time being able to see it.
- (G) Compare sketches in groups.
- (W) Groups take turns at reporting to the class how they showed depth.
- (I) Each student then records their experiences in their journal.

Activity #3

Modelling 3D objects

- (W) Show students some photographs and pose some questions for discussion.

Question 1: What are the different 3D objects you can identify?

Question 2: Where else would we find similar 3D objects in the environment?

Record all responses on board.

- *(I) Students are given some modelling clay and a 3D artefact. Students will then have an opportunity to make their own model.
- (W) Students then walk around the classroom and view the other students' models.
- (W) Pose problem to students: If you cut a slice off your model, what shape would you see?

Teacher records all responses.

- (I) Students then cut a slice and observe what shape it is.
- (G) Students compare with others in their group.
- (W) In turn each group will report to class what they discovered.
- (I) Students then record the experience in their journals.

Activity #4

Are 3D shapes all the same?

- (G) Each group is given a pyramid, cone, sphere, cylinder and a prism. Students are then asked to identify differences between them. Students then record their findings on paper.
- (W) Each group will then report to class what they discovered.
- *(G) Each group is then given a selection of artefacts. Students are asked to identify properties and compare them with a pyramid, cone, sphere, cylinder and a prism. Are there similarities and differences? Students record their findings.
- (W) Each group will then report to class what they discovered.
- (I) Students then record their experiences in their journals.

Key

(W) Whole class

(G) Group work

(I) Individual work

* Assessment

Resources Used for Unit

- Daphne Bell AEA Crawford Public School, Doonside.
- Local Artist-Leo Wright, Doonside. (Designed and painted snake mural)
- Cappers Hardware, Doonside. (Supplied pavement paint and rollers)
- Aboriginal tutors, Crawford Public School, Doonside. (Helped in the classroom and helped paint the feet on the snake mural)
- Staff at Crawford Public School. (Traced around their students feet)
- Aboriginal Artefacts resource kit, Crawford Public School, Doonside.
- Mathematics Draft Syllabus.
- Aboriginal Australia kit, Steve and Dellene Strong, NSW.
- Aboriginal Art, Australian National Gallery Education Department
- Aboriginal Technology book series, Alex Barlow, Macmillan Education Australia.
- Macquarie Aboriginal Words, Macquarie Library.
- Modelling clay.
- Acrylic paints & brushes.
- A3 art paper.
- Five sets of geometric shapes
- Measuring devices. (Trundle wheels, 30cm rulers, metre rulers)
- String and marker pens.
- Cardboard and poster paper.