Teacher planning: YEAR 6 TGT Mathematics and Technology 2005/06

Shape it and Size it

(From Prototype to Commercial Pattern)

<table>
<tr><th>Mathematics</th><th>Technology</th></tr>
<tr><td>Level 3 Space: (Shape and line focus) Students identify and visualise the geometric properties that define and distinguish families of prisms, cylinders, spheres, cones and pyramids. They recognise and describe the properties that distinguish trapeziums and rhombuses from other quadrilaterals, as well as the properties that distinguish different groups of triangles. They describe the properties of shapes using terms such as parallel, congruent, symmetrical and other terms related to angles. They draw shapes using various conventions to indicate particular geometric properties…</td><td rowspan="4">Level 3 Materials: Students choose materials that have characteristics most suited to the product and to user needs.

They select and use suitable equipment and techniques to combine materials accurately.
(as it relates to characteristics of materials only)

Level 3 Technology Practice: Students examine information gathered to meet design challenges. They collaboratively generate design ideas, communicate these in a variety of ways, and develop and follow production procedures to make products. Students evaluate the effectiveness of their own and others' processes and products.</td></tr>
<tr><td>Level 3 Measurement: Students use equivalent forms of standard units to compare, order and measure. They select appropriate standard units to estimate and measure length, …, and area … They further develop their estimation skills by identifying and using a set of personal measurement referents…</td></tr>
<tr><td>Level 3 Chance and Data: (Data focus) …Students identify issues and topics of particular interest and create, trial and refine questions that allow for appropriate details to be gathered through surveys, interviews and existing sources. They organise data and experiment with a variety of manual or electronic displays, selecting those that represent the data clearly. They make statements regarding the results of their surveys using quantitative and comparative language.</td></tr>
<tr><td>Level 3 Number: …Students use a range of computation methods, including mental, written and calculator, to solve problems that involve whole numbers and decimal fractions in context. (strategies and procedures only)</td></tr>
<tr><td>Key concepts:
• Properties of and relationships between 2-D and 3-D shapes (Angle, congruence, symmetry, enlargement factors)
• Measurement concepts and processes
• Comparative and quantitative information/data

Key processes:
• Working mathematically</td><td>Key concepts:
• The nature of materials
• Technology practice

Key processes:
• Working technologically

Key value:
• Appropriateness: cultural, aesthetic, functional.</td></tr>
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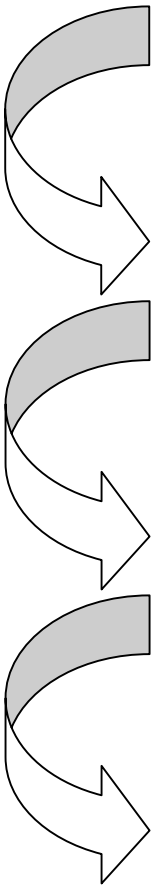
IF THE DESIRED RESULT IS FOR LEARNERS TO UNDERSTAND THAT…

- Families of shapes are made up of shapes with similar properties
- 3-D objects are made up of 2-D shapes.
- Knowing about angles, congruence, lines of symmetry and enlargement factors increases your accuracy and efficiency when working with shapes.
- Skilful use of 2-D and 3-D shapes can increase the practical and artistic value of objects you make.
- Effective measurement is making choices about:
  - how accurate you need to be, and
  - what units and tools of measurement you will use
- The type of information you collect and how you collect it depends on its purpose and use.
- The methods for organising and displaying information can help or hinder decision-making and problem solving.
- A design brief frames the development of a product and helps you to keep in mind the needs and the purpose of the product at every stage.
- Materials have characteristics that need to be considered in design and construction.
- Documenting the technology process helps you to keep on track, test ideas and reflect on your practice.



Then you need evidence of the student's ability to:

- Design, draw, arrange, replicate and re-size variations on 2D and 3D shapes
- Make effective and efficient decisions about the degree of accuracy, units and tools of measurement appropriate for a range of circumstances
- Collect, display and interpret comparative and quantitative data
- Identify characteristics of materials and match material selection and construction to the characteristics and aspects of a design brief
- Use the steps of technology practice to develop a product

Then the assessment tasks need to include:

- A product or products that require the visualisation and adaptation of 2D and 3D shapes in situations that call for a range of appropriate judgements about the degree of accuracy needed in the measurement, layout/order or representation.
- A journal record of a technology process from data collection and design brief through to materials selection, construction and evaluation
- Various items created during the process that demonstrate group-developed and individual solutions to specific mathematical and technological challenges

Then the learning activities need to help students:

- Record and reflect on each phase of the technology process
- Identify changes in context that will impact on their decisions about measurement.
- Gather, interpret and represent data
- Acquire and demonstrate their knowledge about the properties of 2D and 3D shapes and ways to adapt, replicate, enlarge and shrink them.
- Share and compare choices and mathematical solutions at various stages in the task, so that students become more adept in judging the elegance or efficiency of mathematical and technological solutions to specific task requirements
- Investigate the characteristics of a range of materials
- Demonstrate their knowledge of the characteristics of various materials through choice, construction and evaluation.
- Explore conventions of commercial patterns.
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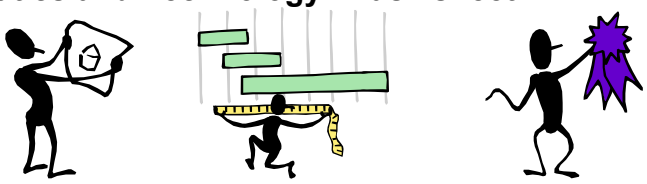
Task Outline: Working in teams and using their knowledge of shape and line, measurement and data, students collect and analyse information to design and evaluate a prototype dress-up costume* for a pre-school child, in order to make a multi-sized commercial pattern suitable for a fete or craft stall.

*Note: A costume may consist of a number of small items: eg. masks, props and simple clothing

YEAR 6 TGT 2005/06 – Mathematics and Technology - Task sheet



Shape it and Size it

(From Prototype to Commercial Pattern)

Most of the everyday objects we use started life in the minds of designers who used knowledge of shape, measurement and the human body to work through the stages of design, prototype, pattern-making before they arrive at a finished product. *This term, we will work as design teams to help our local pre-school fill their empty dress up box:*

Part A:
You will work as a team (in a group of 3-4 people) to design, make and evaluate a set of dress-up costume pieces to fit an average size pre-schooler.

You will submit:

- an individual journal as a record of your own workings and ideas.
- a group folio of what your team produces at each stage.

Part B:
Your team will then go on to create a multi-sized paper pattern of the costume in a form that could be packaged and re-used by pre-school staff or parents. This pattern would be suitable for a fete or craft stall.

There is quite a bit of work to do, so we will spread it across this term:

Exploration of measurement data, pre-schooler's interests and the materials **to analyse the data and complete a design brief.**	Weeks 1-2
Working with shape, measurement and drawing to design and **create a template** for the prototype.	Weeks 3-5
Experimenting with materials to make and **evaluate a prototype** to test the design.	Week 6-7
Refining the design and investigating commercial patterns **to produce a revised template**	Week 8
Designing and drawing the **multi-size pattern**	Week 9-11

The work you do in this unit will let us see how well you

- *Know:*
  - *space (shape and line)*
  - *measurement*
  - *chance and data*
  - *materials*
  - *technology practice*
- *can*
  - *Analyse*
  - *Design*
  - *Evaluate*
- *work in teams*

YEAR 6 TGT 2005/06 – Mathematics and Technology - Task sheet

Shape it and Size it

(From Prototype to Commercial Pattern)

Part A:

Work as part of a small group to collect and analyse the information necessary to design and evaluate a set of dress-up costume pieces to fit an average size pre-schooler. (A fruit bat costume could be made up of a mask, ears and a cape. A gladiator costume could have a shield, a sword and arm and leg protectors.) You will keep a journal of your own workings and ideas. The group will record the stages of development in a folio.

Steps for the team:	*Items for the group folio:*	***INDIVIDUAL JOURNAL*** *Planning, problems posed, calculations, notes, sketches, timetables, recordings, diagrams…*
1. Design and conduct surveys to investigate the sizes of pre-schoolers and their preferences for dress-up costumes.	• Blank survey forms	
2. Brainstorm what materials and construction methods are available to identify any design constraints.		
3. a) Organise and display the data from Steps 1 and 2. b) Use the information collected to **complete the design brief* form provided.** c) Plan a costume that meets the needs of the design brief. ** Part of the design brief is provided for you to ensure you are working with ideas in mathematics as well as technology.*	• Presentation and analysis of both sets of data collected • Completed design brief form • Sketch of the design with notes (shape, size, measurement, materials) and include any samples, explaining how the design brief has been met	
4. Using appropriate conventions of measuring and drawing develop full-sized templates of the shapes needed to construct the costume.	• Full-size templates with all measurements clearly marked	
5. Construct a costume <u>prototype</u> to help sort out problems in the design.		
6. Try the costume on an average-sized pre-schooler and gather a range of feedback **using the Feedback Data collection form provided.**	• Photograph of the costume being worn by a pre-schooler • Completed Feedback Data collection forms	
7. a) Evaluate the match of the prototype to the design brief, review the feedback and use both sets of information to make recommendations for improvement of the design **on the evaluation form provided.** b) Discuss how the group has handled the challenges of this task and make recommendations for improvement of the teamwork on the **evaluation form provided.**	• Completed Evaluation Form	

Part B:
The task for your group is to create a multi-sized paper pattern that could be packaged and re-used. The costume pattern created would be suitable for a fete or craft stall.

Steps:	*Items for the group folio:*	***INDIVIDUAL JOURNAL*** *Planning, problems posed, calculations, notes, sketches, timetables, recordings, diagrams…*
1. Make adjustments to the original template pieces using: • the recommendations made as part of your evaluation • ideas developed through investigating the ways patterns are communicated and published	• Version 2 of the template pieces	
2. Work out a way to enlarge and shrink these template pieces **proportionally** to make a multi-sized* pattern suitable for small, medium and large pre-school children. Note: This means that each template piece will have three size options (S,M,L) marked on the one drawing. Please check your group has a workable solution before continuing.	• The mathematical working and sketches to demonstrate a solution/s to this problem.	
3. Devise a layout for the pieces so that a printed version of the multi-size pattern will use the least amount of paper possible. Make a copy of this layout to produce a paper pattern.	• The multi-sized paper pattern. (These drawings should be on complete/uncut sheets of butcher's paper as a demonstration of how little paper the layout will use and the accuracy of the measurements and drawings. This will be a sample of the product, as it would appear at a craft stall.)	
4. Prepare a set of instructions including: • a method for making the costume • a list of materials and the amounts needed for each size • a guide to cutting out the materials for each size, showing how to lay out the pieces economically	• The set of instructions.	

YEAR 6 TGT 2005/06 – Mathematics and Technology Criteria sheet Name/s: _____

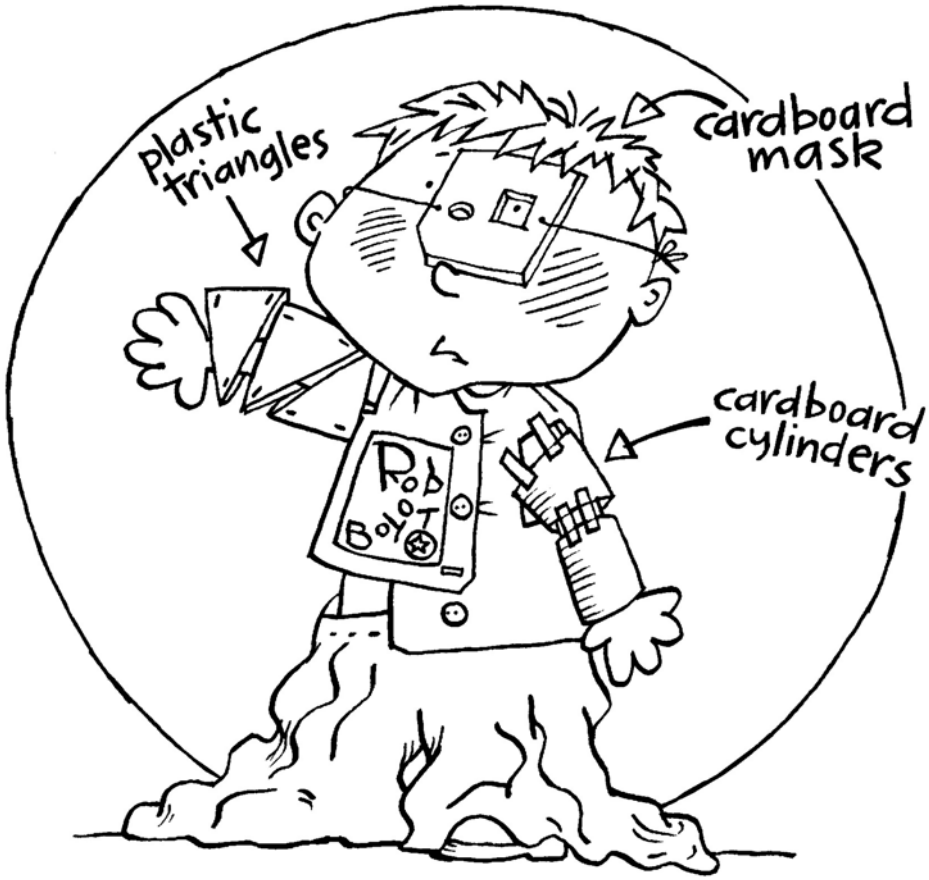
Shape It and Size It: From Prototype to Commercial Pattern Teacher: _____

Knowledges	*Knowing about:* • *space (shape and line)* • *measurement* • *chance and data*	2D and 3D shapes in the design are accurately described explained and represented in terms of relevant geometric properties with fluent use of mathematical terms and appropriate conventions. Appropriately and effectively uses a range of • units and tools of measurement • questions to collect in-depth data	2D and 3D shapes in the design are described and represented in terms of geometric properties using mathematical terms and conventions. Accurately and appropriately uses a range of • units and tools of measurement • questions to collect useful data	2D and 3D shapes are described and represented using mathematical terms and conventions. Uses a range of • units and tools of measurement • questions to collect data	*The student has submitted*
	Knowing about: • *materials* • *technology practice*	Selects and uses materials whose characteristics are suited to the full range of demands of the design brief. Students use information, ideas and feedback to improve the product throughout the design stages.	Selects and uses materials whose characteristics are suited to aspects of the design brief. The product development has clear design steps.	Uses materials whose characteristics are a sensible choice for the costume. A set of stages can be identified in the product development process.	*some work.* *The work submitted has not met the acceptable standard described for this criterion.*
Processing	*Analysing*	Accurate and specific findings based on comprehensive and organised presentation of data.	Reasonable findings based on clear presentation of the data.	Description of features of the data.	
	Designing	Sophisticated and efficient resolution of the practical and artistic demands in the design brief and in the production of a commercial pattern.	Competent resolution of the practical and artistic demands in the design brief and in the production of a commercial pattern.	Resolution of the practical demands of the design brief and the commercial pattern.	
	Evaluating	Insightful recommendations in terms of the design brief.	Reasonable recommendations in terms of the design brief.	Presentation of some recommendations	
Self and Others	*Working in teams*	Sustained, significant and collaborative contribution across all areas in the design and production of the costume and pattern.	Significant and cooperative contribution to the design and production of the costume and pattern.	Identifiable contribution to the design and production of the costume and pattern.	

YEAR 6 TGT 2005/06 – Mathematics and Technology - Diagnostic Activity

DRESS-UP DISASTER!

This pre-schooler wants to dress up as a Robot. He has some good ideas, but the costume is not working very well. Can we improve the costume to make it more effective?



1. Make a list of all the things that need improvement in this robot costume.

2. What advice could you give about shape, measurement, design or construction to improve these parts of the costume?
   (a) The mask
   (b) The shirt
   (c) The pants
   (d) The logo

(You might like to write a list of steps, or draw plans to show what to do.)

3. Present solutions to a small group, and then your group can present the best ideas to the class.

YEAR 6 TGT 2005/06 – Mathematics and Technology - Diagnostic Activity

Teacher Record of student discussion

As groups report and discuss, keep a track of the concepts and language the class are familiar with, and note which areas will need support as the unit progresses.

Size – big, small, fit, tight, loose

Measurement – tools, estimation, accuracy, units

Symmetry – what it is, ways to achieve it, asymmetry

Congruence – what it is

2-dimensional shapes – circle, triangle, quadrilateral, length, breadth, plane, angles, classification of angles, sides, curves, line segments, diameter, radius, circumference

3-dimensional shapes – cones, spheres, pyramids, prisms, number of faces, edges, vertices, length, breadth, depth

Manipulation of shapes – flips, turns, slides, enlargement, proportion

Technology practice – investigation, ideation, production, evaluation

Characteristics of materials – hardness, strength, flexibility, durability, absorbency, transparency, drape…

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Design Brief

Group names: _____ Teacher: _____

The design you create needs to:

- Be recognisable as the character, animal or occupation you have chosen.
- Be comfortable enough for a child to wear while playing.
- Be durable enough for a child to wear several times.
- Include adaptations from TWO shapes from each of:
  (a) Plane shapes: circles, triangles, quadrilaterals
  (b) Solid shapes: cylinders, cones, prisms, pyramids
- Fit an average sized pre-school child.

  The most appropriate measurements for an average sized pre-schooler are:

  (attach the data you collected, displayed and interpreted to arrive at these measurements)
- Appeal to a pre-school child.

  The categories of costumes pre-schoolers find appealing are:

  (attach the data you collected, displayed and interpreted to arrive at these types of costumes)
- Use materials that are available to your class. *(Negotiate with your teacher, then write the full list of materials and construction methods available for this project in the box below.)*

  The materials and construction methods available to us for this task are:

YEAR 6 TGT 2005/06 – Mathematics and Technology - Student Resources

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Feedback Data Collection Form

Group name: _____ Teacher: _____

This data collection form gives the group a frame for collecting feedback about the prototype costume that will contribute to the evaluation. Collect information from pre-schoolers, teachers or parents. Copy this sheet as many times as you need to.

Area of evaluation	**Positive or negative features of the prototype**	**Changes that would improve the design.**
Identification as the character, animal or occupation intended.		
Comfort and durability		
Design – shapes		
Design – size		
Appeal to pre-schoolers		
Materials and construction		
Other things you've noticed…		

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Evaluation Form

Group name: _____ Teacher: _____

Part A: Design

Summarise the group's evaluation of the prototype costume and its design. Start by matching the results of your work with the design brief. How well does it match? If there were problems, were they with the brief or with the development of your prototype?

Match to design brief

Now consider the feedback collected. What were the big issues and ideas that came out of the data collected?

Summary of feedback

Continued over

*Based on the information collected, what improvements could be made to the **design** of the costume? (Remember to consider both the mathematical and technological aspects of the design.)*

Recommendations

Part B: Team work

When did the group work very well together? What factors contributed to the effective teamwork?

When did the group find it difficult to work together? What factors made teamwork difficult?

What things can we do, as a team, to make sure our group work is effective in the future?