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PHOTOCOPY MASTERS

THEMATIC PROBLEM SOLVING

for

9 TO 12 YEAR OLDS

using

TECHNOLOGY *and* ENTERPRISE

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Contents

Introduction

What's This Book All About?

This book consists of a collection of theme based activities from the Design and Technology learning area which is a key aspect of technology-related education. They are hands-on problem solving activities designed for students aged 9 - 12 years, working at Key Stages 2 and lower 3.

The activities are based on a 'Design, Make, Appraise' model. Teachers' notes are directly linked to 'Investigate, Devise, Produce and Evaluate' concepts from accepted student outcome statements. These concepts relate to the higher levels of learning in Bloom's Taxonomy, making the learning format excellent for all students including talented and gifted students.

Why Are These Activities So Good?

These activities provide a meaningful context for the integration of knowledge and skills from across the curriculum.

They encourage informed design making, innovative yet practical solutions, flexibility and adaptability; all vital skills to equip our students for the challenges of the 21st century.

These activities can be undertaken individually, in pairs or in small groups. They are an excellent avenue for the development of team work and cooperative learning.

Experience shows that these types of activities hold universal appeal, inspiring all types of learners, from the student with learning disabilities, to the reluctant learner, to talented and gifted students. All students are able to contribute and experience success at their own level.

Making Life Easier For Teachers

Universal worksheets on 'Working Drawings' (Page 5), 'Modifications' (Page 6) and 'Evaluation' (Pages 7, 8) can be used with all activities.

Teachers' notes accompany each activity, providing details such as time and materials required, basic background information, hints, suggested lesson format, lists of additional resources and extension activities which relate across many areas of the curriculum.

Getting Started

An excellent introduction to design and modification can be found in the Big Book *Fred Makes a Table* by Pat Edwards (Longman Cheshire Pty Ltd). It will help you to explain why it is important to plan first. (Students always want to go straight into the building.) The book also looks at the advantages of ongoing modification and should help you to introduce evaluation of the end product. *Looney Tools* by David Drew (Rigby Technology, Rigby Heinemann, Reed International Pty Ltd) is also a great introduction to the concepts of Design and Technology.

If you are keen to stock up on materials and equipment, various Technology Education Centres and similar enterprises around the country sell great construction packs. It would also be useful to start a class collection of materials that are indicated as 'required' in the text - many of these will be available at minimal or no cost from dad's garden shed or from helpful local businesses.

Name:.....

Working Drawings

❑ Working Drawings are the designs or plans from which you work to build your invention.
They must: 1. Be accurately drawn. 2. Be carefully labelled. 3. List all the materials needed.

My Design

Use a lead pencil and draw lightly to start off.

Trim and glue your completed plans into your workbook for safekeeping.

Materials Needed

_____

_____

_____

_____

_____

_____

_____

Things to get from home.

_____

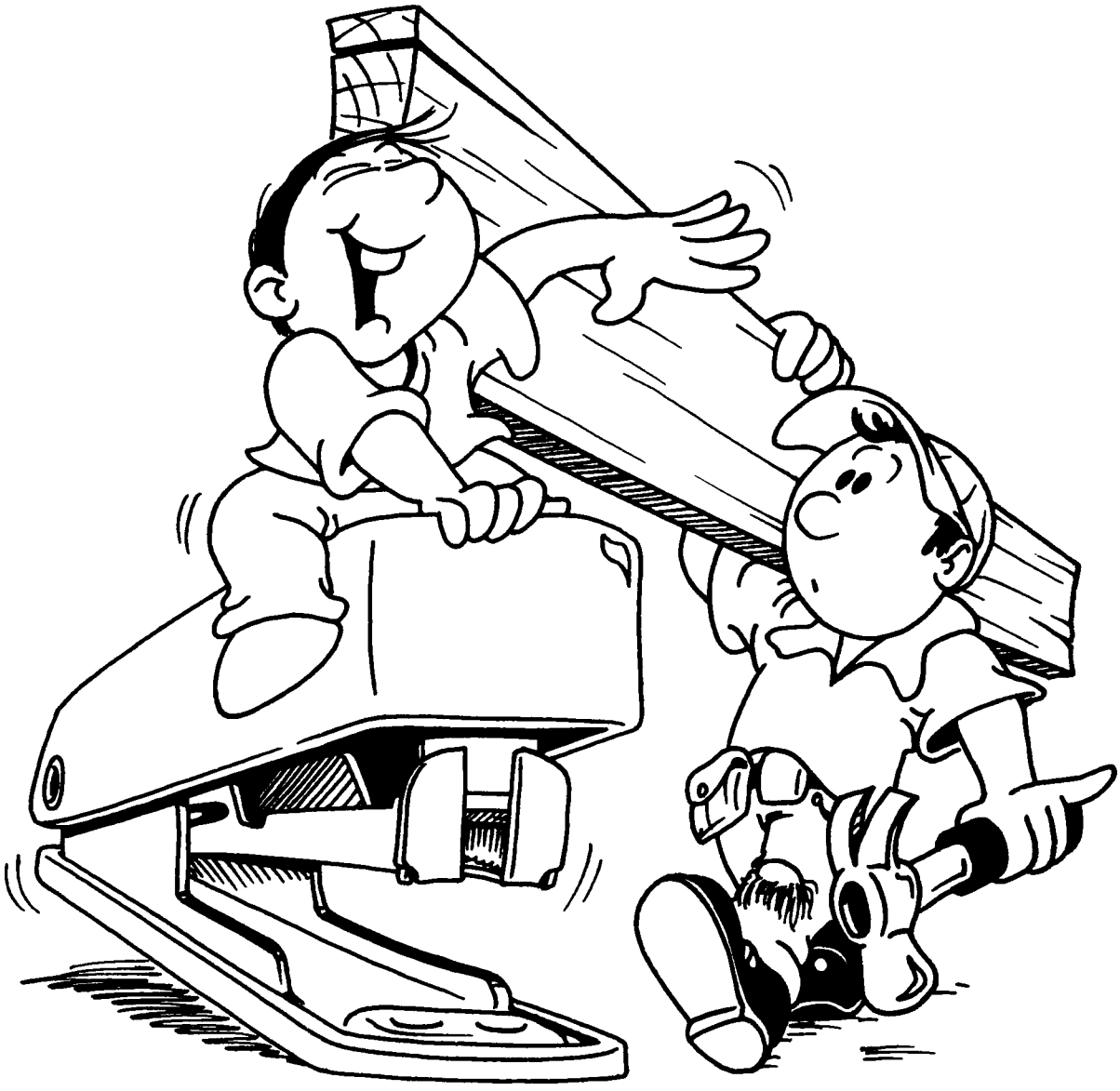
_____

_____

_____

Date needed _____

Thematic Activities



Clubhouse

Time Required - 3 lessons of 40 minutes each.

Materials

- ❑ Models are best built using a medium-sized cardboard box as the framework of the building.
- ❑ Students can collect most of their own materials, although it is handy to have a class recycling box. Useful items include cereal and other medium-sized packaging boxes, smaller boxes such as cosmetics boxes, match and ice lolly sticks, clear cellophane, fabric, wallpaper and carpet scraps.
- ❑ You will need to give students access to craft knives, craft glue or glue gun, sticky tape, stapler and hole punch.

Suggested Lesson Format *(This activity is best completed in groups of two or three.)*

Lesson 1 (40 minutes minimum)

1. *INVESTIGATE* the topic and pose the challenge. *Children should be required to consider design and construction elements before attempting any productions.*
2. Brainstorm possible construction materials and building strategies.
3. Students use 'Working Drawings' sheet to *DEVISE* their plan.
4. Collect materials for next session.

Lesson 2 (40 minutes minimum)

1. Students assemble materials and begin *PRODUCING*.
2. Students can make modifications to improve their design. Have the 'Modifications' sheet available.

Lesson 3 (40 minutes)

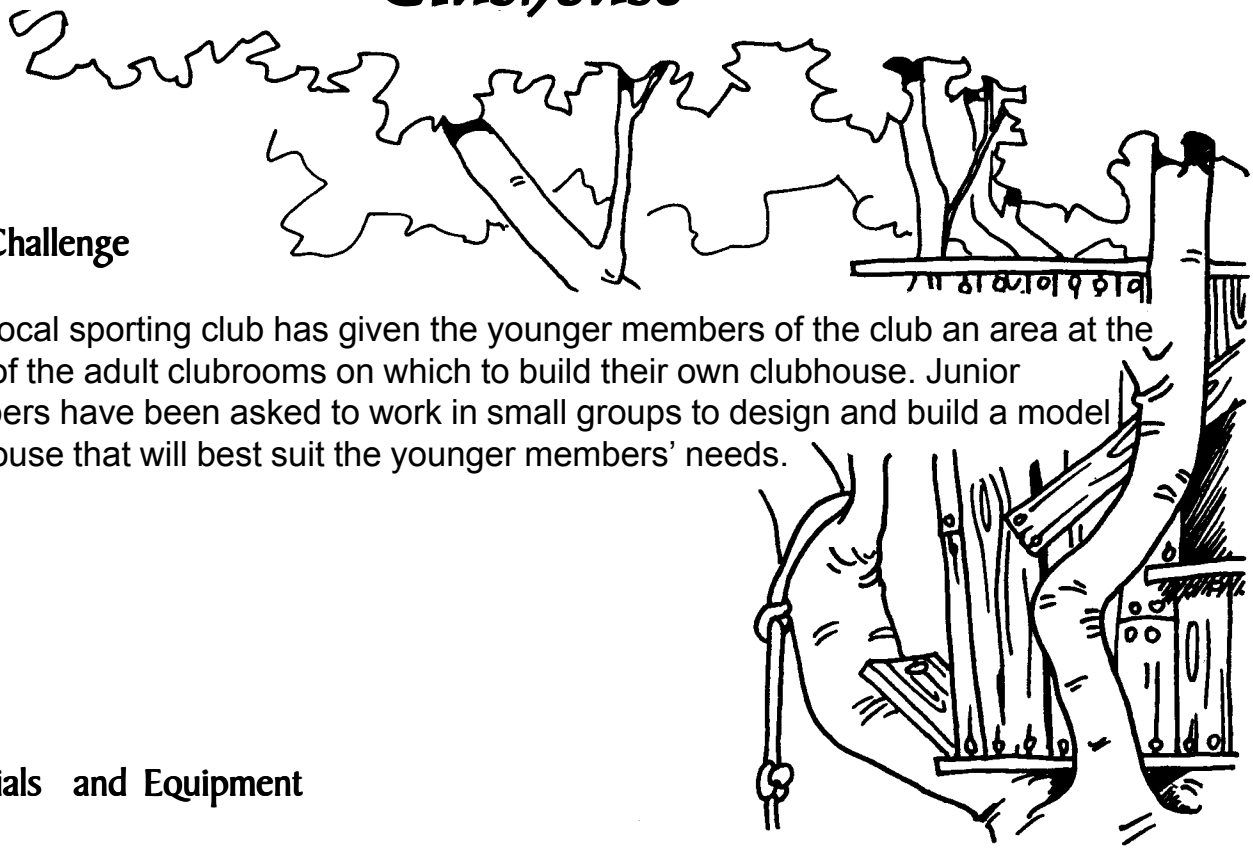
1. Students complete the *PRODUCTION* of their model.
2. Students who have successfully completed their model may go on with extension activities.
3. Towards the end of the session students use the 'How Good Was Your Design?' sheet to *EVALUATE* their design. Demonstrate and discuss the results.

Extension Activities

- ❑ Survey other students in your class to discover how many students spend some of their leisure time at particular sporting venues. Determine what type of clubhouse facilities are available at these venues and what facilities the students would like added. Present your findings to the class.
- ❑ List the benefits of a sporting club having separate clubhouse facilities for junior members.
- ❑ List the possible concerns that club officials may have with the idea. Work out solutions to these problems.
- ❑ Design a poster advertising the sporting club with its new junior clubhouse. The aim is to attract new junior and senior members.

Name.....

Clubhouse



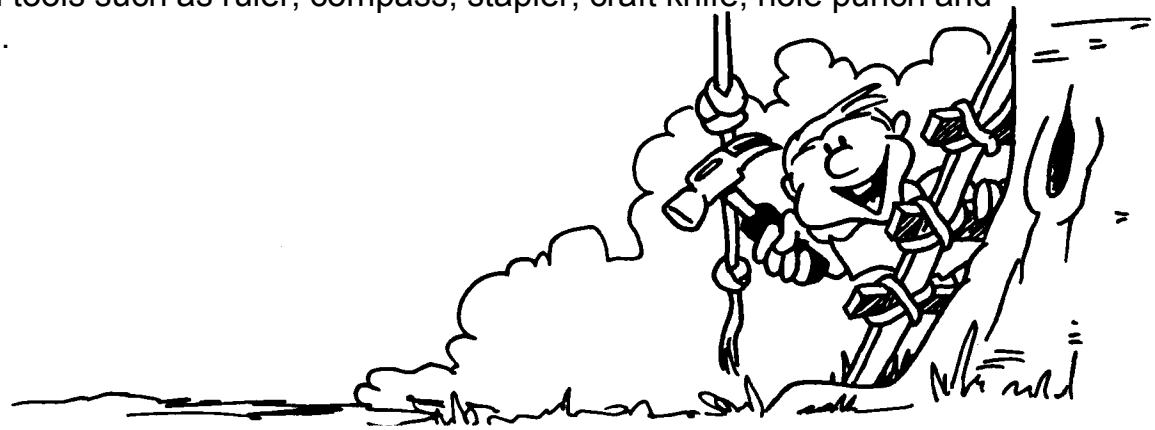
The Challenge

Your local sporting club has given the younger members of the club an area at the back of the adult clubrooms on which to build their own clubhouse. Junior members have been asked to work in small groups to design and build a model clubhouse that will best suit the younger members' needs.

Materials and Equipment

❑Your model must be built mainly from recycled materials. You have access to the class recycling box and may also bring recycled materials from home.

❑You also have access to consumables such as cardboard, craft glue and sticky tape, and tools such as ruler, compass, stapler, craft knife, hole punch and glue gun.



Your Job

Design and build a model clubhouse which:

1. Would be an enjoyable place for young club members to spend their time. (Include the type of furniture you would want);

2. Is a safe building with at least two windows and doors (exits).

All Ages Playground

Time Required - 3 lessons of 40 minutes each.

Materials

- ❑ Models are best built in the confines of a small cardboard box.
- ❑ Students can collect most of their own materials, although it is handy to have a class recycling box. Useful items include drinking straws, ice lolly sticks, match sticks, bamboo skewers, lids and bottle tops of all sizes, cardboard, small boxes and plastic containers, egg cartons, paper clips and split pins, fishing line, string and wool.
- ❑ You will need to give students access to craft knives, craft glue or glue gun, sticky tape, stapler and hole punch.

Suggested Lesson Format *(This activity is best completed in groups of two or three.)*

Lesson 1 (40 minutes minimum)

1. *INVESTIGATE* topic and pose the challenge.
   It may be useful for groups to conduct a survey on favourite play equipment within the class, school or at home.
2. Brainstorm possible construction materials and building strategies.
3. Students use Working Drawing sheet to *DEVISE* their plan.
4. Collect materials for next session.

Lesson 2 (40 minutes minimum)

1. Students assemble materials and begin *PRODUCING.*
2. Students can make modifications to improve their design. Have the 'Modifications' sheet available.

Lesson 3 (40 minutes)

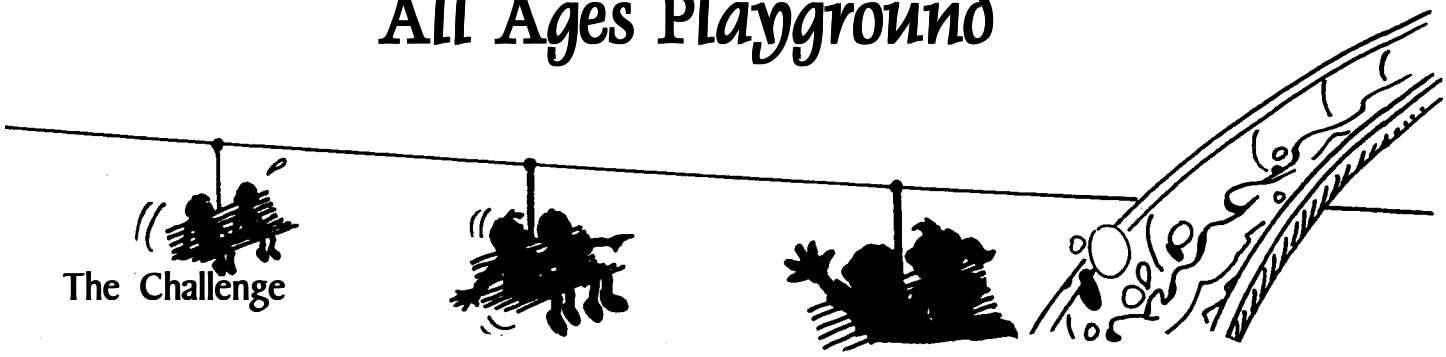
1. Students complete *PRODUCTION* of their model.
2. Students who have successfully completed their model may go on with extension activities.
3. Towards the end of the session students use the 'How Good Was Your Design?' sheet to *EVALUATE* their design. Demonstrate and discuss the results.

Extension

- ❑ Write a brief description of your model, listing the features and the age group each feature is designed for. Include a description of any safety features that you have incorporated.
- ❑ Write a short story about an adventure you might have on a visit to a playground like the one you have designed
- ❑ Write a letter to the editor of a local paper explaining why your area needs a playground like the one you have designed.
- ❑ Survey the class to see which are the most popular and least popular items in the model playgrounds that are being built. Graph your results.

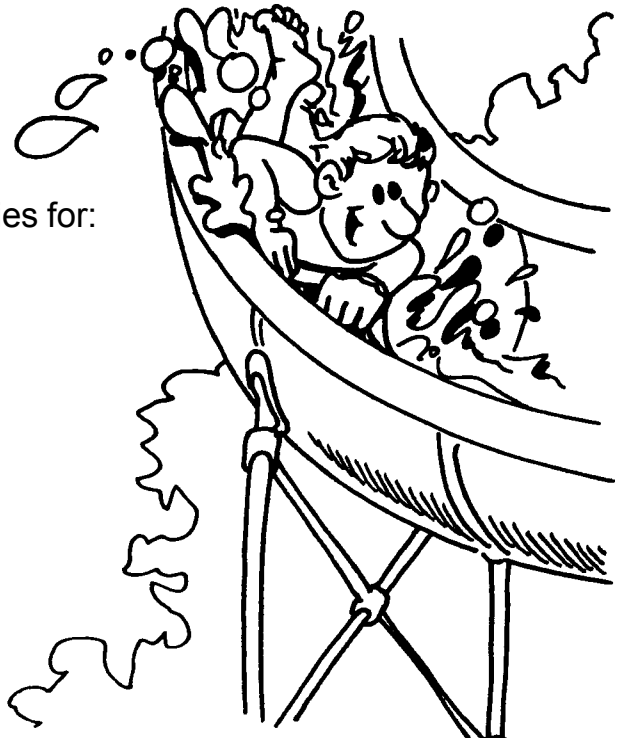
Name.....

All Ages Playground



The Challenge

The local town council is to build an 'All Ages Playground'. It is running a competition for the best design. You are required to produce a model playground which:



❑ Provides safe, enjoyable and challenging activities for:

a. Infants;

b. Primary School Students;

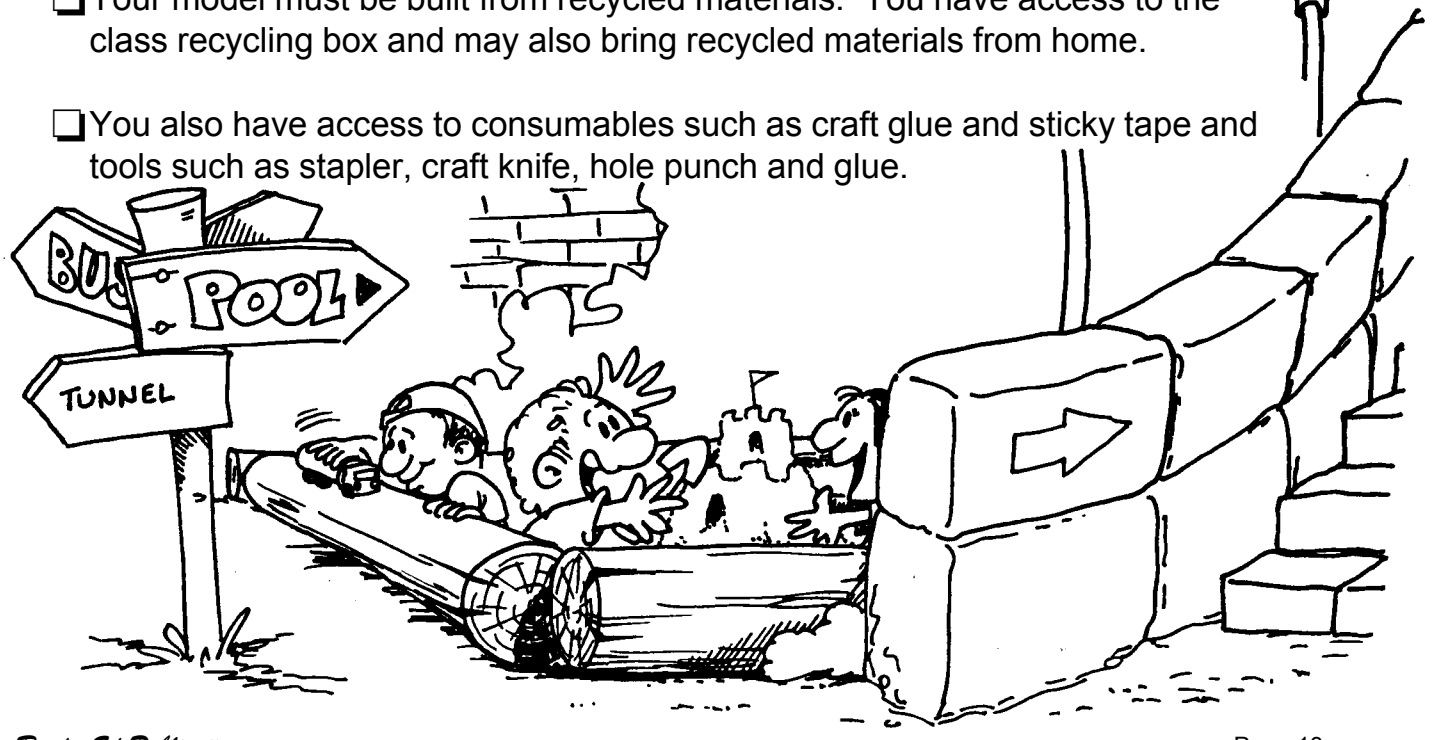
c. Secondary School Students;

d. Adults.

Materials and Equipment

❑ Your model must be built from recycled materials. You have access to the class recycling box and may also bring recycled materials from home.

❑ You also have access to consumables such as craft glue and sticky tape and tools such as stapler, craft knife, hole punch and glue.



Shipwrecked

Time - 3 lessons of 40 minutes each.

Materials

Students can collect most of their own materials. Recycled materials such as milk cartons, meat trays, margarine containers, straws, ice lolly sticks, string, rubber bands and scraps of material are useful. You need to supply Plasticine, craft glue or glue guns and sticky tape.

Suggested Lesson Format

Lesson 1 (minimum of 40 minutes)

1. *INVESTIGATE* the topic. Extracts from *Robinson Crusoe* by Daniel Defoe (Macmillan Company) or *Shipwrecked*, (a video by Walt Disney Pictures) may be useful. You may look at issues such as flotation and propulsion. The Literacy Links Science Series on flotation and Marcia Vaughan's *Ships and Boats and Things That Float* are also useful resources.
2. Pose the problem and brainstorm possible solutions. Students may work individually or in small groups.
3. Students use 'Working Drawings' sheet to *DEVISE* their plan.
4. Collect materials for next session.

Lesson 2 (minimum of 40 minutes)

1. Students assemble materials and begin *PRODUCTION.*
2. Set up the testing area. (Tub and fan, Duplo person, water-bottle, 'food' blocks and towel.)
3. Teacher supervises testing. Students watch or complete their boats.
4. Students can make modifications to improve their design. Have the 'Modifications' sheet available.

Lesson 3

1. Complete testing.
2. Students who have successfully tested their model may go on with extension activities.
3. Students use the 'How Good was your Design?' sheet to *EVALUATE* their design. Discuss the results.

Extension Activities

- ❑ Name the boat.
- ❑ List five things you learnt during this project.
- ❑ Describe what you enjoyed doing in this project.
- ❑ Make up a mime or play about your adventures on your boat.
- ❑ Write a TV or radio interview about your adventures on your boat.
- ❑ Write a story about your adventures on your boat.
- ❑ Research shipwrecks and present an oral or written report.

Additional Resources

How Things Work - Boats, Ships, Submarines and Other Floating Machines
Ian Graham
Kingfisher Books
Grisewood and Dempsey Ltd

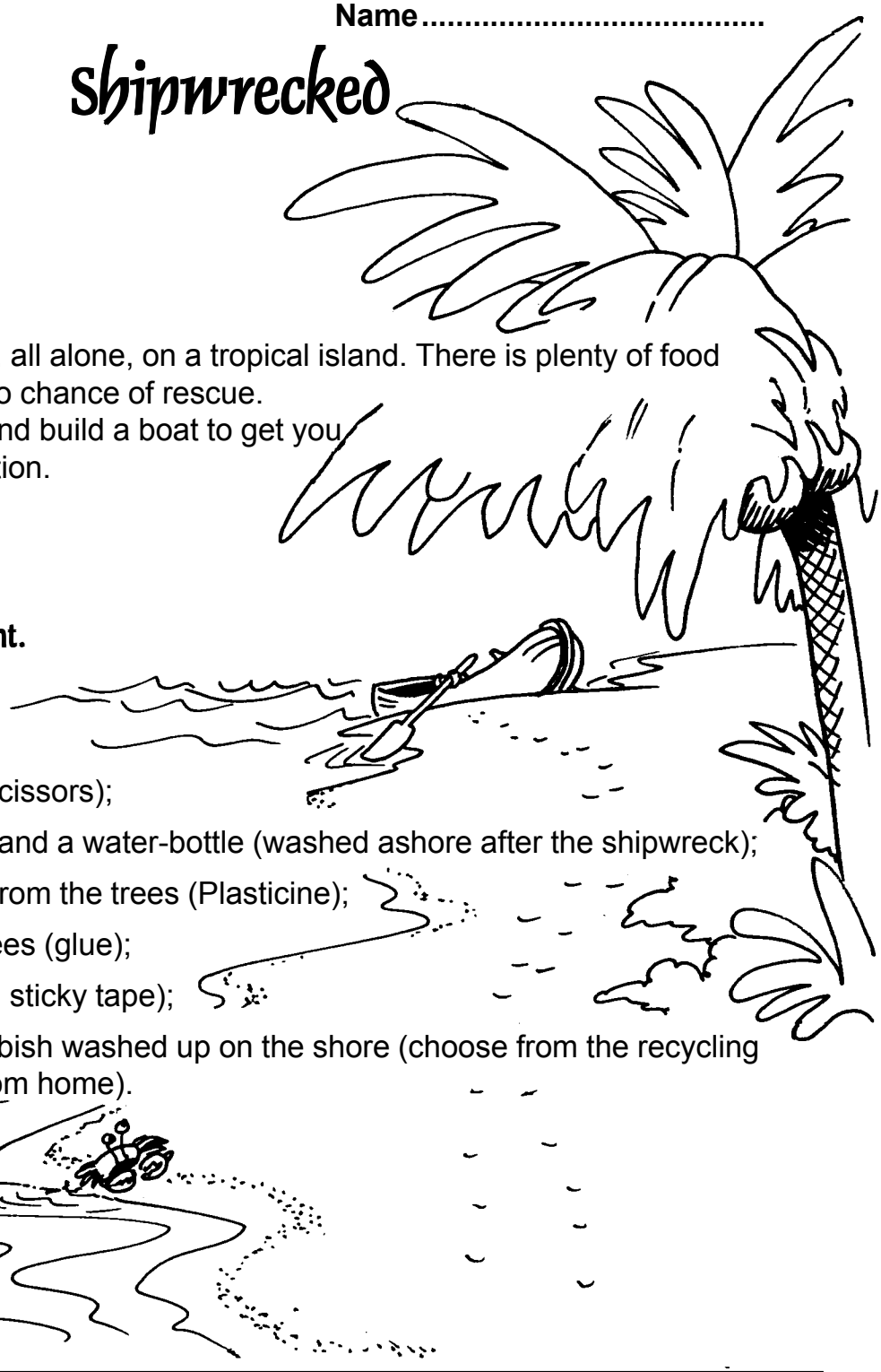
Ships, Boats and Things That Float
(Big book format, middle school)
Marcia Vaughan
Harcourt Brace Javanovich

Shipwrecks -The Stories behind the Legends
(Non-fiction, senior school)
Diana Chase/Valerie Krants
Macmillan Education

Shipwrecks-Time Capsules of the Deep
(Non-fiction, middle school)
John M. Kenny
Bookshelf

Name .....

Shipwrecked



The Challenge

❑ You are shipwrecked, all alone, on a tropical island. There is plenty of food and fresh water but no chance of rescue.
You need to design and build a boat to get you back safely to civilisation.

Materials and Equipment.

You have:

❑ a pocket knife (your scissors);

❑ a large piece of cloth and a water-bottle (washed ashore after the shipwreck);

❑ sticky gum collected from the trees (Plasticine);

❑ gluey sap from the trees (glue);

❑ vine ropes (string and sticky tape);

❑ lots of man-made rubbish washed up on the shore (choose from the recycling box or bring things from home).

Your Job

Design and build a model boat that will:

1. Float while carrying you, your food and water safely. (A Duplo person, blocks and a tiny bottle of water will be used to test your model.)
2. Have some way of moving through the water. (A fan will be provided for testing.)
3. Provide protection from the weather. (Sun, wind and rain.)