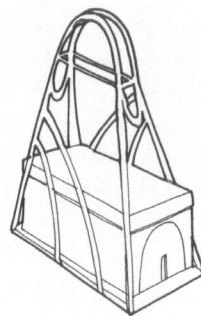


# Carrying

Focusing on flexible and semi-rigid materials



## The big picture

### Task

To design and make a simple personal carrying device.

### The story so far

With increasing concern for the environment, there is likely to be greater demand for carrying devices which can be used when travelling on foot or on public transport. The students' task is to research carrying devices that already exist in different parts of the world and to use this information to

design and make a carrier for someone in the local community. The design should take into consideration all the requirements of users in order to develop an appropriate technology.

### Learning

#### Designing

Using ideas from designers in countries around the world. Using ergonomics to improve product performance.

#### Making

Producing 3D forms using semi-rigid and flexible materials.

#### Technical matters

The strength of materials and the effectiveness of different joining methods.

#### Other matters

Appropriate technology.

### Design decisions

#### The sort of product

This has been decided by the teacher – a carrier of some sort but there is clearly a wide range of choice with regard to the sort of carrier.

#### The customer

The student can decide whom the product is for.

#### The performance of the product

The student can decide what the carrier will carry.

#### The appearance of the product

The student can decide the overall shape and form of the carrier although this may be governed to some extent by the purpose of the carrier. The student can choose any decoration for the carrier.

#### The way the product works

The student can decide how the product works in terms of how the carrier contains what it has to carry and how

the person using the carrier carries it – the nature and positions of handles and straps.

#### The way the product fits together

The student can decide how the parts which make the carrier fit together.

The student can decide how any handles or straps are attached to the carrier.

#### The materials, adhesives, fixings and fastenings

The student can choose from:

- a range of construction materials: cane, willow, thin flexible plywood and narrow section softwood, card sheet and tube, papier-mâché, sacking, medium calico, padding materials;
- a range of appropriate fastenings and fixings: thread, string, laces, press studs, hooks and eyes, paper fasteners, click rivets, pop rivets;
- a range of adhesives and finishes: stains, paints and varnish, PVA glue, double-sided tape, Araldite®.

## Products

The teacher introduced the class by showing a picture of Dick Whittington with his stick and red spotted hankie tied up to act as a carrier. She explained its advantages – simple materials, minimal cost; and disadvantages – all goods carried are just bundled together in an untidy manner. She gave each pair of students a square of thin sheet plastic and a length of dowel and set them the task of producing a simple carrier to hold their P.E. kit and evaluating it in use.

Most students produced a copy of the Dick Whittington carrier:

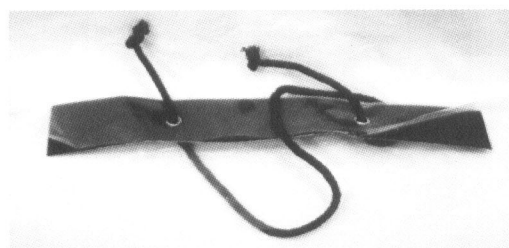


They found that there were problems with the stick digging into the shoulder and the bundle slipping down the dowel and bumping the back. They also found that the carrying capacity was limited.

Some students moved away from the idea of carrying over the shoulder and produced a hand held version.

They found that this was quite comfortable to carry providing the goods weren't too heavy.

The teacher then discussed with the students the difficulties of carrying heavy loads in simple plastic carrier bags. She used the Star\* poem *Scary Sausage Fingers* by Michael Rosen to illustrate the effect of carrier bag handles on fingers. She then set students the task of designing improved handles for carrier bags. Here are two students responses.



This student used thick string as a means of reducing the pressure on fingers.



This student used polythene tubing as a means of reducing the pressure on fingers.

The teacher then described a scene from her childhood. She had gone to a local market stall just to look round when she discovered a large china vase that would really please her mother. Her problem was that she had nothing to carry it home in. She carried it clutched to her chest. It was very uncomfortable and made her arms ache but her mum really liked it. She set the students the challenge of designing a simple-to-make carrier to cope with the situation of a bargain find and no carrier. She provided thin plastic sheeting and masking tape.

This student produced a solution using a large sheet of thin plastic for the bag with just a single seam and folded edges for reinforcement. She used another piece of plastic to act as a shoulder strap. The method of joining the handle to the bag is particularly elegant.

\*Star Poems by Michael Rosen, published by Puffin Books

## Values

### Technical

Students should appreciate that, while it is desirable to use materials with the most appropriate properties, this may not always be possible and that a compromise may be necessary.

### Economic

Students should appreciate that solutions are often dependent on locally available resources.

### Environmental

Students should consider the impact on the environment of the use of materials from trees and plants.

### Social

Students should appreciate the wide range of solutions developed by different cultures over time in response to their particular needs.

### Moral

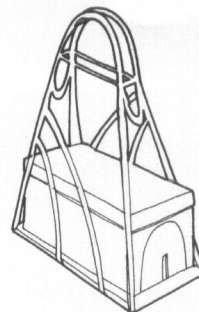
Students should consider the wider idea of 'burden' and how co-operation can 'lighten' loads.

### Aesthetic

Students should consider the need for attractive 'carriers' for a variety of occasions.

# Carrying

Focusing on flexible and semi-rigid materials



## The detail

### Sample brief

Design and make a carrier that can be used by someone travelling on foot or on public transport to carry something of value that is only moderately heavy.

### Sample specification

#### What the product has to do:

- provide the means for carrying particular items;
- be suitable for the identified user, allowing the user to carry things in a safe and comfortable manner.

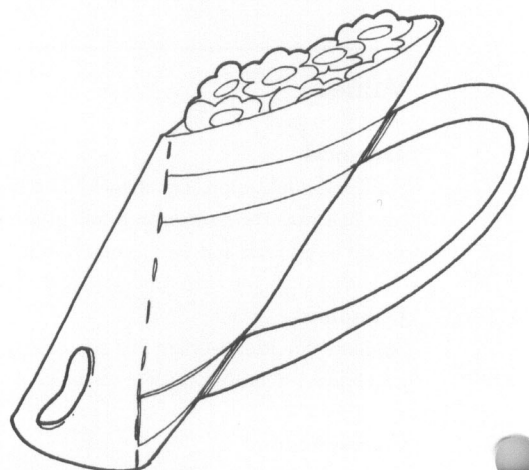
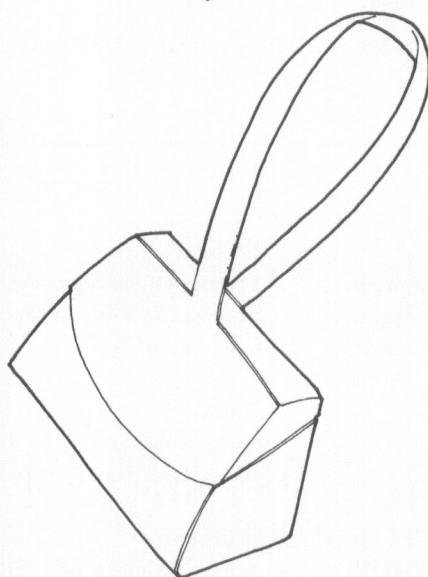
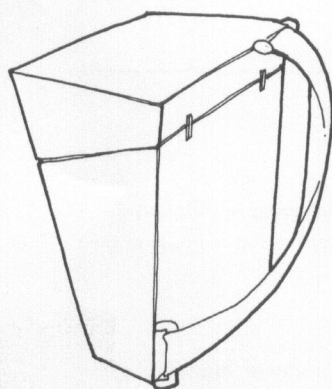
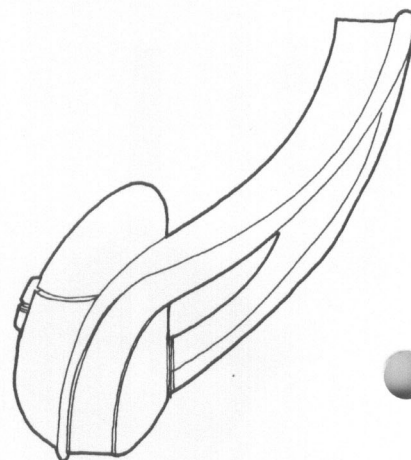
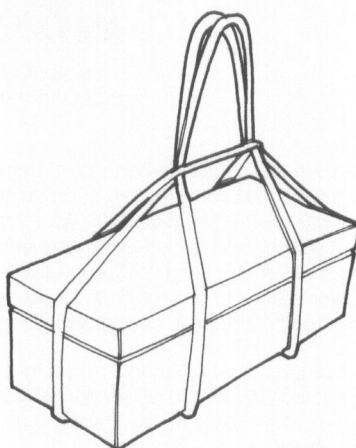
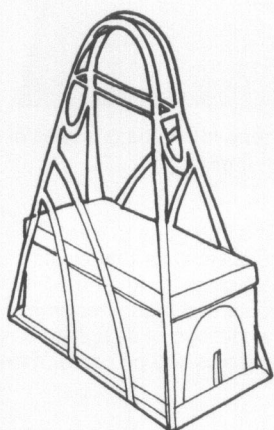
#### Other features:

- limited environmental impact, e.g. uses recyclable or recycled materials.

#### What the product should look like:

- be appealing to the identified user.

### Starter sketches



## Nuffield teacher talk

‘Remember the way they used large leaves to wrap up food parcels. Couldn’t you try that idea with paper to start with? Try drawing a large outline of the leaf – on A3 so that it’s really big. The smart move is to copy the outline using a picture of the leaf rather than just making it up. Now cut it out and see if you can bend parts of it over so that it forms a cage to hold things. Can you join it using paper fasteners?’

‘You’ve made a frame using cane and you want to fill in the sides so that the flowers are protected. Could you use netting? OK, how can you join the netting to the frame?’

‘Yes, little string loops might work.’

‘I can see how the long tube would be really good for

holding all your art and D&T drawings but I’m not sure that the handle will work. You’ve put it near one end – won’t that mean the other end’ll be dragging on the floor? What about putting it in the middle? Yes, it would stick out at the back and front. What about a strap that goes over your shoulder? Try it out with a bit of string.’

‘If the handle cuts into your hand, what can you do about it? OK, try some padding. How? Well you could try just wrapping some wadding around the handle and see if that helps. So it feels easier but it looks naff. What can you do to make it look better?’

## Resource Tasks

### General design

For the first Capability Task in Year 8:

- SRT 4 *Writing interview questions*
- SRT 15 *Getting visual ideas from sections of pictures*
- SRT 30 *Layout*
- SRT 32 *Instructions*
- SRT 38 *Evaluating outcomes – winners and losers*

For the second Capability Task in Year 8:

- SRT 3 *Selecting recording tools*
- SRT 14 *Attribute analysis*
- SRT 19 *Appreciating products – feel*

For the third Capability Task in Year 8:

- SRT 5 *Identifying needs and wants*
- SRT 16 *Making random connections*
- SRT 28 *Modelling with spreadsheets*
- SRT 40 *Freehand product analysis*

### Focus area design

- SRT 25 *Making things look solid* (unless tackled in Year 7)
- SRT 26 *Using nets* (unless tackled in Year 7)

### Communication

CRT 1 *Drawing isometric views*

### Making

RMRT 8 *Designing containers from tube*  
(See RMRT 16 and RMRT 17)

### Technical

- RMRT 12 *Understanding forces in structures*
- RMRT 13 *What makes a beam bridge?*
- RMRT 14 *Understanding balance*
- RMRT 15 *What makes a framework?*
- RMRT 16 *Modelling structures*
- RMRT 17 *Modelling how a handle might work*

### Commercial

RMRT 3 *Marketing: Does TV advertising work?*

## Case Studies

Carrying, downloadable from the website <http://www.nuffield.org/secondaryDandT>

## ICT opportunities

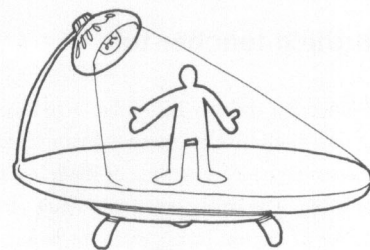
Use www to find out about carriers that are used in different parts of the world. Try putting ‘+sustainable +products +bags’ in the search engine. Look directly at <http://unep.frw.uva.nl/> (search in product examples database, e.g. for ‘bags’; ‘carriers’).

Use CAD to develop shapes for flat panels used in carrier. Use CAD/CAM to cut out flat panel shapes used in carrier. Use CAD/CAM to develop printing blocks for decorative surface patterns.



# Display your treasures

Focusing on using thin sheet, rod, tube and strip



## The big picture

### Task

To design and make a display system for items of special interest.

### The story so far

Many people enjoy collecting items which are of special interest to them. Thimbles, model cars, dried flowers, coloured pebbles, soft toys, antique figures and newspaper cuttings about sports persons or entertainers are some examples of what are called 'Collectables'. The items in such a collection are not always shown off to their best advantage. Sometimes they need to be seen all together and

sometimes on their own. Sometimes they need to be rotated and seen from different angles. The students' task is to identify a personal interest in collecting things, which may be their own or the interest of a friend or relative, to draw up a specification for what a suitable display system should be able to do, and to make either a complete display system or a representative part of it as a prototype.

### Learning

#### Designing

Using structural principles as a starting point for designing.

#### Making

Construction skills required to produce elegant structures from thin sheet, strip, rod and tube.

#### Technical matters

The way the interplay of forces within a structure can be controlled by the design of the parts and the way they are connected to one another.

#### Other matters

Display as a means of marketing.

### Design decisions

#### The sort of product

This has been decided by the teacher – a display system of some sort but there is clearly a wide range of choice with regard to the sort of display system.

#### The customer

The student can decide whom the product is for.

#### The performance of the product

The student can decide what the system will display.

#### The appearance of the product

The student can decide the overall shape and form of the display.

The student can choose any decoration for the display.

#### The way the product works

The students can decide how the product works in terms of the structural elements used to provide the display, whether the display includes lighting, is static and fixed, static and adjustable, or moving.

#### The way the product fits together

The student can decide how the parts which make the display fit together.

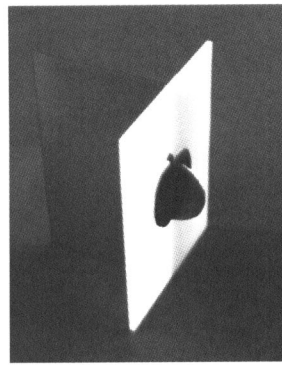
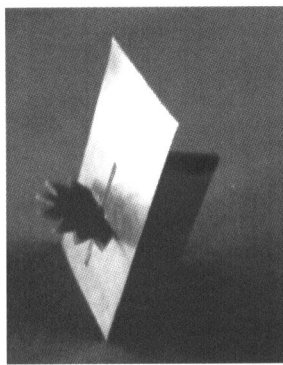
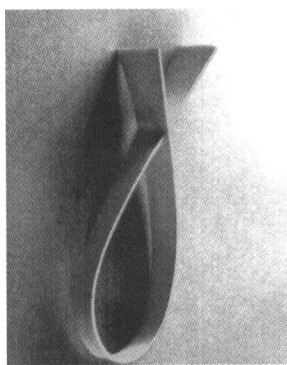
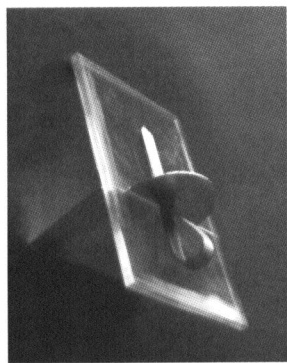
The student can decide how any mechanical or electrical components are fitted into the display.

#### The materials, adhesives, fixings and components

The student can choose from:

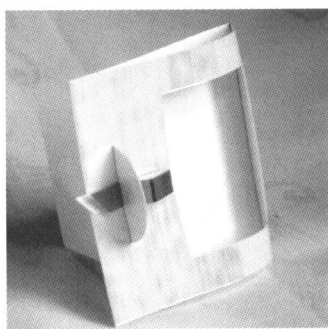
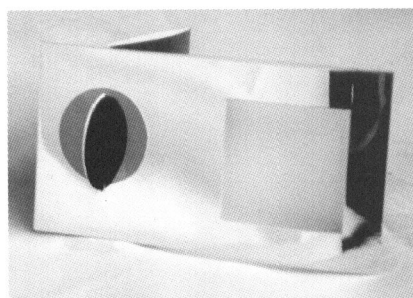
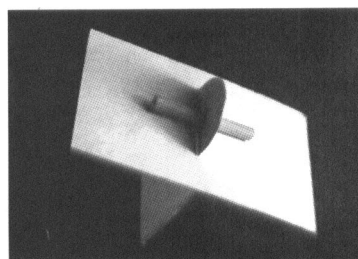
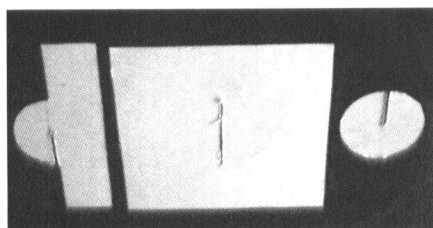
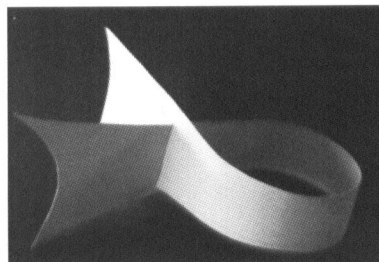
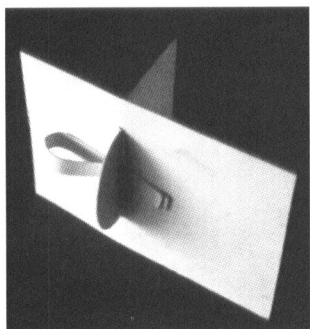
- a range of construction materials: sheet material such as thin plywood, hardboard or stout card, and thin strip wood (10 mm square) for supporting structures; thick and thin wire for suspension systems;
- a range of components: mechanical components – wheels, gears, pulleys, belts and chains; electrical components – 6 V MES bulbs, 6 V electric motors, variety of switches;
- a range of fastenings and fixings: nuts and bolts, paper fasteners, click rivets, pop rivets, press studs, string, thread;
- a range of adhesives and finishes: stains, paints and varnish, solder, PVA glue, double-sided tape, Araldite®.

## Products



In this school the teacher invited a designer maker into the school and she produced a handling collection of 'new' ways to join sheet material. The students were encouraged to explore the different techniques and to ask questions.

The students were then required to model these methods of joining using card.



Here the students have used the joining methods to produce simple but effective 3D photo frames in coloured card.

## Values

### Technical

Students should consider the effects on the final design of alternative technical decisions about the choice of structural system, elements and connections.

### Economic

Students should consider costs of alternative design decisions and what the final cost of production and the market price would be if their designs were to be manufactured in quantity.

### Environmental

Students should consider the source of the materials used

and their disposal after the display has completed its useful life.

### Social

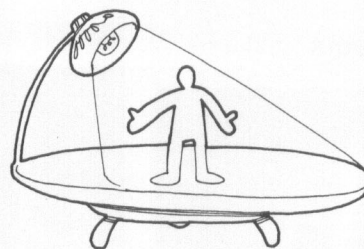
Students might consider the activity of collecting both as an individual and as a co-operative and sharing activity.

### Aesthetic

The aesthetic aspects of a collection and its individual items are likely to be fundamental to their design. Students should take these aesthetic values into account in their design.

# Display your treasures

Focusing on using thin sheet, rod, tube and strip



## The detail

### Sample brief

Design and make a display system for a single item or small collection of items of special interest to a particular person.

### Sample specification

#### What the product has to do:

- provide the means for displaying the chosen item(s).

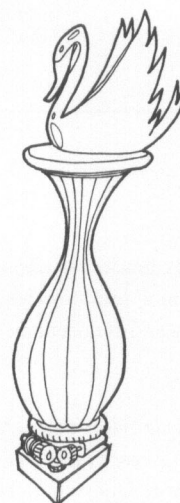
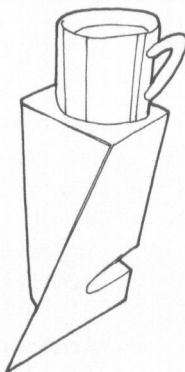
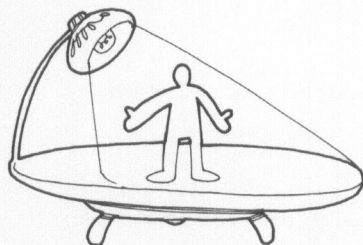
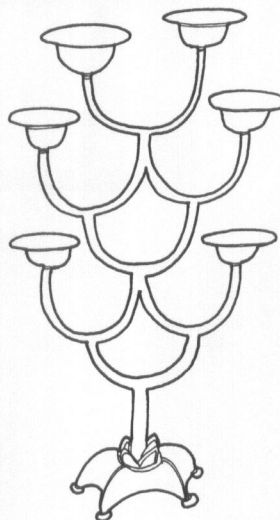
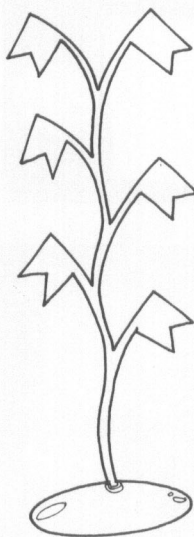
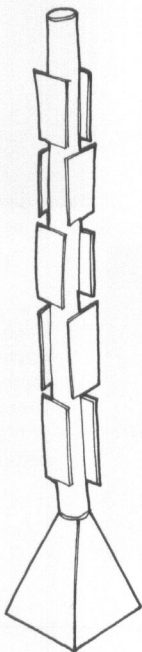
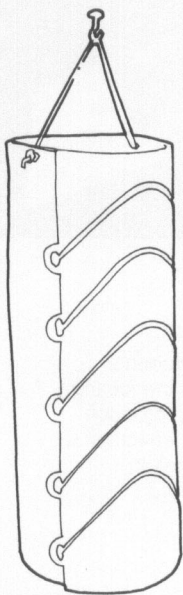
#### Other features:

- take up minimum floor or table space;
- lightweight and easily adjusted.

#### What the product should look like:

- be appealing to the identified user and appropriate for the item(s) displayed.

### Starter sketches



## Nuffield teacher talk

‘OK, it’s a set of china thimbles and it’s for your gran. How many? Only six but they’re really precious. What about a small hanging basket in layers? Three on the bottom, two on the middle and one on the top. Three bits of card and a piece of dowel and you could model it. You’ll need to work out how to get it to hang straight.’

‘Four old coins that your mum found in the garden when she was your age. And you’ve got some information about them as well. Enough to write on a postcard. Can you imagine each coin on a circle with the writing about the coin around it in the circle? Now you’ve got the problem of how to display the four circles. Can you join them into a cross shape which hangs up?’

‘Three *Star Wars* figures that your dad bought when the first film came out. You want to do it as a mobile with them hanging at different heights. Do you know how far apart you

want them? So how will you get that to balance from a suspension point? Do you know how heavy each one is? You can easily work out how to get two of them in balance – use a simple see-saw. But what happens when you add a third? You need to add another bit to the see-saw. So you might need to play with arranging them at the corners of triangles of different shapes to find a triangle which will hang level. That triangle could form the top of your mobile.’

‘You want the column to rotate slowly and use an electric motor to do this. OK, how will you connect the shaft of the motor to the column? A rubber band. Your column is about the same size as the shaft on the motor, so will it turn faster or slower than the motor? You’re not sure – well, let’s try it out. The same and much too fast! How can you slow things down? What if you put a big pulley wheel on your column and the rubber band drives that? Try it out.’

## Resource Tasks

### General design

For the first Capability Task in Year 8:

- SRT 4 *Writing interview questions*
- SRT 15 *Getting visual ideas from sections of pictures*
- SRT 30 *Layout*
- SRT 32 *Instructions*
- SRT 38 *Evaluating outcomes – winners and losers*

For the second Capability Task in Year 8:

- SRT 3 *Selecting recording tools*
- SRT 14 *Attribute analysis*
- SRT 19 *Appreciating products – feel*

For the third Capability Task in Year 8:

- SRT 5 *Identifying needs and wants*
- SRT 16 *Making random connections*
- SRT 28 *Modelling with spreadsheets*
- SRT 40 *Freehand product analysis*

### Focus area design

- SRT 25 *Making things look solid* (unless tackled in Year 7)
- SRT 26 *Using nets* (unless tackled in Year 7)

### Communication

- CRT 1 *Drawing isometric views*

### Making

- RMRT 8 *Designing containers from tube*
- (See RMRT 16 and RMRT 17)

### Technical

- RMRT 12 *Understanding forces in structures*
- RMRT 13 *What makes a beam bridge?*
- RMRT 14 *Understanding balance*
- RMRT 15 *What makes a framework?*
- RMRT 16 *Modelling structures*
- RMRT 17 *Modelling how a handle might work*

### Commercial

- RMRT 3 *Marketing: Does TV advertising work?*

## Case Studies

Making jewellery (photocopiable).

## ICT opportunities

Use www to find out about display systems and structures. Try putting ‘+display +systems +retail’ in the search engine. Look directly at <http://www.optosystem.com/index.html>.

Use CAD/CAM to produce flat parts which slot together, or flat parts which act as ‘hubs’ for strips.

Use CAD/CAM to produce stick-on decoration which could enhance the appearance of the structure.