Discover Primary Science

and see how your world works
agus déan scrúdú ar an domhan atá thart ort

www.primaryscience.ie

DPS Registered School Details:

DPS Number:

Website Username:

Roll Number/Password:

Dun Laoghaire Institute
Art | Design | Technology

Discover
Science + Engineering

1 Introduction

Discover Science and Engineering is managed by Forfás on behalf of the Office of Science & Technology at the Department of Enterprise Trade & Employment. The programme aims to develop creativity in our children, show them how important science is to our everyday lives and more importantly how much fun it can be!

Discover Primary Science aims to make science fun and interesting for all children by:

- helping children develop an interest in science.
- giving children a chance to have fun while being introduced to science.
- promoting an awareness of science to children and teachers (and parents).
- supporting teachers in teaching science.
- supporting the revised SESE: Science primary curriculum.
- promoting an awareness of the Discover Science and Engineering programme.

and this Discover Primary Science Classroom Activity Support Booklet provides practical support to achieve these aims. Each participating school receives the Booklet which consists of:

- **six curriculum activities that can be used directly with classes**
- **other hands-on activities that can be used to develop primary science lessons**

The Activity Support Booklet provides support for the non-specialist teacher including helpful hints, clear explanations of the science background of each activity and additional activities where relevant.

Discover Primary Science is being developed by the Discover Science & Engineering programme in conjunction with Colleges of Education, Education Centres, Institutes of Technology, Universities and Discover Centres and is fully supported by the Department of Education & Science. The Discover Science & Engineering programme would like to acknowledge and thank Marion Palmer and Margaret Horner from the Dun Laoghaire Institute of Art Design & Technology for their assistance in the preparation of the activities which are contained in this Booklet. In addition, representatives from the Department of Education & Science, INTO, ISTA, NCCA and PCSP were involved in reviewing the activities for the current workbook. The Discover Science and Engineering Programme would also like to acknowledge ideas and support received from BAYS, Raring to Grow and James Malseed (Kill o' The Grange National School).

1.1 The Principal and Discover Primary Science

Discover Primary Science is an initiative of Discover Science and Engineering. It supports primary science in schools through the Discover Primary Science (DPS) Activity Pack, the Discover Primary Science website **www.primaryscience.ie,** accredited Discover Science Centres and the Awards of Science Excellence.

Each participating school receives one DPS Activity Pack. This contains:

- Activity Support Booklet
- Black and white activity sheets for photocopying
- Awards of Science Excellence brochure
- Wall planner
- Discovery Log sticker
- Shopping List

One teacher from the school attends the Induction Day where they receive the pack and have an opportunity to engage with many of the activities. Once the school is registered, participation in the programme can continue year on year with support offered on **www.primaryscience.ie** and regular updates and newsletters. No more training is required.

Discover Primary Science uses tried and tested activities for the primary science classroom. They are informal, easy to do and develop primary science knowledge and skills. They will lead children and teachers to develop their own questions. From these questions children can devise and develop their own experiments and investigations. In other words it **adds variety to science, it is not textbook or product driven, it is all about experience and understanding**. All the activities in the pack have been matched to the SESE: Science curriculum (see page 8 & 9).

The importance of the Principal in supporting primary science

Teachers and Principals tell us that taking part in Discover Primary Science supports primary science in the school. While just one teacher attends the induction day and receives the pack we would encourage all the teachers in your school to become involved. Here are some suggestions that you as principal might find useful:

- Encourage one teacher to become the Discover Primary Science teacher (it may be your science co-ordinator or someone who is interested in science). There are suggestions in this pack for how they might work with you and their colleagues in disseminating the programme through the school.
- Read, speak about and support the programme.
- Visit and encourage the children doing the Discover Primary Science activities.
- Encourage children to make a presentation on Discover Primary Science for you, other teachers and classes, or for parents.
- Allow time at staff meetings to discuss Discover Primary Science and to do the activities.
- Include Discover Primary Science in your school planning for science.
- Encourage your staff to apply for the Awards of Science Excellence.
- Work with your Science teachers to complete the annual DPS Programme evaluation - sent out to schools in Spring.

1.2 Discover Primary Science and the school

Taking part in Discover Primary Science is an excellent way of developing your school's primary science programme. The activities are fun and relate to the SESE: Science curriculum. Here are some suggestions that may help you to develop the programme with your own class and get other teachers involved:

With your own class

- Match activities to your class and to your science plan.
- Always remember that doing science can help achieve other curriculum objectives such as maths skills and reading and writing in different genres (factual and report writing).
- Try a science day where you block science into a whole day's work.
- Even if the children have tried an activity once it is worth doing them again with a different focus or with follow on activities built in.
- Having decided the activities for your class, make a list of everything you will need. Ask the children to bring in as much as they can. Ask your colleagues for any materials or equipment they may be able to give or loan you. Purchase any necessary materials. Reuse and recycle materials where possible. See the Shopping List and Section 2.2 for assistance in compiling materials.
- For safety reasons you will need to try the activities yourself beforehand. Have a sample for yourself but not necessarily to show to the children as that might interfere with the excitement of discovery.
- Classroom management is important. You may have all the children doing the activity at the same time or set up a workstation for the activity and have some children do the activity as the class carries on with something else. Although this might seem disruptive it is difficult to manage the whole class doing every activity together. Use the workstations for the quieter activities.
- Recording children's work. There is little emphasis on recording in the Activity Support Booklet, apart from the six curriculum activities. This is deliberate. Consider for each of the activities the recording you wish the children to do. The children could discuss what they have learned; they may have an artefact to act as a record e.g. rainbow spinner, dyed cloth. You could develop a blank report template, there could be a class report template, you could organise a class poster, take photographs, video, make an audio tape or get the children to make a PowerPoint presentation – not all recording has to be written. Any of these suggestions can be used as part of the Discovery Log.
- Teacher observation – while the children are working keep a notebook handy and jot down a few observations for yourself noting children who may need more challenging activities or those who are having difficulties.
- Some children might need more training in group working skills or more explicit work on the language being used. It can be useful to note particular vocabulary before you start the activity and encourage children to use it while working. Terminology from the maths curriculum can be integrated particularly well in these activities, for example higher than/lower than, bigger than/smaller than... and also shape and directional terminology.
- Train some children from your class to provide demonstrations for other classes.
- Invite your principal to visit your class during activities or to see a presentation on the activities.
- Invite your colleagues to visit your class during activities or to see a presentation on the activities.
- Don't forget to check **www.primaryscience.ie** for e-newsletters, trigger questions relating to activities in the pack, new activities, handy hints, web & book reviews, and a discussion forum during the year.
- Network with registered schools in your area for science events, sharing ideas, developing follow up activities etc.
- Upload your own ideas or classroom activities that relate to science in the gallery section of the website.
- Visit an accredited Discover Centre with specifically devised progammes supporting Discover Primary Science (see **www.primaryscience.ie** for a list of centres).

Getting other teachers involved

- Talk to the principal about how he/she can support this initiative.
- Present the scheme to the school in a staff meeting.
- Explain the background clearly to the staff (refer Section 1).
- Demonstrate a few activities and get people involved. Give them a copy of the worksheets. The Black and white worksheets are included in the pack for photocopying. Keep the master copy safe for future use.
- Start early in the year. September is good as people are planning their year's work so include Discover Primary Science in your planning.
- Match activities to classes and encourage other teachers to try them out at a staff meeting or as part of a planning day.
- Co-ordinate science resources so that teachers know where materials are. Give teachers a list of consumables that they can ask children to collect them from the very beginning of the year (refer photocopiable Shopping List in Pack).
- If possible develop boxes or kits for the different activities. It may encourage your colleagues to do the activities if the materials are easily available (refer Section 2.2).
- Arrange to have some older children available to demonstrate activities in the junior classes. Naturally they will need to be fully supervised and safety precautions followed.
- Invite the principal to visit classes during activities or to see a presentation on the activities.
- Consider entering for the Award of Science Excellence. It is not compulsory and does not have to be sophisticated. Encourage children to complete the Discovery Log themselves in any format, clearly providing evidence for the four steps (see Award of Science Excellence Brochure).
- Have a Discover Primary Science display day for your principal, colleagues, the children and parents.

1.3 Using the activities with children who have differing needs

(e.g. younger children, children with special educational needs, more able children)

The activities have been prepared and tested with specific class levels in mind and so may require adaptation for use with those who have differing needs. Some of the activities are not appropriate for younger children – check your SESE: Science curriculum if you are unsure. They may also need to be extended for very able children as the activities may not be sufficiently challenging for them. Very often these children will come up with extension suggestions themselves.

Differentiating the activities may include provision of extra support for some children at the beginning of the activity, allowing more time to complete the activity or varying the method in which the child records their results. Often children with special educational needs can understand the concepts involved and engage with the activity but are unable to read instruction cards or write down their responses.

Using the activities with children who have differing needs (cont'd)

Teachers can help by:

- Presenting equipment carefully.
- Explicitly explaining the purpose and sequence of the activity.
- Assigning group roles matched to the skills/abilities of particular children.
- Older children could prepare materials for the younger or children with motor skill difficulties as with the Rainbow spinner or the Acrobatic clown. The emphasis of the activity can then be on discussion of what happens and how it can be changed rather than on the making and doing.

Extension activities

- Children could explain and demonstrate activities to others.
- Encourage more able children to ask more probing questions and encourage further thinking and investigation.
- Give these children exploratory time with the resources, uninterrupted by the teacher.
- Use computers, books and other resources to find out more about the topic or to develop further activities.
- Provide a context for an activity to become part of a bigger project for older classes. The children could start with the lighthouse but then explore using this to develop a streetscape which lights up. The Myself activity could become a data collection and analysis exercise where children collect data to see what percentage of children in the school are left-handed, have blue eyes, what is the average reaction time in a particular class, what is the range of reaction times across the school, across the teachers, at home... The activities are only the starting point – let the child's imagination take him/her where their questions are leading them!
- Many of the activities provide excellent links to other areas of the curriculum and in particular to maths (Skills and Strand Data) and SPHE (Strand: Myself and co-operative learning).

Children with special educational needs

Vary the method of recording results. Recording can be done pictorially, diagrammatically, or through story telling, concept mapping and annotated drawings. Digital cameras offer another effective and easy method of recording.

For children with specific reading difficulties keep workcards simple and with minimal language – devise common symbols (such as a pen to indicate draw a picture) or use colour coding to indicate what to do next (red cards first, then yellow, then blue).

Make sure instructions are explicit – get older children to make a HOW TO... booklet for the activity and test it out on younger children to see if they can follow the instructions easily.

Take a set of digital photos yourself showing the main stages in the activity and get the child to sequence them before starting on the activity. *NB: The flash activities on the website* ***www.primaryscience.ie*** *may be of assistance.*

Use sentence strips in the same way to sequence the activity before you do it.

First I .....

Then I....

Spend more time on the initial stages of the activity and teach the language required to describe the activity – do they know what 'balance' means, what does 'launch' do...

2 Classroom Activities

There are two main categories of classroom activities in Discover Primary Science – **curriculum activities** and **the other activities**.

There are six curriculum activities. These are hands-on activities that reflect the approach in the primary science curriculum and can be used directly with primary classes. They are:

- **Design a Bridge**
- **Paper Helicopters**
- **Can you Balance?**
- **Rainbow Spinner**
- **Make a Lighthouse**
- **Strange Sounds**

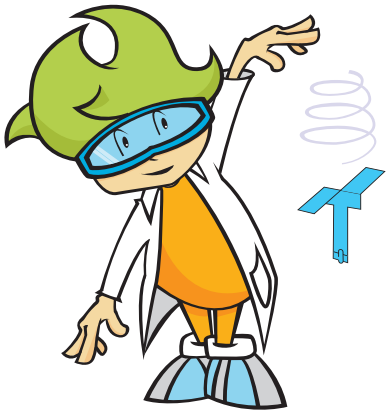
The remainder are hands-on activities that can be used to develop primary science lessons. These have been identified as straightforward – the Bronze (B) activities, intermediate – the Silver (S) activities and demanding – the Gold (G) activities. Suitable adjustments can be made on all activities to either a more straight forward or more demanding level.

The straightforward (Bronze) activities are:

- **Dancing Raisins**
- **Diving Drops and Sinking Feelings**
- **Air Pressure**
- **Friction – slip or stick?**
- **Surface Tension and Bubbles**
- **Mirror Writing**
- **Make a Lever (Wag the Dog)**
- **Creepy Reflections and Floating Finger**

The intermediate (Silver) activities are:

- **Acrobatic Clown**
- **Design a Boat**
- **Making a Diver**
- **Rocket Launch**
- **Water Fountain (Demonstration only)**
- **Snake Spiral**
- **My Reaction Time**
- **Myself – Fingerprints, Dominant eye, Blind spot**
- **How much air can my lungs hold?**
- **Creeping Colours**
- **String Telephone**
- **Starch is Everywhere**
- **Make a Rocket**
- **Starting and Stopping**
- **Grow Some Crystals**



The demanding (Gold) activities are:

- **Motors and Vehicles**
- **Make an Electric Quiz**
- **Make a Periscope**
- **Dyeing with Red Cabbage, Soap and Vinegar**
- **Growing Tomatoes**
- **Magnetic Car**
- **Which Paper Absorbs Best?**
- **Exercise Your Heart**

The two sets of activities provide a starting point for the children's own investigations. The children may come up with questions and suggestions as they do the activities. **Please encourage the children to develop and test their own ideas.** The activities aim to stimulate children's curiosity and develop scientific skills such as observing, measuring and recording. Further ideas for activities can be obtained from the follow-up activities and the resources. Developing the children's ideas and then answering their own questions is an important part of the SESE: Science curriculum.

2.1 Discover Primary Science Activities and the SESE: Science curriculum

The table shows how the activities support the SESE: Science Curriculum.

Activity	Content Strand Unit	Skill development strand	Approach / Level	Page number
DESIGN A BRIDGE	Forces	Investigating and Experimenting	Curriculum	14
PAPER HELICOPTERS	Forces	Investigating and Experimenting	Curriculum	18
CAN YOU BALANCE?	Human life, Forces	Investigating and Experimenting	Curriculum	22
RAINBOW SPINNER	Light	Making, Observing	Curriculum	25
MAKE A LIGHTHOUSE	Magnetism and electricity	Experimenting, Making	Curriculum	28
STRANGE SOUNDS	Sound	Experimenting	Curriculum	31
DANCING RAISINS	Forces	Observing	Bronze	35
DIVING DROPS AND SINKING FEELINGS	Forces	Observing, Experimenting	Bronze	36
AIR PRESSURE	Forces	Experimenting	Bronze	37
FRICTION – SLIP OR STICK?	Forces	Investigating and Experimenting, Observing	Bronze	38
SURFACE TENSION AND BUBBLES	Forces	Investigating and Experimenting	Bronze	39
ACROBATIC CLOWN	Forces	Investigating and Experimenting	Silver	41
DESIGN A BOAT	Forces	Designing and Making Investigating and Experimenting	Silver	43
MAKING A DIVER	Forces	Designing and Making Investigating and Experimenting	Silver	44
ROCKET LAUNCH	Forces	Investigating and Experimenting	Silver	45
MOTORS AND VEHICLES	Forces	Designing and Making	Gold	47
WATER FOUNTAIN (Demonstration only)	Heat	Observing	Silver	48
SNAKE SPIRAL	Heat	Making, Observing	Silver	49
MY REACTION TIME	Human life	Investigating Estimating and Measuring	Silver	51

** refer to www.primaryscience.ie/activities for flash based versions of these activities*

2.2 Equipment and materials for the activities

This is a list of equipment required for each activity. One or two of the activities are demonstrations, others are individual activities and some are very suitable for small groups of two or three. Scientific equipment such as hand lenses, plastic mirrors and motors can be obtained from scientific suppliers. The Primary Science Day Magnetism, Electricity and Light kits can also be used.

Activity	Equipment and materials per group of children
DESIGN A BRIDGE	Paper, coins, blocks or books (i.e. things to make two banks of a river)
PAPER HELICOPTERS	Paper, ruler, paper clips, scissors Template for older children Template for younger children
CAN YOU BALANCE?	Rulers and weights, Metre stick (if available), chair
RAINBOW SPINNER	White cardboard, scissors, a cup or jam jar, string (120 cm works well), a pencil, coloured pencils or markers, protractor – not essential, for older children only (6th class)
MAKE A LIGHTHOUSE	Cardboard tube (e.g. empty kitchen roll or a long crisps tin), bulb-holder, 3.5 V bulb (flashing or ordinary), battery (3 V or 4.5 V), connecting wires, small glass or plastic jar, black and white paper, sellotape, glue
STRANGE SOUNDS	(i) Seeing Sound – Plastic bowl, cling film, rubber band, uncooked rice, saucepan, large spoon, scissors, sticky tape (ii) Feeling Sound- A partner, balloon (iii) Making Weird Sounds – Drinking straw, strip of plastic, balloon
DANCING RAISINS	A glass of water, a glass of clear fizzy drink, e.g. 7-UP or soda water (freshly-opened: must be very fizzy), a handful of raisins
DIVING DROPS AND SINKING FEELINGS	Jam jar with lid, cooking oil, food colouring, eye dropper, syrup
AIR PRESSURE	Plastic bottle, ruler, large sheet of paper (e.g. newspaper), table
FRICTION – SLIP OR STICK?	Wooden plank, length of plastic pipe (e.g. Wavin), coins, rubbers, marbles, empty tin with rim (e.g. Bisto), book
SURFACE TENSION AND BUBBLES	Empty butter cartons, needle or pins, tissue paper, water, a glass, small coins, washing-up liquid, thin wire such as florist's wire, drinking straw – one per child, newspaper
ACROBATIC CLOWN	Thin cardboard (cornflake packet will do), pencil, scissors, sellotape, coloured markers or crayons, 2 coins of the same value or plasticine or clothes pegs

DESIGN A BOAT	Plasticine, dried peas, container (e.g. butter carton) of water, orange, jam jar
MAKING A DIVER	Pen top with clip (no hole in lid), plasticine, paper clip, large plastic bottle with screw top
ROCKET LAUNCH	Large balloons (any shape but long shaped look more like rockets), balloon pump, string OR cotton thread OR fishing line 3-4 m long, drinking straw, clothes-peg, sellotape
MOTORS AND VEHICLES	Strips of wood for chassis, wood glue, cardboard triangles, cardboard triangles with holes (axle support), dowels (for axles), wheels with holes, motor with small pulley on spindle, large pulley to fit dowel, elastic band, motor mounting clip, battery and battery holder.
WATER FOUNTAIN **(Demonstration only)**	A small plastic 500 ml bottle with a screw top lid, awl (borer) Hot water - use a kettle or thermos, large jug or deep bowl, or bucket A strong plastic drinking straw Blu-tack or plasticine Drawing pin Food colouring, Dropper Sink, newspaper, plastic sheet
SNAKE SPIRAL	One piece of paper (A4) per child or A4 card A pencil per child Scissors, coloured markers or crayons Needle and thread Plasticine
MY REACTION TIME	Reaction strip, paper clip, plasticine, glue or Prittstick, hole puncher.
MYSELF – FINGERPRINTS, DOMINANT EYE, BLIND SPOT	'Lead' pencils, White paper Sellotape, Marker pen Hand lens
HOW MUCH AIR CAN MY LUNGS HOLD?	Large basin of water, large plastic bottle (4 to 5 litre) with cap, plastic tubing, old towels for mopping up
MIRROR WRITING	Small flat plastic mirrors, White paper, Pencils, Markers
CREEPY REFLECTIONS AND FLOATING FINGER	A small plastic mirror A clean washing-up bowl Water Newspaper
MAKE AN ELECTRIC QUIZ	Cardboard (cornflake packet will do), battery and bulb (in the range 1.5 to 3 volts), bulb-holder, connecting wires, metal paper-clips or paper fasteners (split pins), paper, scissors, glue or Prittstick.
MAGNETIC CAR	Two magnets, empty match box, drinking straw, two cocktail sticks or toothpicks, card, scissors, sellotape, plasticine or blu-tack, coin or compass
CREEPING COLOURS	Filter paper or blotting paper, coloured markers, beaker or jar, water

DYEING WITH RED CABBAGE, SOAP AND VINEGAR	Half a red cabbage, knife Hot water – use a kettle or thermos flask. Large bowl or several small bowls Slotted spoon, Dropper Scraps of white cotton material – old handkerchiefs or old cotton sheet Soap, Vinegar, Lemon juice, Bread soda Kitchen paper, Newspapers
GROWING TOMATOES	Tomato seed from garden centres. Choose Bush or varieties suitable for container production like BALCONI, TOTEM or TUMBLER. (Obtain enough seed to provide a plant for each child to take home plus one or two for the classroom. Seed count is available on the packet - 90% germination / survival rate). Small flower pots or old yoghurt containers Larger pot (4 litre container) Seed and potting compost Plant food Canes to support plants
STRING TELEPHONE	Piece of string about 10 m long, 2 tins with metal bases, awl (borer)
STARCH IS EVERYWHERE	Tincture of iodine (available from chemists), small dropper bottles (available from chemists), measuring jug, funnel, small samples for testing such as paper, cardboard, polystyrene, plastic, bread, potato, apple, salt, cheese, rice, spaghetti, sugar, flour, biscuits
MAKE A ROCKET	Film canister (no hole), any tablet that disolves and fizzes e.g. Alka Seltzer or vitamin C, blu-tack, water
MAKE A PERISCOPE	Cardboard (cereal packet), 2 small plastic mirrors (7.5cm x 5cm) for each periscope, sellotape, rulers, protractors, scissors
MAKE A LEVER	Templates (dog and tongue/tail), cardboard, (cereal packet), scissors, colour markers/pencils, paper fasteners(split pins)
STARTING AND STOPPING	Oranges (satsumas fit well into jampots), matchboxes, jampots, postcards. 5 or 6 identical coins for each group of children, thick card e.g. postcard, rulers or flat knives. Fresh eggs, hard-boiled eggs.
WHICH PAPER ABSORBS BEST?	Three different types of paper (e.g. serviette, kitchen paper, tissue paper), scissors, water, butter cartons, red food colouring and either a metre stick & blu-tack *or:* string and clothes pegs *or:* (for older classes): strips of wood, junior hacksaws, bench-hook, glue-gun, plasticine or blu-tack.
GROW SOME CRYSTALS	Sodium bicarbonate *(bread soda)*, cream of tartar *(or Bextartar) (both obtainable in supermarkets)*, plastic container, stirrer *(e.g. plastic spoon)*, cold water, bowl of hot tap water. Hand lens to look at crystals.
EXERCISE AND YOUR HEART	Watch, paper, pencil, skipping rope (optional).

3 Curriculum Activities

There are six hands-on curriculum activities. They have been developed using the following template and are structured in three sections – **preparation, the activity itself, and review.**

Title	Preparation
Class level	This indicates the class level the activity has been developed for. The activity can be used with children of a different class but may need to be adapted.
Objectives	- Content strand and strand unit. This indicates the main curriculum content objectives that match the activity and refers to the appropriate pages in the SESE: Science Curriculum. - Skill development. This identifies the skills developed by the activity.
Curriculum links	Suggestions for links to other strands in science curriculum Suggestions for integration across the primary curriculum
Background	This section indicates any prior knowledge required by the children.
Materials/ Equipment	This is a list of the equipment and materials required for the activity.
Preparation	This indicates any preparation needed for the activity.
Background Information	This section provides the basic science background information for the activity. This supports teachers as they prepare for the activity.

Title	Activity
Setting the scene	This section suggests a setting or context for the activity. This helps the children relate to the activity. It is often useful to do this introductory work on the day prior to doing the activity.
Trigger questions	These are suggested questions that a teacher might use with a class to elicit their prior knowledge and understanding before starting the activity. It is not necessary to know all the answers to the questions. Doing the activity should help teachers and children answer the questions.
Development of activity	This section suggests some starter actions to introduce the main activity.
Safety	Any safety precautions needed for the activity are stated here.
Activity	Here are the instructions for the activity. Usually the full instructions are here. Sometimes there are just suggestions and the children are asked to work out how to do it. This makes the activity more of an investigation.

Title	Review
Review	Ask the children to review the activity. What have they found out? What did they like/dislike about the activity? What questions would they have? What else would they like to find out?
Assessment	Here are suggestions how the children and the teacher assess the learning.
Follow-up activities	One or two follow-up activities are suggested. This will often include a relevant web link. This will be correct at time of issue. Children could be asked what else they would like to find out about the ideas. Then asking them how they might find this out would encourage them to design their own investigations.

Design a Bridge

Preparation

CLASS LEVEL	**First – sixth class**
OBJECTIVES	**Content Strands and Strand Units** **Energy & forces, Forces, Materials, Properties and characteristics of materials** The child should be enabled to investigate how forces act on objects SESE: Science Curriculum page 45. The child should be enabled to investigate how materials may be used in construction SESE: Science Curriculum page 66.
	Skill development Through completing the strand units of the science curriculum the child should be enabled to carry out simple investigations where the problems, materials and methods are suggested by the teacher SESE: Science Curriculum page 37. Exploring how to make a paper bridge stronger would enable the children to achieve this objective. Designing and making.
CURRICULUM LINKS	**SESE: History** Local studies/explore some feature of local environment, e.g. ...bridge.../my locality through the ages/important events...erection of bridges/early people and ancient societies/ where people settled in Ireland (near rivers and built bridges, e.g. Ath Cliath). Continuity and change over time/ technological and scientific developments over long periods **SESE: Geography** Human environment/ features of the built and natural environment / County, regional and national centres/ origins and geographical significance of place names, e.g. Newbridge. **Visual arts** Construction / making constructions / make drawings from observations to analyse the structures of buildings. Construction / looking and responding / look at collections or photographs of built structures **Mathematics** Shape and space / 3-D shapes.
BACKGROUND	Children will have played with building blocks and made simple structures.
MATERIALS/EQUIPMENT	Paper, coins, blocks or books (i.e. things to make two banks of a river). Other materials as available
PREPARATION	Gather the materials. Decide a suitable span for the bridges made during the activity. For fair testing use the same width of 'river' eg. 14 cm, and using A4 paper lengthways works well.
BACKGROUND INFORMATION	The material from which a structure is made is important but you can strengthen a material by changing its shape. Bridge designers often use different shapes, e.g. arches and triangles. The curve of the arch spreads the load on the bridge and makes it stronger.

Design a Bridge

Activity

SETTING THE SCENE

Find a context where children have to think about crossing a river. This might be a story or a local river crossing. Find out what children think and know about bridges. They may mention tunnels as well as a means of getting across.

Have a display of pictures of bridges.

Visit a local bridge.

Do this introductory work on the day prior to doing the activity.

TRIGGER QUESTIONS

What is a bridge?

Where would you find bridges?

What are bridges made of?

What makes a good bridge?

What types of bridges are there? Can you name any?
(Bridge designs include arch, suspension etc.)

Can you find out about the tallest bridge in the world, opened in December 2004?

Ask the children to draw a bridge they know or have crossed. They can count how many bridges (if any) they meet on the way home.

DEVELOPMENT OF ACTIVITY

What can be changed about a bridge? Ask the children. *(Generally the shape and the materials).*

Decide where the river will be. Two piles of books the same distance apart on each table will provide opportunities for children to test any bridges they make.

Get the children to make a simple bridge using e.g. 1 page of A4 paper. The children can test its strength by adding coins or other masses.

SAFETY

Care with coins (weights) falling.

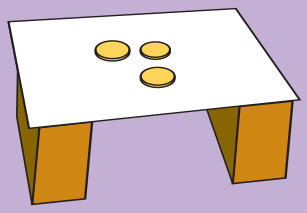
Design a Bridge

ACTIVITY

Explore how to make a paper bridge stronger

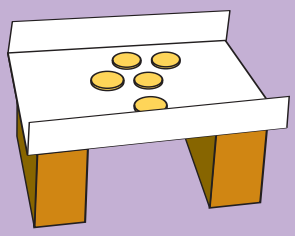
Using the blocks or books, paper and coins ask the children to design a bridge that will take the heaviest weight. For fair testing use the same width of 'river', e.g. 14 cm, and use A4 paper lengthways.

Try the following and record the results:

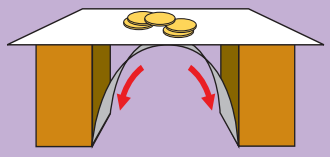


1) Make a bridge from one piece of paper and test its strength by adding coins or other masses until the bridge collapses.

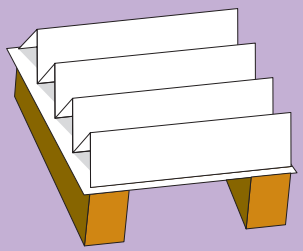
2) Use two pieces of paper and test again.



3) Use one piece of paper and fold up sides, i.e. a walled bridge.



4) Make an arch (using two pieces of paper).



5) Make a corrugated bridge.

6) Make a bridge out of a different material.

Design a Bridge

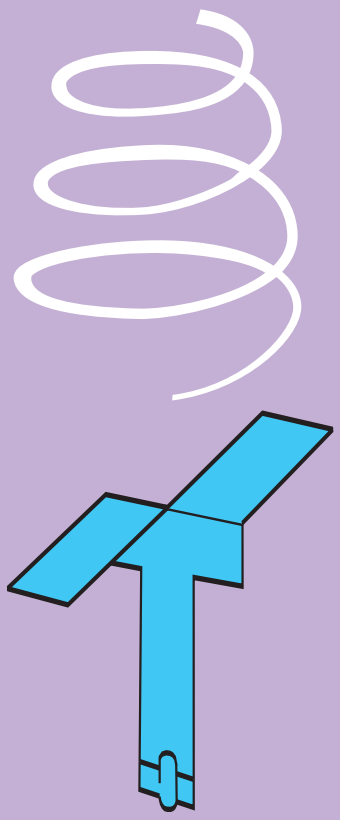
Review

REVIEW	Ask the children to review their investigation.
	What have they found out about bridges? What have they changed about the bridges they made? *They have changed the materials and the shape of their bridges.* What else could they change? If you change the distance between the supports will the bridge support the same load? *(Try it, make the river wider!)* **Note:** *A shape which is weak in one direction may be stronger in another. The weakest bridge is often the flat sheet of paper. Then, in order of increasing strength, the walled bridge, the arched bridge, and finally the corrugated bridge. The children may be amazed at the strength of the corrugated bridge. Sheets of steel which are used to make the floor of a car have folds put in them. But this sort of bridge might be hard to drive across - how could you make a smooth roadway across a corrugated bridge?*
ASSESSMENT	Ask the children to draw a picture of their favourite bridge and to explain the design features. **Discussion and observation –** the teacher and the child/children could discuss their work about bridges. The teacher could 'actively and purposefully' observe the children's work. She/he could make notes about how the children are learning and what they are learning and understanding.
FOLLOW-UP ACTIVITIES	A similar open-ended activity could be conducted using art straws instead of paper. **The children could be asked** - Can you come up with a design of your own? - How would you build your bridge? - How would you build a bridge that would support 1 kg (e.g. a bag of sugar)? *For more work on bridges see* **http://www.exploratorium.edu/structures/index.html**

Paper Helicopters

Preparation

CLASS LEVEL	**First – sixth class**
OBJECTIVES	**Content Strand and Strand Unit** **Energy & forces, Forces** Through investigation the child should be enabled to come to appreciate that gravity is a force, SESE: Science Curriculum page 87. In this activity children explore how some things fall and how varying the size of the rotor blades, the shape of the rotor blades and the weight of a paper helicopter affect the way a helicopter spins.
	Skill development Through completing the strand units of the science curriculum the child should be enabled to design, plan and carry out simple experiments, having regard to one or two variables and the need to sequence tasks and tests, SESE: Science Curriculum page 79. This activity helps them understand fair testing by changing only one variable (i.e. shape only or length only) at a time. Investigating; experimenting; observing; analysing; measuring/timing; recording and communicating.
CURRICULUM LINKS	**Mathematics** Data / representing and interpreting data. **SESE: History** Continuity and change over time/ technological and scientific developments over long periods.
BACKGROUND	A previous activity on how things fall (i.e. the weight of the object is not a factor – Galileo and the Leaning Tower of Pisa) would help understanding of this activity, but not essential.
MATERIALS/EQUIPMENT	Paper, ruler, paper clips, scissors Templates of different sizes
PREPARATION	Test out a few thicknesses of paper/cardboard first to see that some of them spin.
BACKGROUND INFORMATION	The shape of the helicopter rotor blades make it spin when dropped from a height. Gravity pulls the helicopter down. The air resists the movement and pushes up each rotor separately, causing the helicopter to spin.



Paper Helicopters

Activity

SETTING THE SCENE

When we talk of flight we can mean a number of things. Some things actually fly while others glide or float. What do these do – aeroplanes and birds, gliders and flying foxes, balloons?

Have pictures of things in flight so that children can compare and contrast.

Discuss aeroplanes – how they have to keep moving in order to stay in the air. So how do helicopters stay still in the air?
(The spin of the rotor blades keeps them up).

What do sycamore seeds do when they fall off the tree? Describe what happens.

TRIGGER QUESTIONS

What makes a good helicopter?

Can you make some different helicopters and decide which one is best?

What do we mean by best? Is it the one that spins the most?
Or is it the one that takes longest to fall to the ground?

THE CHILDREN CAN DECIDE WHICH.

DEVELOPMENT OF ACTIVITY

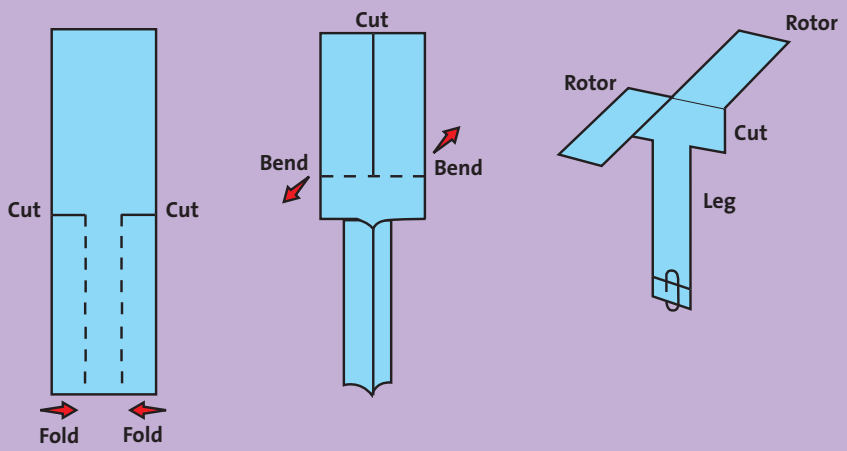
Drop different things from a height and observe how they fall. Dropping flat pieces of paper and scrunched-up pieces could set the scene.

SAFETY

Care to be taken if children stand up on chairs/stools in order to drop the helicopters from a greater height.

ACTIVITY

Begin by using the templates to make paper helicopters and watching them spin as they are dropped.

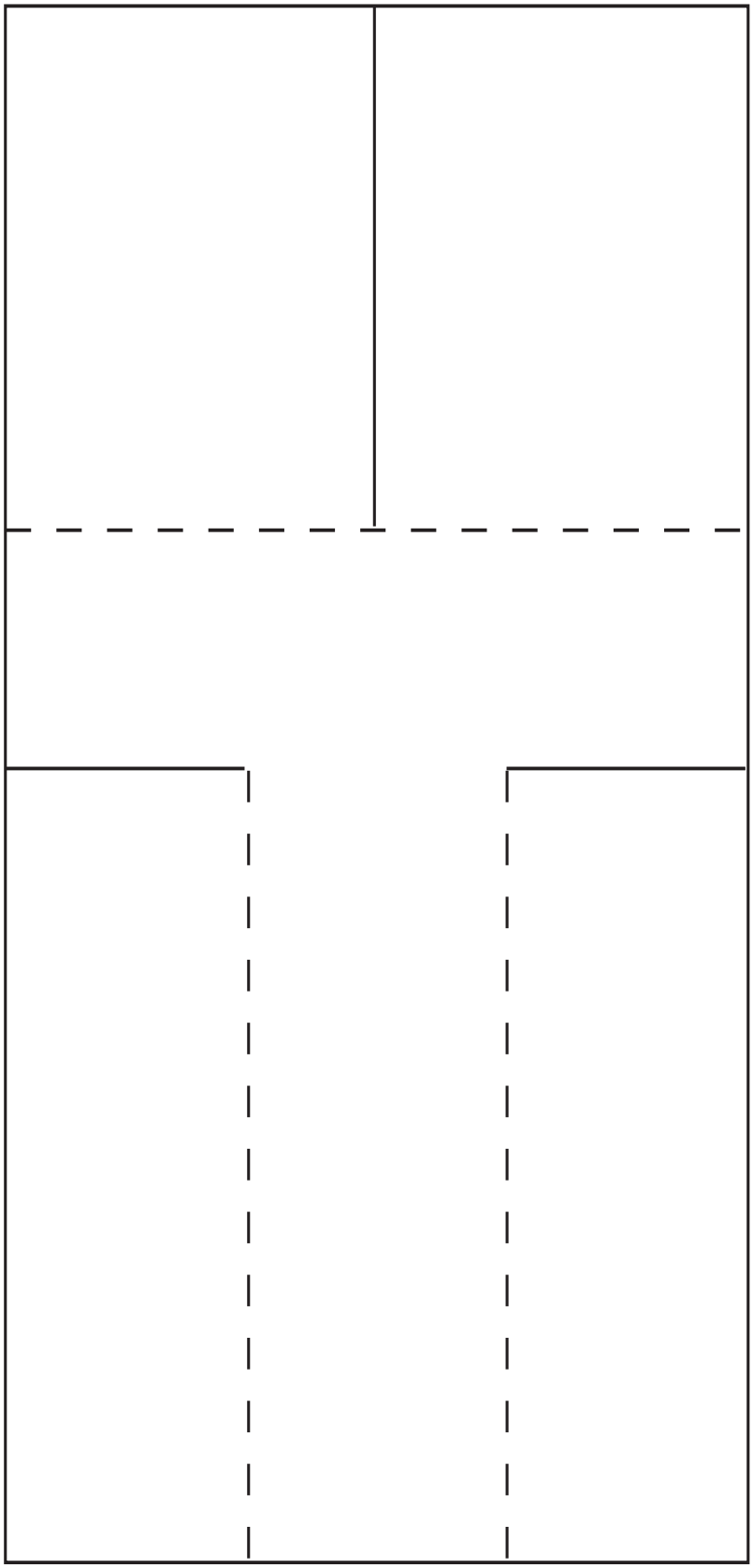


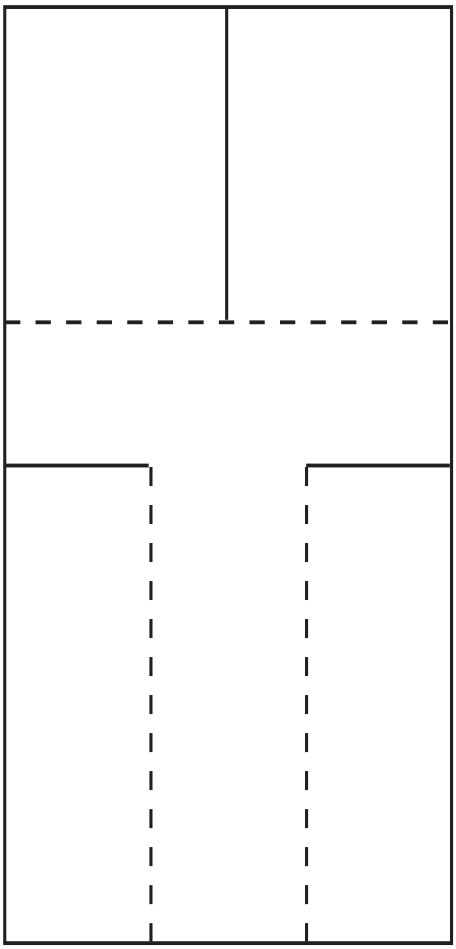
Bend the rotor blades the other way around and watch again. Is it any different this time?

Then make variations on the design by changing the length of rotor blades, the type of paper/card, the number of paper-clips, etc.

Paper Helicopters

Use the templates to make paper helicopter





Review

REVIEW

What did they notice about the spins for each helicopter?

Did they spin clockwise or anticlockwise?

How can you change the spin?

Does the weight (the number of paper-clips on the stem) change the spin?

Which combination made the best spinning helicopter?

Helicopters – some possible outcomes

Two similar-sized helicopters

a) *add paper clips to one: the heavier one spins more and reaches the ground first.*

b) *make one with longer rotor blades than the other: the one with the longer rotor blades takes longer to reach the ground (more surface area to experience air resistance - think of a parachute).*

One large and one small helicopter
Small one reaches the ground first (less surface area to experience air resistance).

ASSESSMENT

The children could draw annotated diagrams showing how their different helicopters fell. They could be given other helicopters and asked to predict how they would fall.

Concept-mapping could be used as means of the teacher building up an understanding of how and what the children understand about 'forces'.

FOLLOW-UP ACTIVITIES

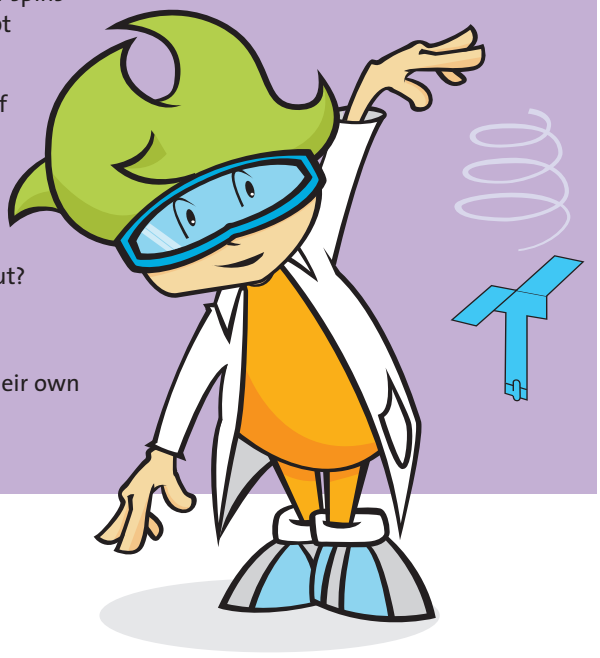
Various graphs could be drawn, e.g.

- Length of rotor blades/number of spins (height and no. of paper-clips kept constant).
- Number of paper-clips/number of spins (length of rotor blades kept constant).

The children could be asked:

- What else would you like to find out?
- How would you find it out?

This would encourage them to design their own investigation.



Can you Balance?

Preparation

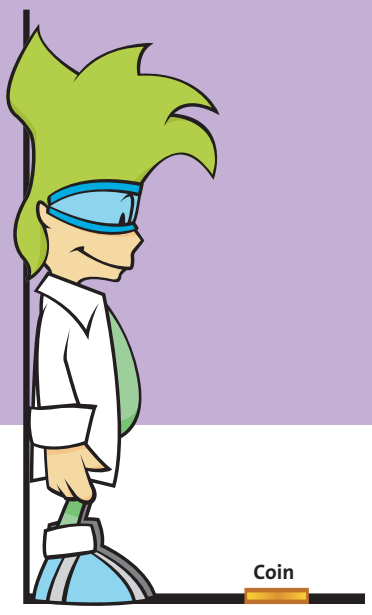
CLASS LEVEL	**Fifth – sixth class**
OBJECTIVE	**Content strands and strand units** **Energy & forces, Forces, Living things, Human life** Through investigation the child should be enabled to (i) come to an appreciation that gravity is a force and (ii) develop a simple understanding of the structure of some of the body's major internal and external organs, SESE: Science Curriculum pages 87 and 83. In this activity children begin to appreciate how muscles and the skeleton help keep people balanced. **Skill development** Investigating and experimenting
CURRICULUM LINKS	**SESE: Geography** Natural Environments/Planet Earth in space **SPHE** Myself/Taking care of my body **PE** Dance/ ...poise, balance, control while moving and stopping Gymnastics/ movement/ balancing and counterbalancing
BACKGROUND	On Earth our bodies feel the effect of gravity and react so that we can balance and move. In a microgravity environment such as on the International Space Station people feel weightless.
MATERIALS/EQUIPMENT	Rulers and weights Metre stick (if available) Chair
PREPARATION	None
BACKGROUND INFORMATION	In order to balance when you are standing your centre of gravity should be over your feet. When you are sitting your centre of gravity is over the chair. To stand up, you must move it over your feet; so it is impossible to stand up if you don't lean forwards. When you are standing and bend forwards your centre of gravity starts to move forward too. Normally, you'd compensate by sticking your bum out behind you. But with the wall there, this is impossible, so you tip over.

Can you Balance?

Activity

SETTING THE SCENE	Look around the room. Are we all sitting comfortably? Can we stand? Can we stand easily on 1 leg? When we are sitting or standing we are balanced. We can stay in that position.
TRIGGER QUESTIONS	Do you usually fall over when you are walking? What happens when you are standing on a bus? Is it easy to balance? What do we do to keep our balance?
DEVELOPMENT OF ACTIVITY	Take a ruler. Can you get it to balance on your finger? Start with your fingers at the opposite ends of the ruler (or metre stick). Slowly move your fingers together keeping the ruler balanced at all times. Where they meet is the balance point. It should be the same point where you balance with one finger.
SAFETY	**Make space for children to fall safely.**
ACTIVITY	**(i)** Sit straight up on a chair, with your arms down beside you. Can you get up without using your arms or leaning forwards? **(ii)** Stand with your back and heels against a wall. Drop a coin on the floor in front of you. Can you pick it up without falling over? Don't bend your knees. **(iii)** Stand with your feet apart, one foot, shoulder and head all touching the wall, and raise your other leg. Dead easy- or is it? **(iv)** Stand with two feet apart with your feet, both shoulders and head against the wall. Now try to lift one leg. Can you? These activities could be recorded using a video camera.

(i)



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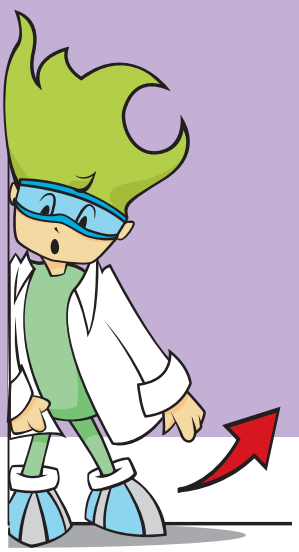


(iii)

Can you Balance?

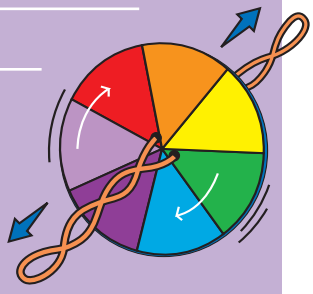
Review

REVIEW	What happens? To stay balanced our body has a balance point (called the centre of gravity) and it has to be over our feet. When we move our body adjusts to keep our balance point over our feet.
ASSESSMENT	Use a digital camera to record the activities. Ask the children to write narrative to explain the photographs. Another approach would be to use ICT to produce the narrative explaining the photographs.
FOLLOW-UP ACTIVITIES	The activity Gravity and Muscles at **www.nsbri.org/Education/TG2_Act7.pdf** is a similar approach to the question of gravity and the effect it has on the human body. The children could research about the Solar System and how gravity changes on the different planets. **The children could be asked:** • What else would you like to find out? • How would you find it out? This would encourage them to design their own investigation.

Rainbow Spinner

Preparation

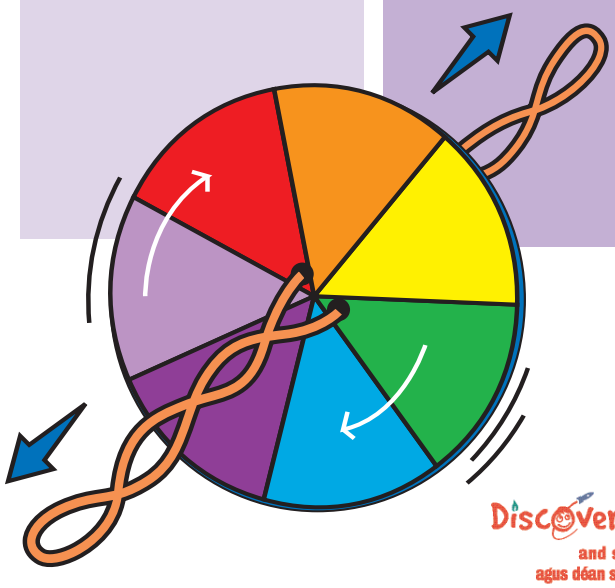
CLASS LEVEL	**Third – sixth class**
OBJECTIVES	**Content strand and strand unit** **Energy & forces, Light** Through investigation the child should be enabled to investigate the splitting and mixing of light, SESE: Science Curriculum page 85. In this activity children learn that not only can white light be broken up into the rainbow colours, but also that the rainbow colours can be brought together to produce white light. They also learn about persistence of vision (i.e. that if things move fast enough the eye cannot distinguish between them and they merge). **Skill development** Making; observing.
CURRICULUM LINKS	**Geography** Natural environment/weather phenomena. **Visual arts** Paint and colour/painting.
BACKGROUND	A previous activity, perhaps a demonstration, of white light being broken into the seven rainbow colours by a prism would be helpful. Working with bubbles is another way of introducing some ideas about colours.
MATERIALS/EQUIPMENT	White cardboard, scissors, cup or jam jar, strong string (120 cm works well), pencil, coloured pencils or markers, small electric fan, protractor (for older children only).
PREPARATION	Collection of materials and equipment.
BACKGROUND INFORMATION	Ordinary light consists of the seven rainbow colours, viz. Red, orange, yellow, green, blue, indigo, violet. Isaac Newton was the first person to show that light could be split up into seven different colours. Just as raindrops, prism, etc. can split white light into these seven colours so can white light be made by mixing the seven colours together. By spinning the disc quickly the eye sees all the colours together (persistence of vision) and so the disc appears white (in practice the disc appears off-white, as most colours are not pure).

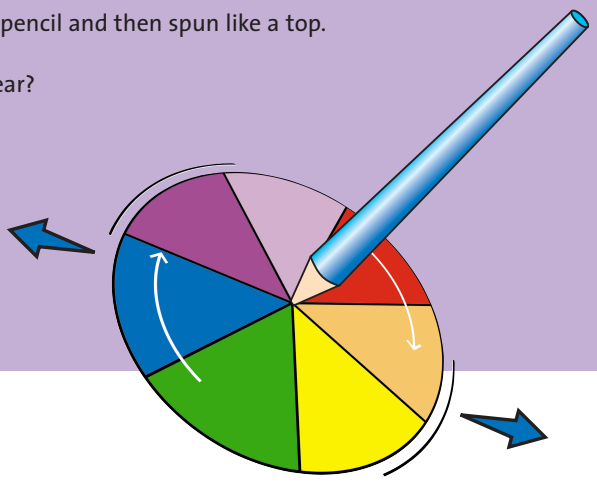


Rainbow Spinner

Activity

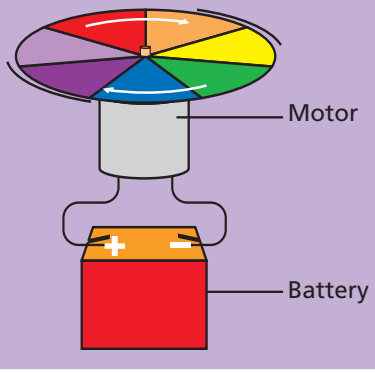
SETTING THE SCENE	Discussion on colour – what would the world be like without it, e.g. clothes, weather, gardens, organising city traffic, etc. Not all creatures see colours in the same way, e.g. guinea pigs and squirrels are colour blind. Colour is really the way our eyes see different kinds of light.
TRIGGER QUESTIONS	When/where do you see rainbow colours? Where do you think that the colours that you see in rainbows, in bubbles, on CDs, oil, etc. come from? What are the rainbow colours? If you can split light up into rainbow colours (by raindrops, prism, CD, etc.) can you make white light by bringing the rainbow colours together? TRY AND SEE! If we switch off the light will we see the colour?
DEVELOPMENT OF ACTIVITY	You can bring the colours together by making a cardboard disc with all the colours and then spinning – a rainbow spinner.
SAFETY	**General care with scissors**
ACTIVITY	Cut out a cardboard disc and divide it into seven equal segments (the older children may like to do this with a protractor). Colour the segments the seven colours of the rainbow. Make two holes in the centre of the card 1 cm. apart and thread the string through them making a loop at each end. Put a finger through the end of each loop and flip the disc over the string several times until the string is well twisted. Pull your hands apart and let the string go slack. The disc should now spin. OR The card can be placed on a pencil and then spun like a top. What colour does the card appear?





Rainbow Spinner

Review

REVIEW	Is there any difference between coloured pencils and markers in this activity? Does it matter what order the colours are arranged on the disc?
ASSESSMENT	The children could display their rainbow spinner and use diagrams and text to explain how they work. They could film their spinners and add a voice-over explaining how they work.
FOLLOW-UP ACTIVITIES	The coloured card can be placed on the spindle of a motor. When the motor is connected to a battery the spindle will turn and the card rotates. Reverse the connections between the motor and the battery. Is there any difference? **The children could be asked:** • What else would you like to find out? • How would you find it out? This would encourage them to design their own investigation. Colour Wheel 

Make a Lighthouse

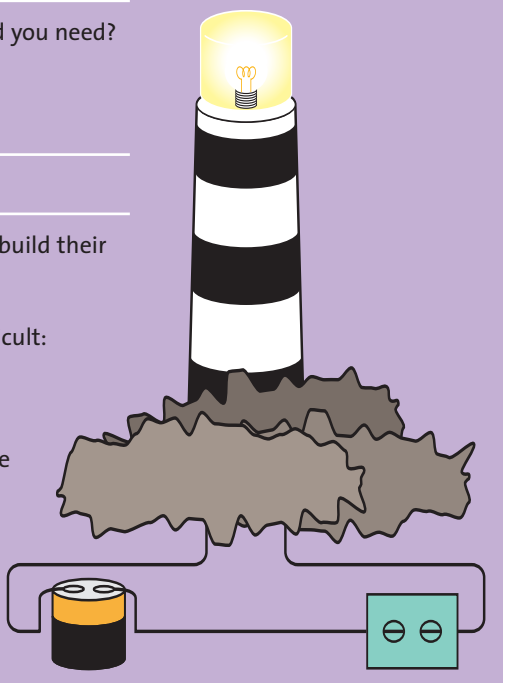
Preparation

CLASS LEVEL	**Third – sixth classes**
OBJECTIVES	**Content strand and strand unit** **Energy & forces, Magnetism and electricity** Through investigation the child should be enabled to investigate current electricity by constructing simple circuits SESE: Science Curriculum pages 64 and 86. In this activity children apply the knowledge gained and skills learned in making electrical circuits to construct a model of a lighthouse that shines a light. **Skill development** Experimenting; designing and making.
CURRICULUM LINKS	**SESE: History** Local studies/explore some feature of local environment/purpose of construction. Continuity and change over time/ technological and scientific developments over long periods. **SESE: Geography** Human environment/ features of the built and natural environment. Maps, globes and graphical skills/ construction of sketch maps (e.g. location of lighthouses). **Visual arts** Construction / making constructions / make drawings from observations to analyse the structures of buildings. Construction / looking and responding / look at collections or photographs of built structures. **Language: English/Gaeilge** Folklore, sea-tales involving lighthouses.
BACKGROUND	Some classes on electricity and circuit-making should have taken place prior to this activity so that the children understand the basics of electric circuits (i.e. need a source of electricity, conducting wires and a complete circuit).
MATERIALS/EQUIPMENT	For lighthouse: cardboard tube (e.g. empty kitchen roll or a long crisps tin), bulb-holder, 3.5 V bulb (flashing or ordinary), battery (3 V or 4.5 V), connecting wires, small plastic jar, black and white paper, sellotape, glue. For switch: cardboard, 2 paper fasteners, 1 paper clip.
PREPARATION	Collect materials, check batteries and prepare connecting wire.
BACKGROUND INFORMATION	The bulb will light only when there is a complete path for the electricity to flow (i.e. a complete circuit).

Make a Lighthouse

Activity

SETTING THE SCENE	Begin with a brainstorm on finding one's way around – e.g. street names, maps, compasses, etc. Talk about land, sea (and perhaps air if they wish). Introduce lighthouses. Look at pictures of lighthouses. Visit a lighthouse if possible. Why do we need lighthouses? Lighthouses send out warning lights. The interval between the flashes identifies the lighthouse; e.g. Dun Laoghaire will have a different interval to the Old Head of Kinsale.
TRIGGER QUESTIONS	How do you find your way safely when travelling? What about travelling at sea? How do sailors know if there are dangerous rocks sticking up? Do you know any lighthouses? Where are they? Do all lighthouses look the same? Does the light from a lighthouse shine continuously? How does a lighthouse tell you where you are (as well as warning you of land/danger)? How did lighthouses work long ago? Do you know any stories about lighthouses? Draw a diagram.
DEVELOPMENT OF ACTIVITY	How could you make a lighthouse? What would you need? Draw a diagram. How would you design your lighthouse?
SAFETY	**Care with batteries and wire**
ACTIVITY	The children could be given the opportunity to build their own designs. Here are some instructions if they find this difficult: Glue the black and white paper onto the cardboard. Make an electric circuit using the battery, wires, bulb and bulb-holder. Arrange the circuit so that the bulb is at the top of the tube and the battery at the bottom. Put the jar over the bulb.



Make a Lighthouse

Review

REVIEW	If your lighthouse does not light what do you need to check? (*INCOMPLETE CIRCUIT, SHORT CIRCUIT, DEAD BATTERY, BROKEN BULB)* How could you make a better lighthouse? What did you like/dislike about this activity?
ASSESSMENT	Children could draw their lighthouse and circuit showing how they made the light work. Another approach would be to use the models the children have made. They could display their models with annotated notes. They could be asked to show their models to their peers and explain how they work. They could invite other classes to view their displays and they could answer questions that the other children might have.
FOLLOW-UP ACTIVITIES	(1) You can operate the lighthouse by inserting a switch in the circuit as follows: Insert two paper fasteners into cardboard and join them with a paper-clip on top, so that the latter can swivel. Join the wires from the circuit to each paper fastener at the back of the cardboard. (2) Rocks made from papier-mâché add a nice touch to this activity, and a link with art. (3) Research a local lighthouse. (4) Make a lighthouse quiz e.g. in what counties are various lighthouses. (5) Design a lighthouse model that includes a sensor switch. When boats sail over a certain point in the 'water' the lighthouse light comes on. Further information on lighthouses can be obtained from the Commissioners of Irish Lights Information webpage at **http://www.cil.ie/sh675y.html.** **The children could be asked:** What else would you like to find out? How would you find it out? This would encourage them to design their own investigation.

Strange Sounds

Preparation

CLASS LEVEL	**First – sixth class**
OBJECTIVE	**Content strand and strand unit** **Energy & forces, Sound** Through investigation the child should be enabled to learn that sound is a form of energy; understand and explore how different sounds may be made by making a variety of materials vibrate SESE: Science Curriculum page 63. In this activity children learn that vibrations produce sounds, observe the effects of these vibrations and then produce different sounds and vary the pitch and volume of these sounds. **Skill development** Investigating; experimenting; observing
CURRICULUM LINKS	**SESE:Science** Living things – use all the senses to become aware of and explore environments. **Music** Listening and responding – exploring sounds. **SPHE** Myself/ knowing about my body/the ear.
BACKGROUND	A session on sound (noting the sounds from the classroom, the school grounds; identifying recorded sounds from a CD, or from a number of different items in wrapped-up containers) would make a good lead-in to this activity.
MATERIALS/EQUIPMENT	**(i)** Seeing sound – Plastic bowl, cling film, rubber band, uncooked rice, light saucepan, biscuit tin, large spoon, scissors, sticky tape **(ii)** Feeling sounds - A partner, balloon **(iii)** Making weird sounds – drinking straw, strip of plastic, balloon.
PREPARATION	Gather materials
BACKGROUND INFORMATION	Sound is caused by vibrations which travel through the air or other medium. Vibrations can be made by (i) blowing, (ii) banging or (iii) plucking a string. Sound cannot travel through a vacuum because there is nothing to pass on the vibrations.

Strange Sounds

Activity

SETTING THE SCENE	Brainstorm on sound – what is it? What would the world be like without sound? How would people communicate with each other? Discuss speech as one of the forms of communication. What other forms are there?
TRIGGER QUESTIONS	What are vibrations? Why do you need air or some other substance for sound to travel? How are sounds made? Can you always hear sounds? Can you see sound? TRY AND SEE
DEVELOPMENT OF ACTIVITY	Ask the children to put their fingers on the outside of their throat when they are talking – do they feel anything? Ask the children to tap the desk and listen; then to tap the desk again, this time listening with their ear touching the desk. Do they notice any difference? Does sound travel better through the air or through the desk?
SAFETY	**Care with cutting the straws.**
ACTIVITY	**(i) Seeing sound:** Cut the piece of cling film so that it is bigger than the top of the bowl. Stretch the cling film over the top of the bowl and secure it with the rubber band. Tape the cling film down to keep it stretched. This is your 'drum'. Sprinkle a few grains of rice on top of the 'drum'. Hold the saucepan near the 'drum' and hit it sharply with the spoon. What do you notice? **(ii) Feeling sound:** Blow up the balloon and hold it against your ear. Ask your partner to press their lips against the balloon and speak; then swap around. What do you notice? **(iii) Making weird sounds:** a. Hold a strip of plastic tightly between your thumbs and the heel of your hands and blow hard across the strip. b. Press one end of the straw flat. Cut the sides to form a point, put the pointed end of the straw in your mouth and blow hard. c. Blow up a balloon and hold the neck to stop the air escaping. Grip the neck of the balloon and stretch it vertically and horizontally. What happens as the air escapes?

Review

REVIEW

What have you found out about sound?

(i) Seeing sound

Does the loudness of the sound affect the way the rice dances?

Does the distance between the saucepan and the 'drum' affect the way the rice dances?

(ii) Feeling sound

Is there any difference in what you feel when your partner speaks loudly and softly?

(iii) Making weird sounds

Try different lengths of straw. Does this make any difference to the sound produced?

ASSESSMENT

The children could be asked to make a sound tape. They could make their sounds and explain them on tape or video-tape.

FOLLOW-UP ACTIVITIES

How could you use what you have learnt about sound to investigate a musical instrument?

What vibrates when playing a drum?

What vibrates when playing a guitar or a flute?

Design and make a musical instrument. How can you vary the sound produced by your instrument? Why does this affect the sound?

Can you make strange sounds?

The children could be asked:

- What else would you like to find out?
- How would you find it out?

This would encourage them to design their own investigation.

4 Other Activities

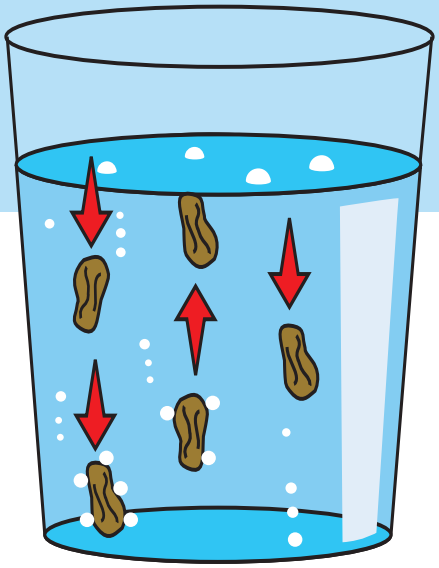
There are 27 other hands-on activities that can be used to develop primary science lessons. These have been identified as straightforward – the Bronze (B) activities, intermediate – the Silver (S) activities and demanding – the Gold (G) activities. These activities are listed in the order found in section 2.1. Most of the activities have been developed using the following format:

TITLE	BRONZE/SILVER/GOLD
EQUIPMENT	This is a list of the equipment and materials required for the activity.
PREPARATION	This indicates any preparation needed for the activity.
BACKGROUND INFORMATION	This section provides the basic science background information for the activity.
SKILLS	This identifies the primary science skills developed by the activity.
ACTIVITY	Here are the instructions for the activity. Usually the full instructions are here. There may be an additional page. Sometimes there are just suggestions and the children are asked to work out how to do it. This makes the activity more of an investigation.
SAFETY	Any safety precautions needed for the activity are stated here.
FOLLOW-UP ACTIVITY	One or two follow-up activities may be suggested.

NB: While some activities have templates provided, others will require the children to create their own template eg. Make a Periscope, encouraging investigative development.

Dancing Raisins

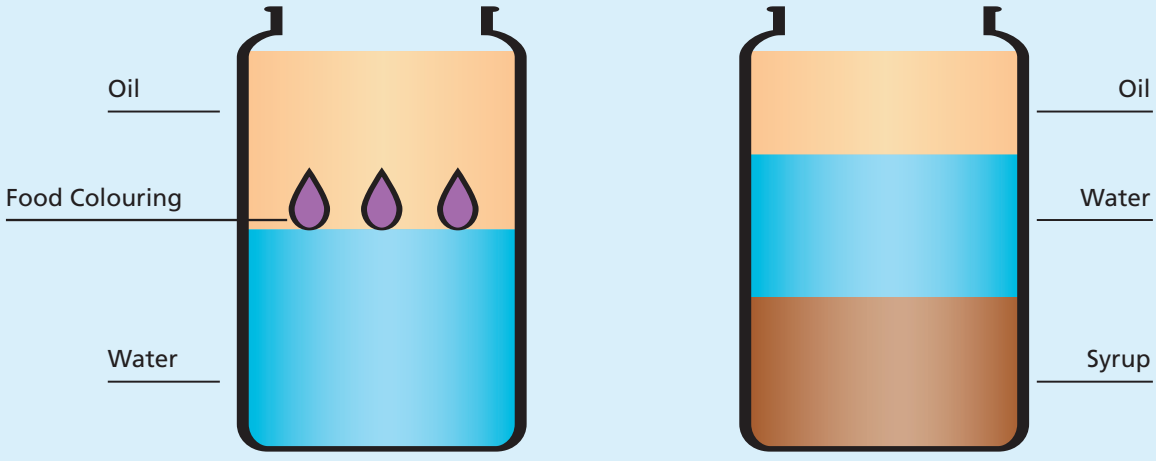
EQUIPMENT	A jar/glass of water, a jar/glass of clear fizzy drink, e.g. 7-UP or soda water (freshly-opened: must be very fizzy), a handful of raisins
PREPARATION	None
BACKGROUND INFORMATION	The raisins are heavier than the drink so they sink to the bottom. At the bottom of the fizzy drink they collect bubbles of carbon dioxide and now the 'raisins + bubbles' are lighter than the drink so they rise to the surface. When they reach the surface the gas bubbles burst and the raisins sink; then they collect more gas bubbles etc. This will continue as long as the drink is quite fizzy.
SKILLS	Observing
ACTIVITY	***(Note: This may be best done as a demonstration – something going on in the background during another activity).*** Drop a handful of raisins into a jar/glass of water. (They sink to the bottom). Drop a handful of raisins into a jar/glass of freshly opened fizzy drink. After a while the raisins will rise to the surface, sink, rise again, etc. thus dancing up and down.
SAFETY	**Care with liquids**
FOLLOW-UP ACTIVITY	Weigh the raisins before and after the activity. Do you notice anything? Can you explain?



Diving Drops and Sinking Feelings

BRONZE

EQUIPMENT	Jam jar with lid, cooking oil, food colouring, eye dropper, syrup
PREPARATION	Collecting materials.
BACKGROUND INFORMATION	Oil is lighter than water and so will sit on top of it. Syrup is heavier than water and so will sink to the bottom.
SKILLS	Observing Experimenting
ACTIVITY	Diving Drops: Half fill the jar with water. Carefully, by tilting the jar, fill the remaining space in the jar with cooking oil. What happens? *(The oil stays on top because it is lighter than water).* Now, using the eye dropper put one or two drops of food colouring into the jar. What happens? *(The drops sit on top of the water layer).* Wait a few seconds and watch the jar closely. Put the lid on the jar and rock it gently back and forth – you've invented a wave machine! *(the colouring will eventually burst through the surface of the water and stream into the water).* Sinking Feelings (demonstration): Pour syrup into the jar until about a quarter full. Add about the same amount of water with food colouring added. Pour some cooking oil on top. *(Three levels of liquid should be clearly visible).*
SAFETY	**Care with liquids.**
FOLLOW-UP ACTIVITIES	Children can experiment with other transparent everyday liquids. They could try floating different objects in the liquids.

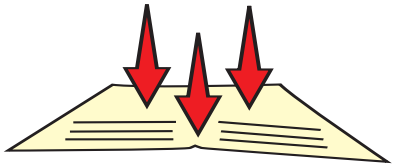


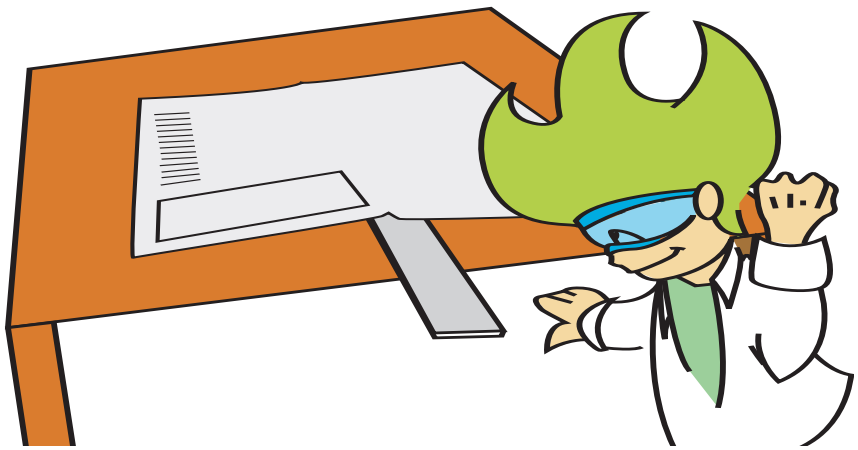
Diving Drops **Sinking Feelings**

Air Pressure

BRONZE

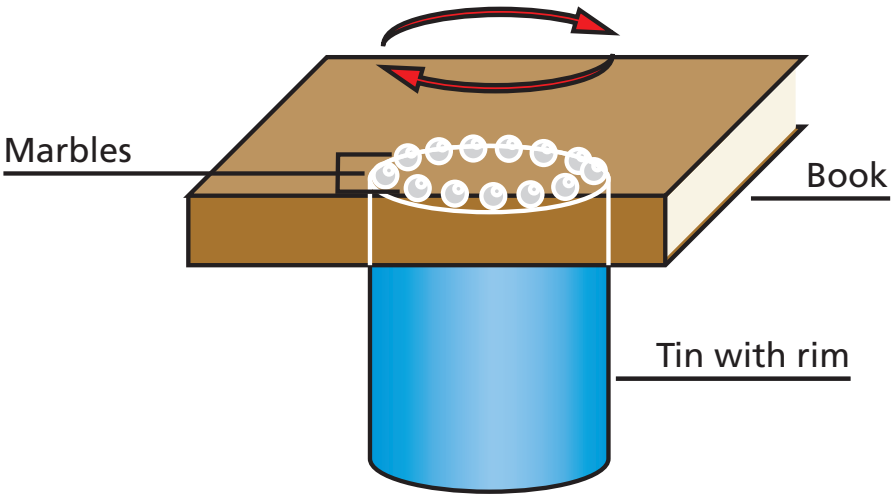
EQUIPMENT	Plastic bottle, ruler, large sheet of paper (e.g. newspaper), table
PREPARATION	Gather materials
BACKGROUND INFORMATION	The space around us is not empty but is filled with air, which is pushing on everything around us. This is called air pressure. When tyres are pumped up, air is squashed inside. This makes lots of pressure. So the tyres can support a truck which is carrying a heavy load.
SKILLS	Experimenting
ACTIVITY	To show that air is pressing on everything: 1) Squeeze air out of a plastic bottle. Let go and see what happens. *(The bottle regains its shape because air pressure forces air back into the bottle).* Now put the lid on before you let go and see what happens. *(No air can get in so the bottle stays squeezed).* 2) Put a ruler on the desk/table with a bit sticking over the edge. Spread out some newspaper over it and smooth it down so that it is flat. Now try to lift the paper by hitting the wood. *(When you hit the wood the air pressing down on the newspaper makes it difficult to lift the paper).*
SAFETY	**Care – ruler could break.**





Friction – Slip or Stick

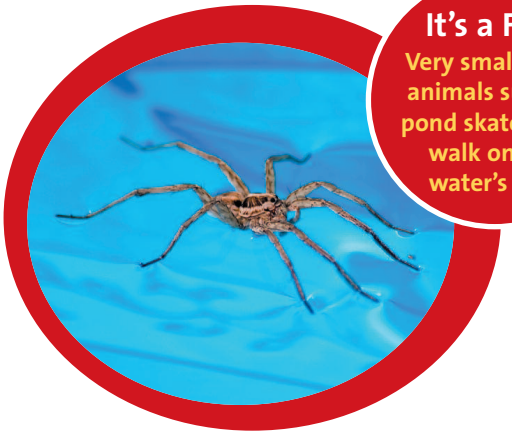
EQUIPMENT	Wooden plank, length of plastic pipe (e.g. Wavin), coins, rubbers, marbles, empty tin with rim (e.g. Bisto), book.
PREPARATION	Collection of materials.
BACKGROUND INFORMATION	Friction is a force that tries to stop things sliding over each other. There is more friction between rough surfaces than between smooth surfaces. It has its good points and bad points. Friction is needed for gripping things, e.g. a goalkeeper's gloves. You could not walk if there was no friction between your shoes and the ground, and a car would skid all the time if there was no friction between the tyres and the ground. Brakes work because of the friction between the brake pads and wheels. However, you may also want to reduce friction (e.g. in an engine by adding oil) as the engine would get very hot on account of the friction and the parts would also wear away quickly.
SKILLS	Investigating and experimenting Observing
ACTIVITIES	Rub your hands. What do you notice? *(Hands get hot due to friction).* Rub soap on your hands. What do you notice? *(Soap reduces friction – i.e. makes your hands more slippery).* Slide different objects down different slopes – try coins, rubbers, etc. on wooden plank, plastic pipe etc. Which ones slide most easily and on which slopes? Ball bearings: Swivel a book on the top of a tin. Now put some marbles in the rim of the tin and swivel the book again. Do you notice any difference? *(The marbles reduce the friction and enable the book to move more easily. This is the principle on which ball bearings are based, e.g. in lawnmower wheels).*
SAFETY	General care with tin (ensure it has a rim), wood (care from splinters), plastic pipe (smooth edges).



Surface Tension and Bubbles

BRONZE

EQUIPMENT	Empty butter cartons, needle or pins, tissue paper, water, a glass, small coins, washing-up liquid, drinking straw – one per child, thin wire such as florist's wire, newspaper
PREPARATION	Collection of materials
BACKGROUND INFORMATION	A glass or carton of water contains millions of tiny particles of water, which are pulling towards each other. This has the effect of a kind of invisible skin on the surface of water. This is called the surface tension. A small thing like a pin or a needle can actually sit on top of the water, even though they are actually heavier than water. Washing-up liquid weakens this skin so the bubbles become larger when washing-up liquid is added to water.
SKILLS	Investigating and experimenting
ACTIVITY	Three activities all connected with the surface tension of water: 1. Floating a pin or needle on the surface of water. 2. Sliding coins carefully down the side of a full glass of water and watching the water surface bulge at the top. 3. Blowing bubbles in a carton of water and noting the size of the bubbles. Then adding some washing up liquid and again blowing bubbles and noting any difference in size *(they are now bigger)*. Try making different-sized and shaped loops out of thin wire and noting the bubbles formed.
SAFETY	**Care with water, wire and needles/pins.**



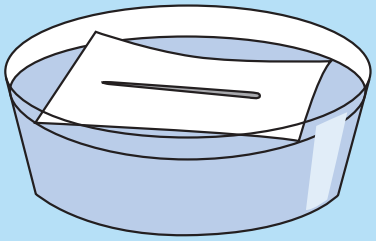
It's a Fact

Very small, light animals such as pond skaters can walk on the water's skin

Surface Tension and Bubbles continued

A

1. Fill a glass or butter carton with water.
2. Put the pin or needle on a little piece of tissue paper and lay it carefully on the surface of water. Eventually the tissue will absorb the water and sink. What happens to the pin (or needle)?



B

1. Fill the glass to the brim with water.
2. Gently slide in some coins, one at a time. What happens to the surface of water as you add the coins?

(Use small coins).

C

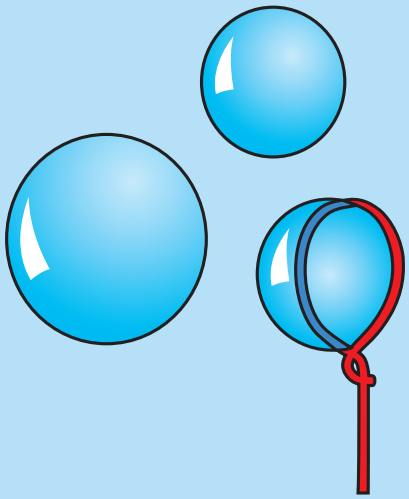
1. Put some water in a butter carton.
2. With a drinking straw blow bubbles in the water. Note the size of the bubbles.
3. Add a little washing-up liquid to the water. Note the size of the bubbles.
4. Add some more washing-up liquid. Again note the size of the bubbles.
5. What effect is the washing-up liquid having on the water?

Poke a dry finger into a large bubble.

What happens?

Now put a finger into the soapy liquid and then poke into a large bubble.

Any difference?



Acrobatic Clown

EQUIPMENT	Thin cardboard (cornflake packet will do), pencil, scissors, sellotape, coloured markers or crayons, 2 coins of the same value or plasticine or clothes pegs
PREPARATION	Make some cardboard templates of the clown (to speed up procedures – say one per 5 children). With younger children stick the template on cardboard and get enough cut out for all the children. A simpler shape could also be used.
BACKGROUND INFORMATION	All objects have a balancing point, called the centre of gravity. The lower you make the centre of gravity the more stable the object is. This is why a double decker bus should fill up the bottom deck first with passengers – i.e. make the bottom heavier, the bus is less likely to topple over.
SKILLS	Investigating and experimenting
ACTIVITY	Using the template make a cardboard clown and try to balance it first on its nose – difficult. Then lower the centre of gravity by attaching coins or plasticine and it will balance.
SAFETY	**General care with scissors.**
FOLLOW-UP ACTIVITIES	Design and make your own balancing figure.

Acrobatic Clown continued

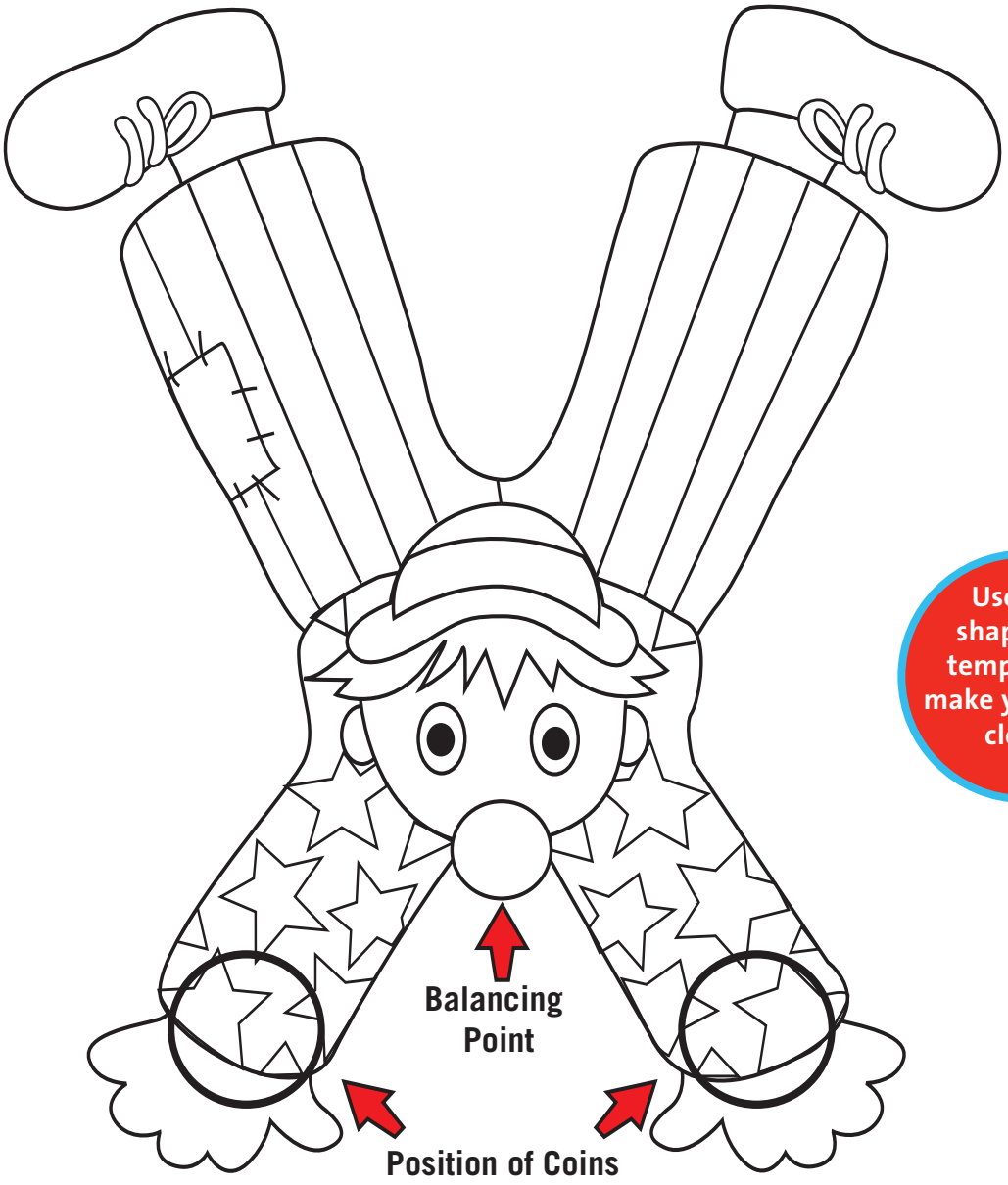
Use the template to draw out a clown shape, then cut it out.

Use the markers or crayons to colour the clown's face, costume etc.

Try to balance the clown on its nose on the rim of the glass or on your finger.

Attach either two similar coins or two similar sized lumps of plasticine to back of each hand.

You should now be able to balance the clown on its nose of the rim of a glass or on your finger.



Use this shape as a template to make your own clown

Design a Boat

SILVER

EQUIPMENT	Plasticine, dried peas, container (e.g. butter carton) of water, orange, jam jar
PREPARATION	Collecting materials.
BACKGROUND INFORMATION	Water pushes upwards with a force called 'upthrust'. (You can feel this if you try to push a light object such as a balloon or aeroboard under water). The shape of a 'boat' affects the weight (passengers/cargo) it can hold. The more water that the boat displaces the more it will float and therefore the more weight it can take.
SKILLS	Designing and Making Investigating and experimenting - fair testing
ACTIVITY	Design and make a boat to take the maximum number of passengers with the given materials. For fair testing give each group the same amount of plasticine. Suggest they first roll the plasticine into a ball and put it into the water. What happens? (It sinks). Now see if they can get it to float. Once they have it floating can they get it to take some 'passengers' (dried peas)? Can they alter the shape so that the boat will take more 'passengers' before it sinks? Whose boat takes the most 'passengers'?
SAFETY	**Care with water.**
FOLLOW-UP ACTIVITIES	(i) Put an orange in water. What happens? *(It floats).* Now peel the orange and put it back into the water. What happens? *(It sinks. Orange peel is full of trapped air bubbles, which make the orange light for its size, so the unpeeled orange floats. Without the peel the orange is heavy for its size, so it sinks).*

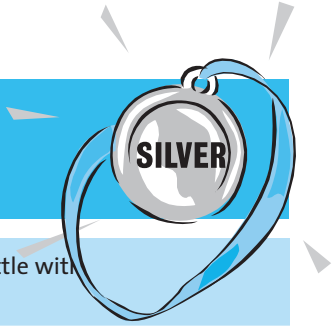
SHIPS ARE HEAVY

but they are shaped so that they push aside lots of water.

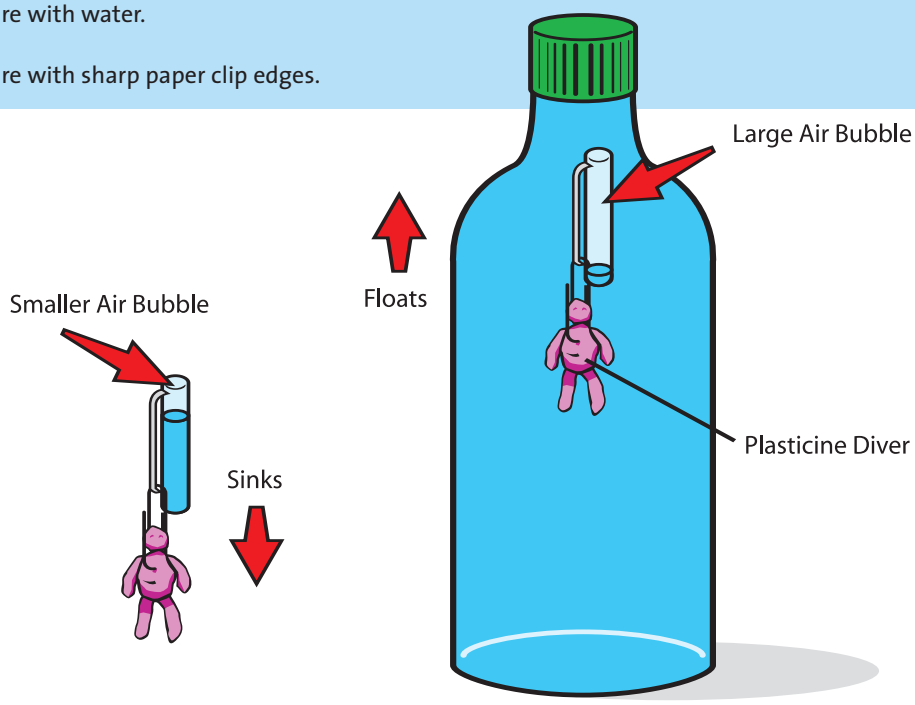
The water pushes back hard enough to keep them floating

Making a Diver

Which will float and sink



EQUIPMENT	Pen top with clip (no hole in lid), plasticine, paper clip, large plastic bottle with screw top
PREPARATION	Collection of materials
BACKGROUND INFORMATION	When you put the diver (pen top, paper clip and plasticine) into the water so that it floats the trapped air bubble inside the pen top makes the diver lighter than water so it floats. When you squeeze the bottle, water is pushed up into the pen top, squashing the air into a smaller bubble. The pen top now has more water in it, making the diver heavier, so it sinks. When you relax your grip on the bottle, the air in the pen expands again, the diver becomes lighter and floats again.
SKILLS	Designing and making, Investigating and experimenting
ACTIVITY	Make the plasticine figure of such a size that when it is attached to the paper clip and pen top it just floats (i.e. the top is just above the water-level). Children can try different sizes until it floats. Ensure no hole in penlid. What happens when you squeeze the bottle? (It sinks). What happens when you relax your grip? (It rises to floating).
SAFETY	Care with water. Care with sharp paper clip edges.



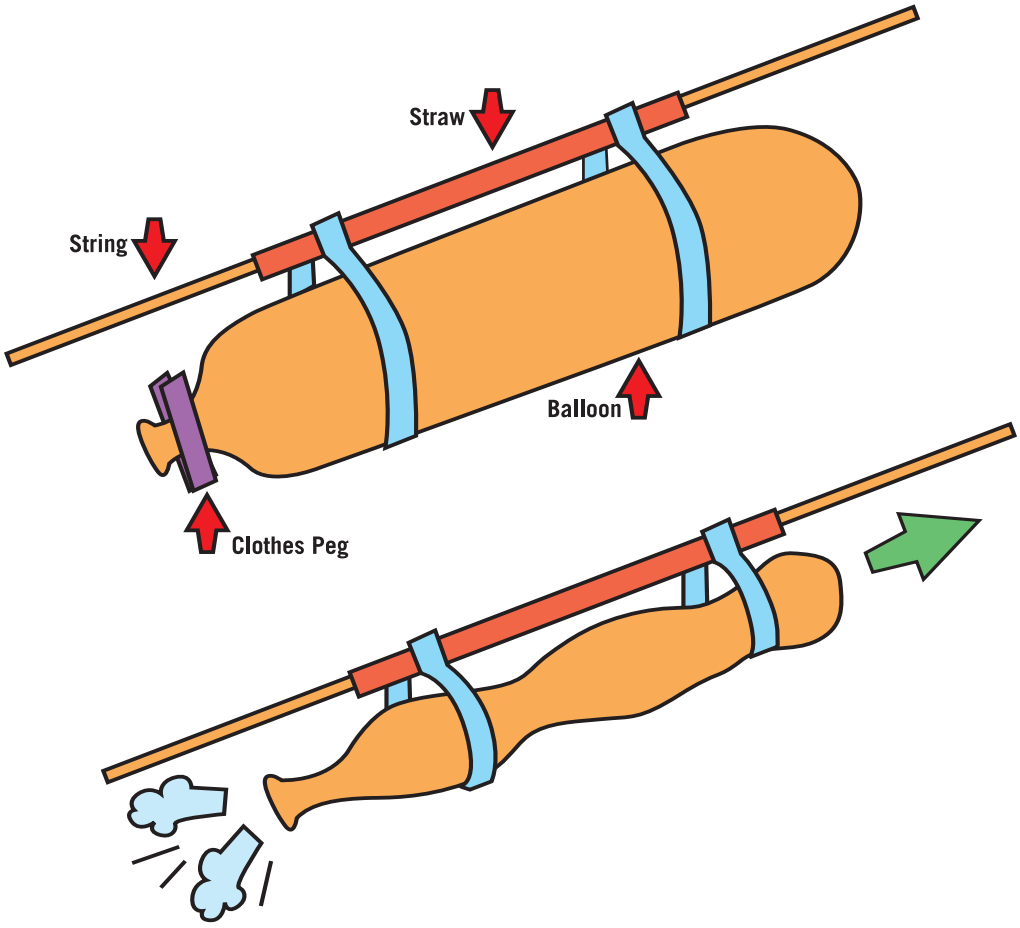
Rocket Launch

SILVER

EQUIPMENT	Large balloons (long shaped - round ones will work but the long balloons look more like a rocket), balloon pump, string OR cotton thread OR fishing line 3-4 m long, drinking straw, clothes-peg, sellotape, two chairs
PREPARATION	Collection of materials
BACKGROUND INFORMATION	The air coming out of the back of the balloon pushes the balloon forward. This is how rockets work – the hot burning gases rushing out the back of the rockets push them forwards.
SKILLS	Investigating and experimenting
ACTIVITY	Blow up a long shaped balloon and let it go. Notice what happens. *(The balloon will travel off in random fashion as the air rushes out the back of it).* Now control the path of the balloon by connecting it to a piece of string. *(The balloon will whiz along the string).*
SAFETY	**Care with the string.**

Rocket Launch continued

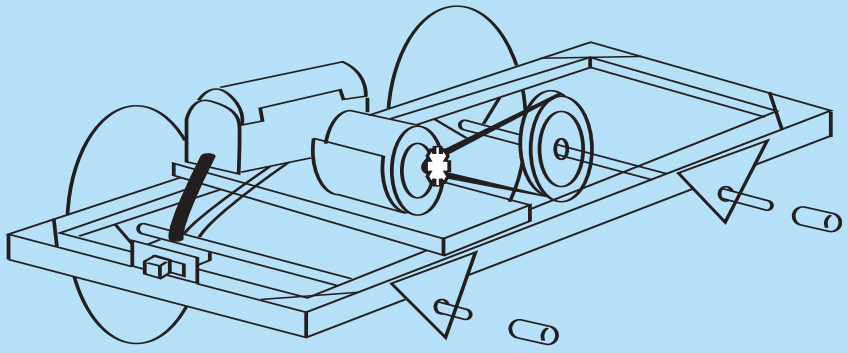
1. Blow up a long-shaped balloon and let it go.
2. Notice what happens.
3. Pull string through a drinking straw.
4. Tie the string to two chairs and pull it tight.
5. Blow up a long-shaped balloon and keep the air in it using a clothes peg.
6. Using sellotape attach the balloon to the side of the straw.
7. Pull the whole thing back to the beginning of the string and take off the clothes peg and ... launch your rocket!



Motors and Vehicles

GOLD

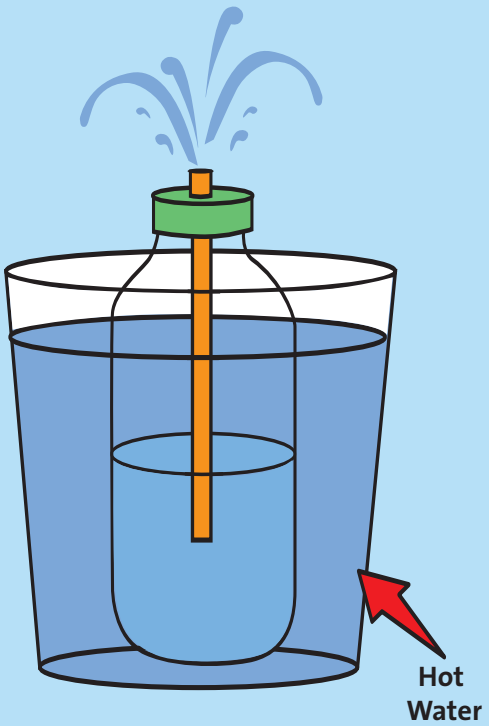
EQUIPMENT	Strips of wood for chassis, wood glue, cardboard triangles, cardboard triangles with holes (axle support), Dowels (for axles), wheels with holes, motor with small pulley on spindle, large pulley to fit dowel, elastic band, motor mounting clip, battery and battery holder,
PREPARATION	Make a model beforehand Source materials
BACKGROUND INFORMATION	When an electric current passes through a motor the spindle turns around. The spindle turns too quickly for practical purposes for a vehicle. To slow down this movement a large pulley is attached to the 'axle' and is connected to the small pulley on the motor by an elastic drive band. The large pulley turns at a slower rate than the small pulley and so the wheels of the vehicle now turn at a slower and more practical speed.
SKILLS	Various technology skills – designing and making, construction skills, use of tools.
ACTIVITY	Design a vehicle which will move, using a motor and batteries: • chassis with axle supports, • axles and wheels, • motor, pulley and drive band system, • batteries The length of the vehicle can vary, 15 cm – 20 cm works well. What alterations do you need to make to your design in order to make the vehicle run better?
SAFETY	**Use of tools**
FOLLOW-UP ACTIVITIES	Can you design and make other objects/toys, which move, using the battery, motor, pulley and drive band system?



Water Fountain Demonstration

SILVER

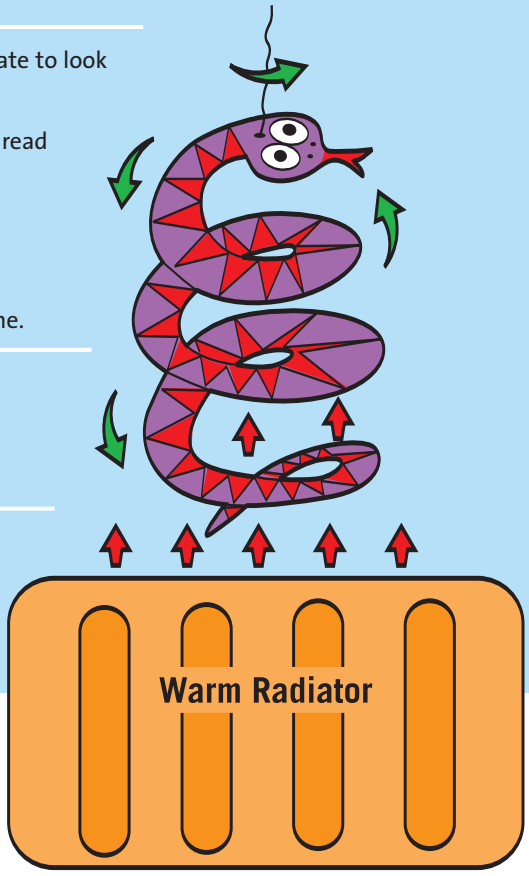
EQUIPMENT	A small plastic 500 ml bottle with a screw top lid, awl (borer) A large jug or deep bowl or bucket of hot water, a thermos flask is useful here. A strong plastic drinking straw, blu-tack or plasticine Drawing pin, food colouring, dropper Sink, newspaper, plastic sheet
PREPARATION	Make a hole in the lid of the bottle, just the right size to fit the drinking straw. This is a wet activity so do it in a waterproof area e.g. at a sink, over newspapers or on a plastic sheet.
BACKGROUND INFORMATION	Air expands as it is heated. When the bottle is put into hot water the air inside the bottle expands and pushes the coloured water into the straw and out the top like a fountain.
SKILLS	Observing
ACTIVITY	Put some water in the bottle until it is about half full. Add a few drops of food colouring. Screw the lid very tight on the bottle and push the straw through the hole in the lid until it is below the surface of the water. Press some blu-tack or plasticine round the straw to seal the hole in the lid. Put a small piece of blu-tack or plasticine in the end of the straw and plug it with the drawing pin. Put the bottle carefully into the jug/deep bowl of hot water and remove the plug (pin and blu-tack).
SAFETY	**ADULT DEMONSTRATION ONLY** **Care with hot water.** **Be careful that no faces are directly above the 'fountain'. This is a wet activity – to be done at a sink, over newspaper or on a plastic sheet.**



Snake Spiral

SILVER

EQUIPMENT	One piece of paper (A4) per child or A4 card A pencil per child Scissors Coloured markers or crayons Needle and thread Plasticine
PREPARATION	Check that there is a radiator with free space above it to hang the snakes i.e. not one with a shelf immediately above it
BACKGROUND INFORMATION	Warm air is lighter than cold air. Warm air therefore rises and cold air comes in to take its place. This causes air currents – both indoor and outdoor. These are called convection currents. The air above the radiator is warm and rises and makes the snake spin.
SKILLS	Making, observing
ACTIVITY	Draw a spiral on a sheet of paper and decorate to look like a snake. Cut along the spiral and attach a piece of thread to the snake's head. Hang the snake over a hot radiator. The snake spins as the warm air rises. The children can then take their snakes home.
SAFETY	**Care is needed with:** **Needle** **Hot radiator**
FOLLOW-UP ACTIVITIES	The children can develop their own questions about how heat travels and test them.

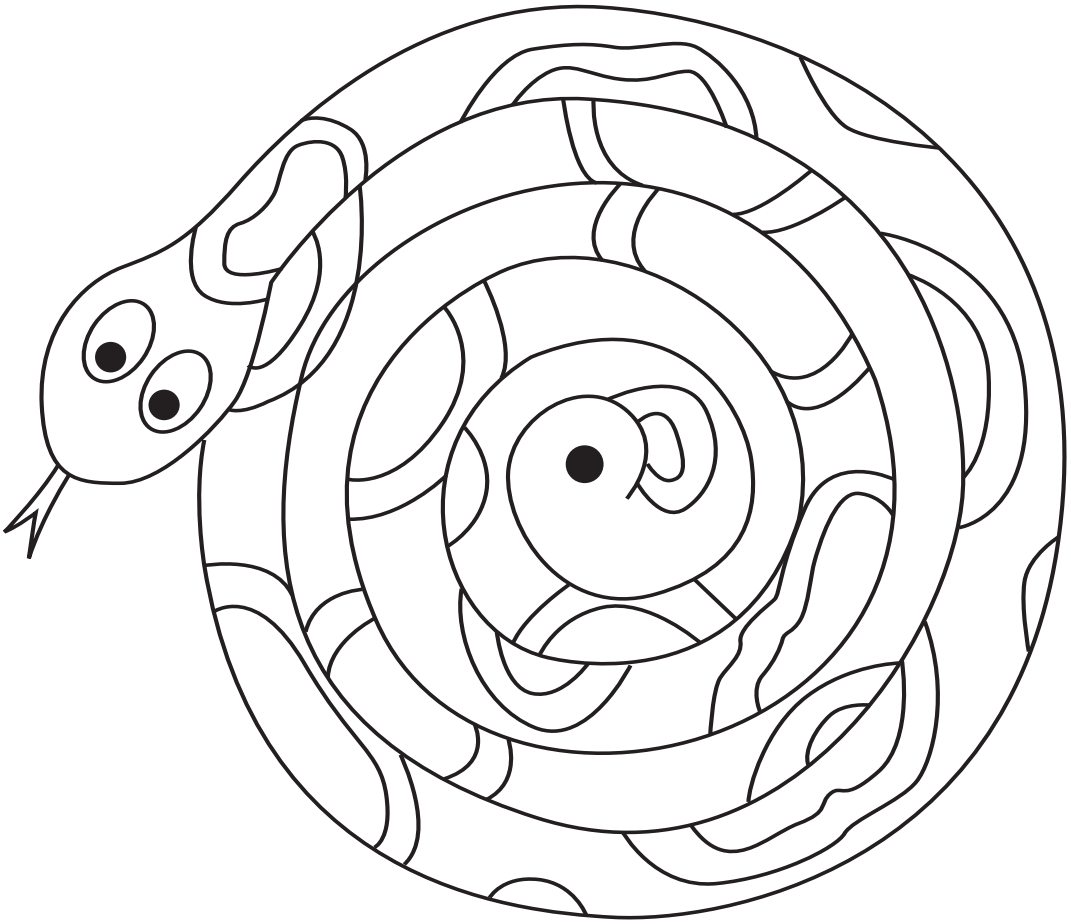


Snake Spiral continued

1. Draw a spiral on the piece of paper and decorate it with markers or crayons to look like a snake.
2. Cut around the spiral carefully
3. Cut a piece of thread and push it through the eye of the needle. Push the needle through the head of the snake and make a knot so that the thread does not push through.
4. Hang the snake above a warm radiator.

Safety
Care is needed with Needle and Hot Radiator

To keep your snake spinning longer fix it on the tip of a pencil by making a small hole in the head end. Keep the pencil upright by placing the unsharpened end in some plasticine and attaching it to the radiator.



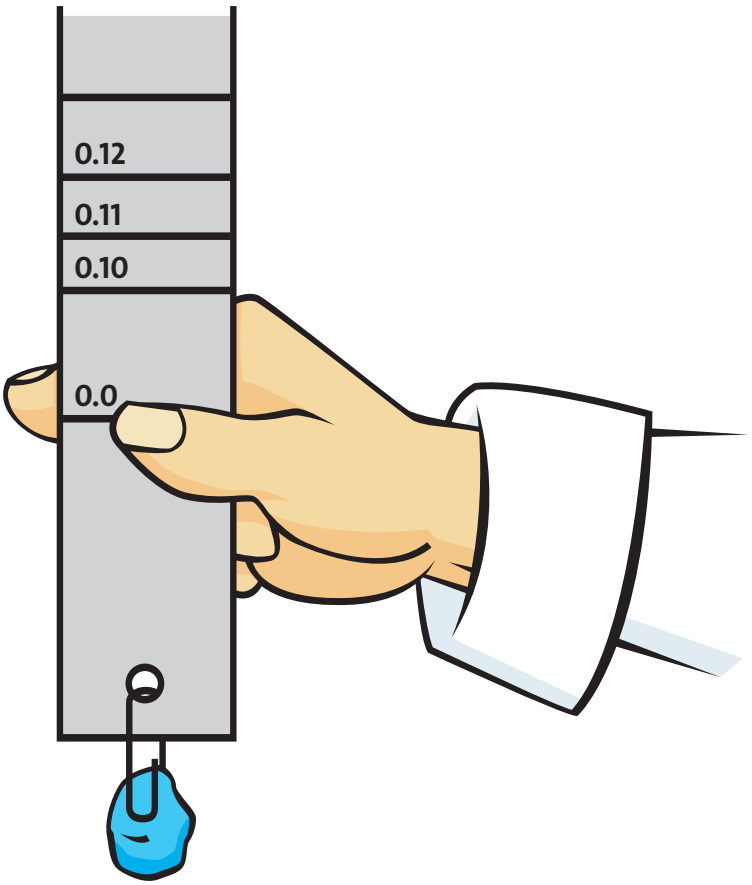
My Reaction Time

SILVER

EQUIPMENT	Reaction timer strip, paper clip, plasticine, glue or Prittstick, hole puncher.
PREPARATION	Photocopy and cut out reaction timer strips.
BACKGROUND INFORMATION	Although light and heavy things fall to the ground at the same speed (Galileo's famous experiment from the Tower of Pisa), because paper is very light, it can be subject to air resistance, currents, etc. A piece of plasticine weighs it down so that gravity is the only relevant force acting on it and all the timers should fall to the ground with similar acceleration. Do the pieces of plasticine have to be the same weight for fair testing among a group?
SKILLS	Investigating Estimating Measuring
ACTIVITY	Timing your Reaction: Cut out the reaction timer strip, fold down the centre vertical line and glue the two sides together. Make a small hole near the bottom edge, insert the paper clip and add a piece of plasticine to weigh the strip down. To test the speed of your reaction get a friend to hold the top of the strip. Place your thumb and first finger so that they are level with the 0.00 line. Your friend drops the strip and you try to catch it as quickly as possible between your thumb and first finger. Read your reaction speed in seconds from the scale on the strip.
SAFETY	General care with scissors and hole puncher.
FOLLOW-UP ACTIVITIES	The children could test their reaction times in different situations.

My Reaction Time continued

Reaction Timer



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Approximate time in seconds	

Fold along dotted line

Myself – Fingerprints, Dominant eye, Blind Spot

SILVER

EQUIPMENT	'Lead' pencils White paper Sellotape Marker pen Hand lens
PREPARATION	Collection of materials
BACKGROUND INFORMATION	Everybody's fingerprints are different. This science fact greatly helps the police. Everyone has a dominant eye – it can be the right one or the left one. (The brain might get confused as to where an object actually is, or see on the double, if we did not) Every eye has a blind spot – the place where the optic nerve joins the retina. You are not normally aware of this with two eyes, as this phenomenon does not happen at the same time with the two eyes.
SKILLS	Investigating and experimenting
ACTIVITY	To investigate some scientific facts about oneself: To take fingerprints To find which is your dominant eye To investigate the blind spot of your eye
SAFETY	**Wash hands after fingerprints activity**

Myself continued

A Taking your own fingerprints

Using the pencil scribble quite thickly on white paper.

Rub your finger all over the scribble, making it very smudgy.

When your finger is black press it firmly to the sticky side of a piece of sellotape. Press it hard so that the ridges are transferred to the sellotape.

Now stick the sellotape onto white paper and you should see your finger print.

Look at the print with your hand lens.

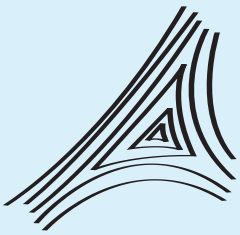
Look for loops (L), splits (S), ridges (R), cusps (C)

Mark these on your fingerprint.

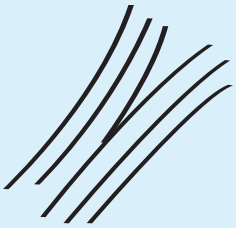
Take a print from a friend and mark it in the same way.

How can you tell the same person did not make these prints?

Do the lines of the print ever cross?



Cusps



Ridges

Loops

Splits

Myself continued

B To find your dominant eye

Pick out a vertical object or line in the distance e.g. a lamppost (outdoors) or the edge of a door or window (indoors). Hold a finger or pencil vertically in front of you and line it up with the vertical object. Now close each eye in turn. Which eye do you think is the dominant one?

(The eye which sees the finger or pencil in the same place as when your two eyes are open is the dominant one).

C To discover the blind spot of your eye

1. Hold the cross and spot diagram at arm's length with the cross on the right.
2. Close your right eye.
3. While looking only at the cross, bring the page slowly towards your face.

What happens?
At a certain point the image of the spot will disappear because the light from it is falling on the blind spot of your left eye.

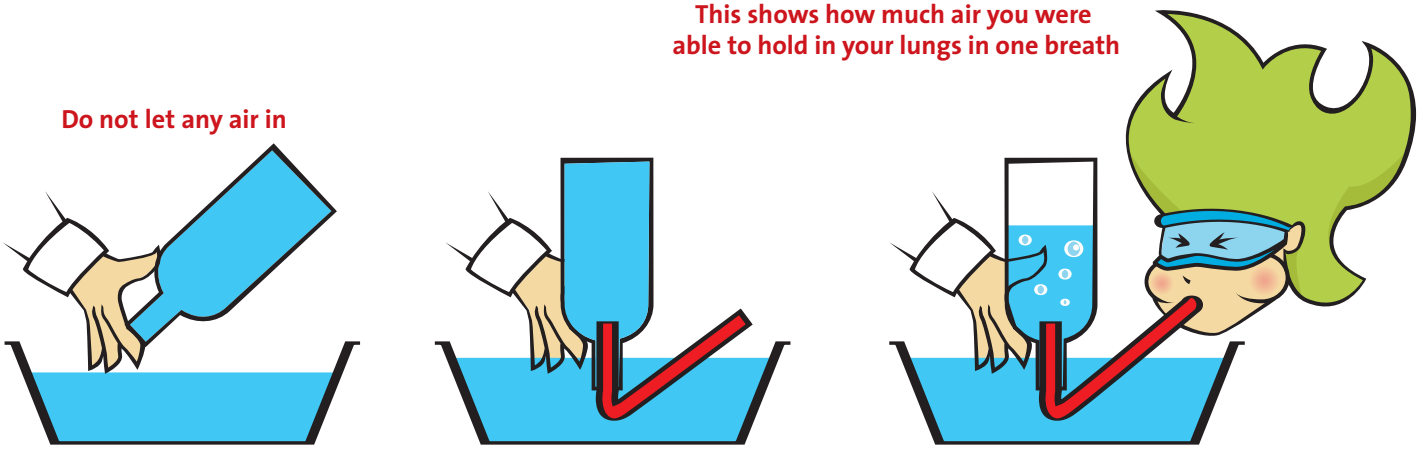
How much air can my lungs hold?

SILVER

EQUIPMENT	Large basin of water, large plastic bottle (4 to 5 litre) with cap, plastic tubing, old towels for mopping up.
PREPARATION	Mark volume on the plastic bottle e.g. the 1 litre mark, 2 litre, 3 litre, 3.5 litre etc by pouring in a known volume of water. You can mark the bottle upside down as this is how it will be used. Use waterproof marker
BACKGROUND INFORMATION	Each time you breathe your lungs fill with air and empty again. The amount of empty space at the top of the bottle shows the amount of air that was in your lungs and which pushed the water out.
SKILLS	Investigating Estimating Measuring
ACTIVITY	Measuring the Capacity of Your Lungs: Fill the plastic bottle with water and put on the lid. Turn it upside down in the basin of water and remove the lid. Put one end of the tube into the bottle (careful not to let any air in). Take a big breath and then blow into the tube until you cannot breathe out any more. What happens?
SAFETY	**Hygiene – clean the end of the plastic tube with dilute Milton solution after each child.**
FOLLOW-UP ACTIVITIES	Can you refill the bottle from the basin of water using the plastic tube as a siphon this time?

A space forms at the top of the bottle. This shows how much air you were able to hold in your lungs in one breath

Do not let any air in



Mirror Writing

EQUIPMENT	Small flat plastic mirrors White paper Pencils Markers
PREPARATION	Collection of equipment
BACKGROUND INFORMATION	When white light meets a shiny surface like a mirror, it bounces off it and is reflected back. In these activities when you look in the mirror the top of your picture becomes the bottom and vice versa. This makes it very difficult to draw around, especially when you change direction. All of the letters in 'CHOICE DICE' are symmetrical (top to bottom). These activities appear simple but are actually quite difficult – try and see!
SKILLS	Investigating and experimenting
ACTIVITY	***These activities probably work best in twos – one holding the mirror while the other writes. Then swapping around.*** With a mirror standing at right angles to a piece of paper try to go over a simple shape with a marker while looking in the mirror **only**. Try to write your name on a piece of paper while only looking at the mirror (and not looking at the paper). Again looking **only** in the mirror, with a pencil try to find your way around a maze from start to finish. Hold the mirror behind each of the shop signs. CHOICE DICE is the same.
SAFETY	**Use plastic mirrors – obtainable from scientific suppliers.**

Mirror Writing continued

IN THESE THREE ACTIVITIES LOOK IN THE MIRROR ONLY WHILE DOING THEM – DO NOT LOOK AT THE PAPER

MIRROR WRITING – A

1. Draw a simple shape (e.g. a star) on a piece of white paper and stand a mirror behind it.
2. Looking in the mirror only (and not at the paper) try to draw over the shape with a coloured marker.

NOT AS EASY AS YOU THINK!

MIRROR WRITING – B

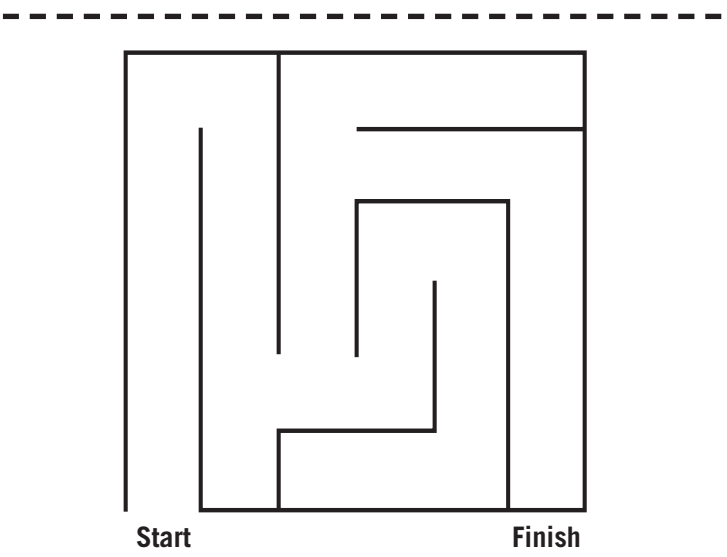
With the mirror standing up on a plain piece of white paper and looking only in the mirror try to write your name on the paper so that it looks normal writing in the mirror (do not look down at the page)

AGAIN NOT AS EASY AS YOU THINK!

MIRROR WRITING – C

Stand the mirror on the dotted line behind the maze and tilt it forward a little so that you can see the maze clearly in the mirror. Again looking only in the mirror, use a pencil to find your way from the START to the FINISH.

How many times did you cross a line?



Mirror Writing continued

HOLD A MIRROR BEHIND EACH OF THESE TWO NOVELTY SHOP SIGNS (ALONG THE DOTTED LINES) IN TURN:

LOVELY JELLIES – 70C

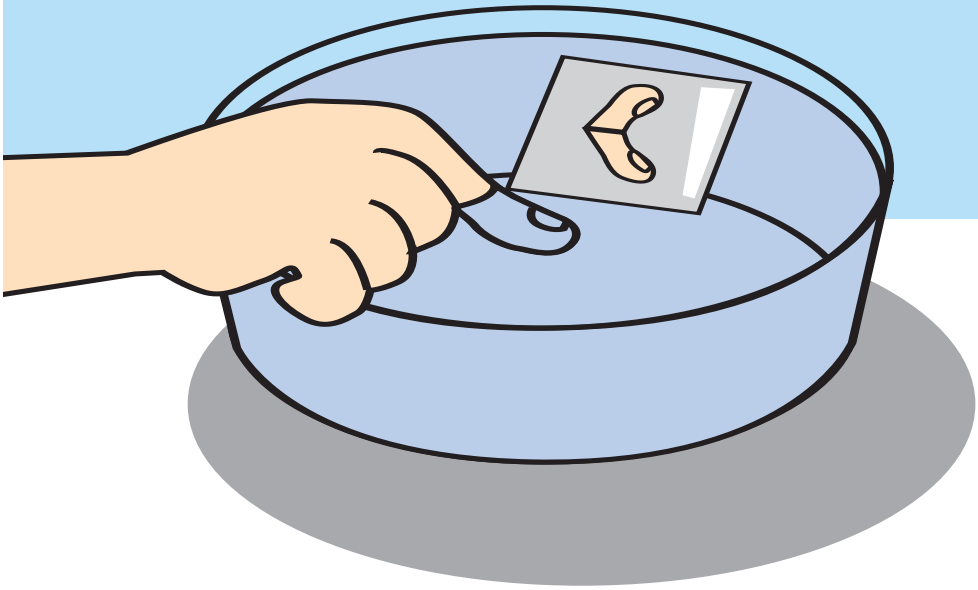
CHOICE DICE – 80C

Can you explain the difference?

Creepy Reflections and Floating Finger

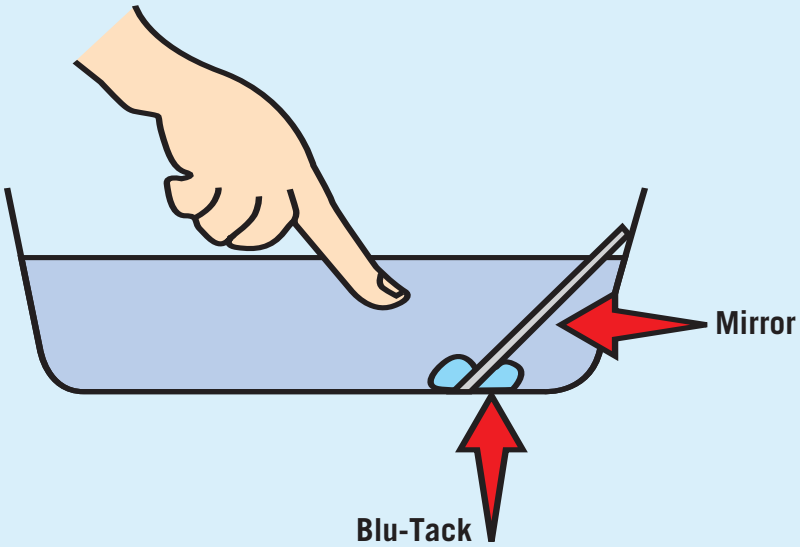
BRONZE

EQUIPMENT	A small plastic mirror A clean washing-up bowl Water Newspaper
PREPARATION	Collection of the equipment
BACKGROUND INFORMATION	This is how to get a fish's eye view of a water surface. The mirror enables you to see the surface of the water from *underneath*.
SKILLS	Investigating and experimenting
ACTIVITY	Put the mirror in the bowl of water at an angle of about 45°. Look into the mirror through the water and put your fingertip into the water. You should see the tip of your finger appearing out of nowhere. Next to it will be a reflection of your fingertip. The strange thing is that there is no hand attached to the finger.
SAFETY	**Care with water.**

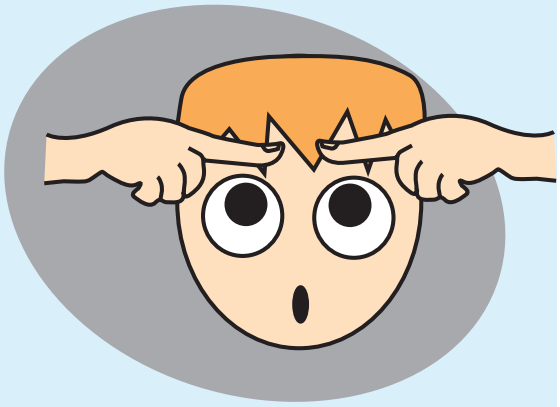


Creepy Reflections

1. Fix the mirror into the bowl at an angle of 45°. You may need to stick the bottom edge of the mirror with blu-tack or plasticine.
2. Fill the bowl with water; it does not matter if the mirror is not completely submerged. When the water has settled look straight down at the mirror through the water.
3. Slowly put your fingertip into the water, fairly close to the mirror.
4. What do you see in the mirror?



Floating Finger



Now try THE FLOATING FINGER (no equipment needed)

Hold one finger of each hand in front of your eyes like this:

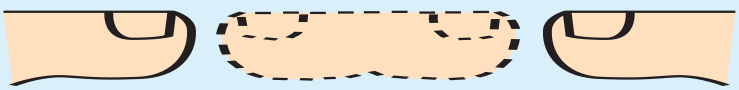
Stare at something beyond your fingers – not at your fingers.

Stare hard at the gap between your fingers.

What do you see?

Do you see a short finger (in-between your two fingers) with a nail at each end?

(You are seeing 2 fingers with each eye, i.e. 4 in all. The 2 extra ones overlap).

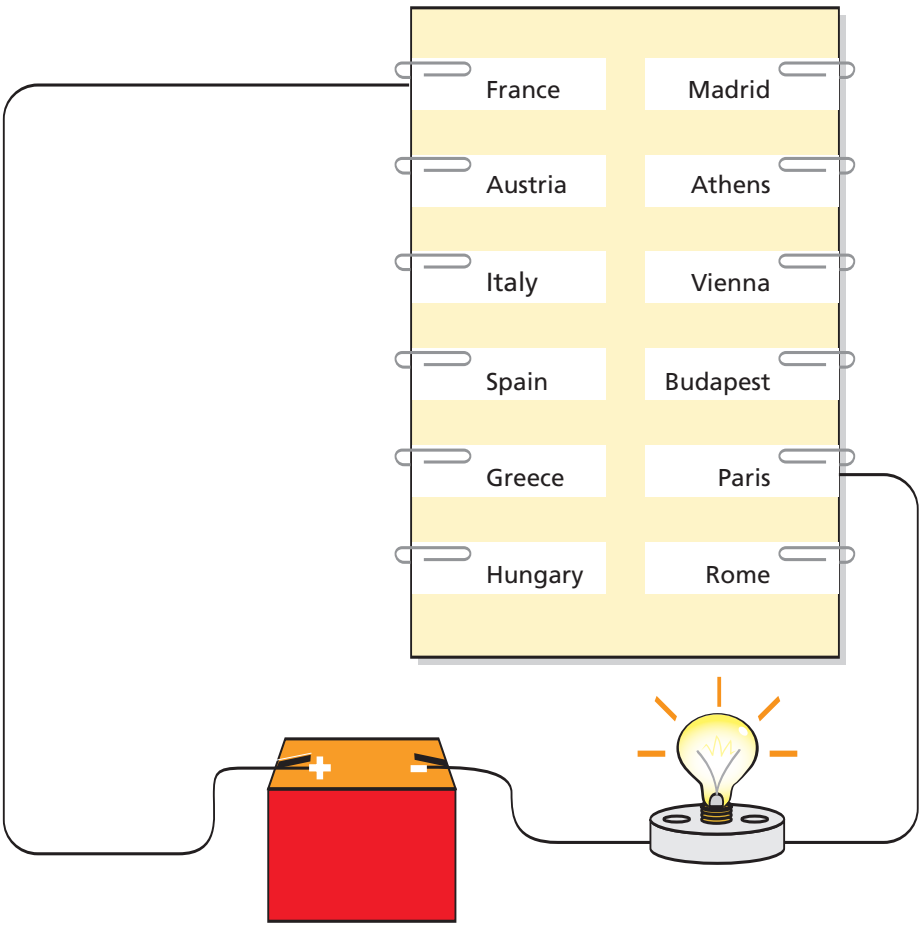


Make an electric Quiz

EQUIPMENT	Cardboard (cornflake packet will do), battery and bulb (in the range 1.5 to 3 volts), bulb-holder, connecting wires, metal paper clips or paper fasteners (split pins), paper, scissors, glue or prittstick.
PREPARATION	Collect materials, prepare wires.
BACKGROUND INFORMATION	Electricity will only flow when there is a complete circuit. The correct answer is connected, behind the cardboard, to the question. If the correct answer is touched on the front of the cardboard the bulb will light up. If the wrong answer is touched the bulb will not light up, as there will not be a complete circuit.
SKILLS	Handling of electrical components Investigating and experimenting Making
ACTIVITY	Make a quiz game with a light that flashes to show the right answer. *Making the Quiz Board:* On one side of the card, glue or tape some pieces of paper with the questions (or names of countries or football teams or whatever the children suggest) on the left, and the answers (or corresponding capital cities or football players, etc) on the right. Muddle them up so that each question is next to a wrong answer. Attach a paper clip to each question and answer. Turn the cardboard over and connect each question up to the right answer with a piece of wire, looping the wire round the paper clip, making sure there is a connection. With some more wire, join the battery to the bulb-holder as shown in the diagram. Join some more wire to the other side of the battery and the other side of the bulb-holder. Leave the ends of both these wires free. *Playing the Game:* Ask a friend to touch one of the paper clips next to a question and the other loose wire to the paper clip next to the answer which he/she thinks is the right one. If the answer is correct, the circuit will be complete and so the bulb will light up.
SAFETY	**Care with batteries and wires.**
FOLLOW-UP ACTIVITIES	This activity can be done with a buzzer also (in this case the red wire attached to the buzzer must be connected to the positive terminal of the battery).

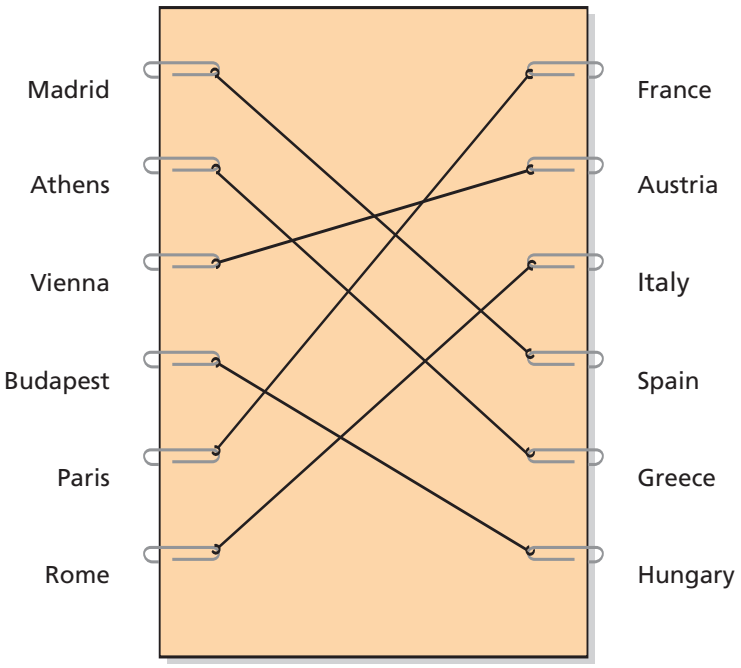
Make an electric Quiz

Front of Card



Back of Card

Join each country to its capital city with wires

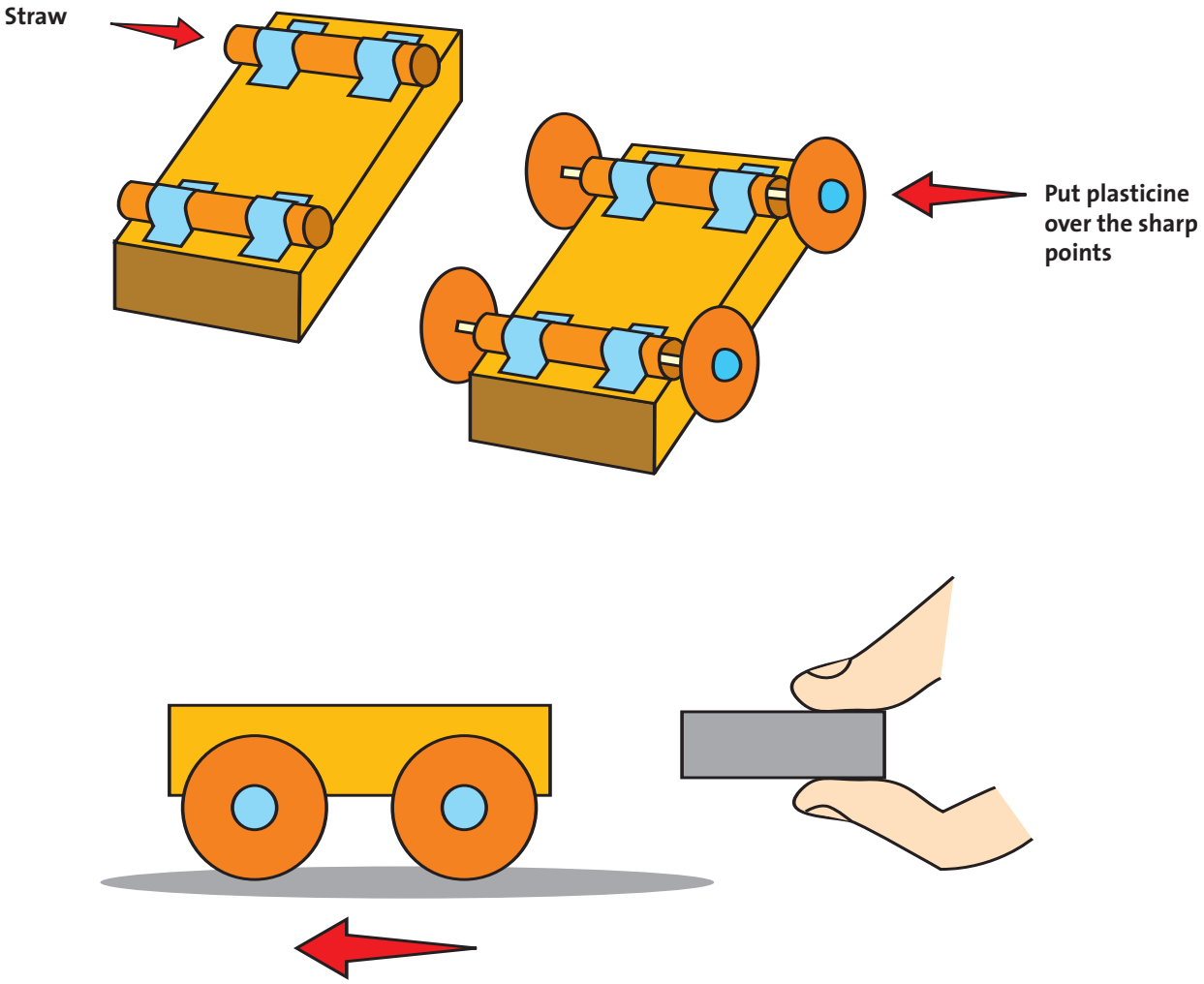


Magnetic car

EQUIPMENT	Two magnets Empty match box Drinking straw Two cocktail sticks or toothpicks Card, scissors Sellotape Plasticine or Blu-tack Coin or compass
PREPARATION	Make sure that at least one of the magnets fits inside the matchbox.
BACKGROUND INFORMATION	You can get the car to move without touching it. Two magnets can either attract or repel each other. If the North pole of the magnet in the car is facing the North pole of the other magnet the magnets will repel each other and the car will move. Similarly with the South poles facing each other. This is better on a smooth surface rather than a carpet.
SKILLS	Making, observing
ACTIVITY	Make the matchbox cars with the wheels and axles. Get them to move using the repelling force between the like poles of two magnets. The children may like to race the cars.
SAFETY	**General care with scissors**
FOLLOW-UP ACTIVITIES	Design and make another moving vehicle based on the repelling force of magnets.

Make a Magnetic Car

1. Cut out four wheels from the card (you can use a €1 coin or a protractor to create round shape).
2. Cut the straw into two pieces, making sure each piece is the same size as the width of the matchbox.
3. Tape the pieces of straw to the underside of the matchbox near each end.
4. Push the cocktail sticks through the straw and fix the wheels to them.
5. Put the Plasticine over the sharp points of the sticks.
6. Firmly attach the little magnet to the inside of the tray of the matchbox and slide in the tray.
7. Place the matchbox on a table top. Bring the other magnet close.
8. If the like poles are facing each other the car should move away from the other magnet.



Creeping Colours chromatography

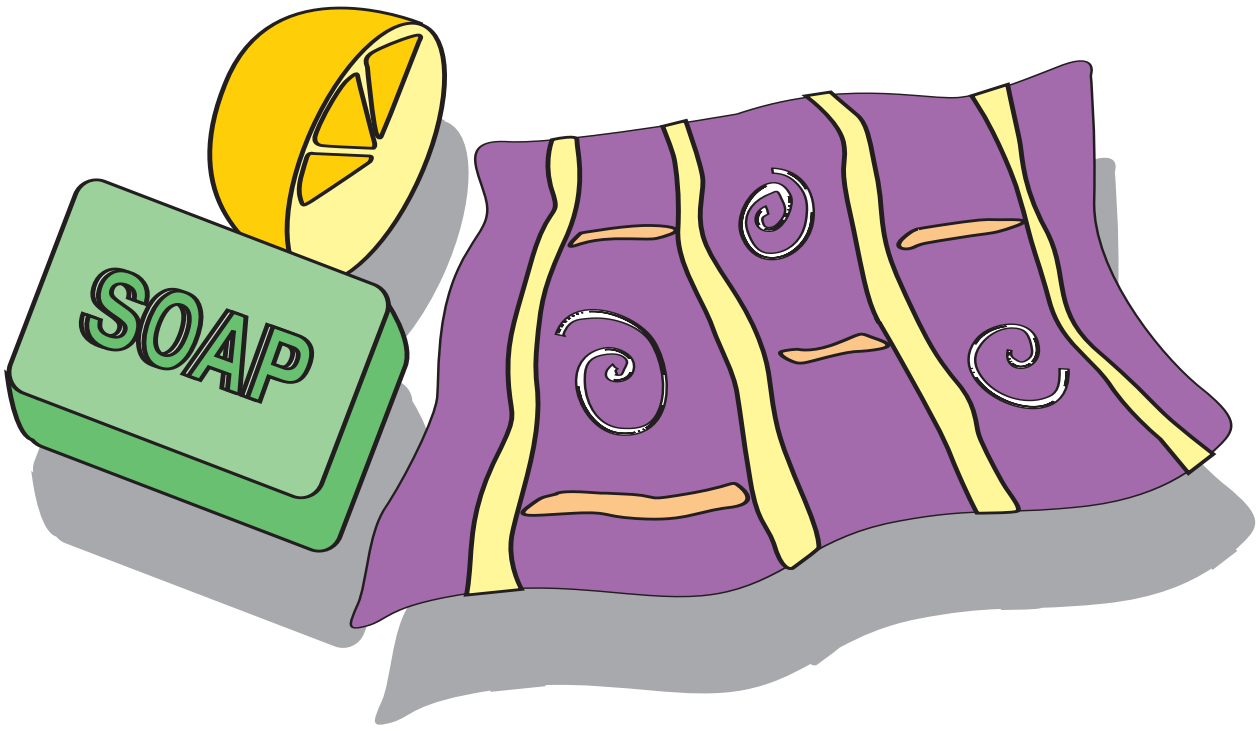
EQUIPMENT	Filter paper or blotting paper, coloured markers, beaker or jar, water
PREPARATION	Collect a good variety of coloured markers, both light and dark colours (the darker colours work best as they contain a larger number of colours) and include a few waterproof colours as well (which will not separate out as they do not dissolve).
BACKGROUND INFORMATION	Inks and dyes are made from different chemicals. To make all the different colours, lots of different coloured chemicals are mixed together. As the water rises up the filter paper, it dissolves the chemicals and carries them with it. Some chemicals are more easily absorbed by the paper than others and they travel up at different speeds. The different chemicals, therefore, separate out. Separating chemicals like this, by absorbing them, is called CHROMATOGRAPHY. Chemists often use chromatography to test the purity of a substance. Doctors use it to test urine samples (e.g. for traces of sugar if diabetes is suspected).
SKILLS	Observing Investigating and experimenting
ACTIVITY	To investigate what happens when inks from coloured markers are absorbed by wet filter paper. Cut strips of filter paper just wide enough to fit into the jar. Make blobs of colour with different markers on the paper approximately 5 cm from the bottom. Put some water in the jar (to a depth of about 2 cm) and put the paper in the jar and wait. What did the water do? What happened to the colours? Which markers contained most colours? Why did the blobs from some markers do nothing at all? How could you detect forgery using chromatography?
SAFETY	**Care with water.**
FOLLOW-UP ACTIVITIES	**(I)** Can you make a multi-coloured book-marker using a long strip? **(II)** Make a self-watering plant-holder (no need to worry about your plants while you are away on holidays). **(III)** What colours make up the outer coatings on some sweets, e.g. Smarties or M & Ms?

Dyeing with red cabbage, Soap & Vinegar

EQUIPMENT	Half a red cabbage Knife Hot water – use a kettle or thermos flask. Large bowl or several small bowls Slotted spoon Dropper Scraps of white cotton material – old handkerchiefs or old cotton sheet Soap Vinegar, lemon juice Bread soda Kitchen paper Newspapers
PREPARATION	Make the bread soda into a solution - 1 teaspoon to a cup of water. Make the purple dye by adding hot water to red cabbage leaves.
BACKGROUND INFORMATION	Red cabbage is an indicator – i.e. it is one colour in an acid and another in an alkali. Acid means 'sour' in Latin. An alkali is the chemical opposite of an acid. Toothpaste is an alkali that neutralizes the acids which build up in our teeth. Indigestion tablets are alkalis that neutralize excess acid in the stomach. The purple colour of the dyed material turns pink when it meets an acid (vinegar) and turns blue or blue/green when it meets an alkali (bread soda and soap)
SKILLS	Investigating and experimenting
ACTIVITY	Soak the cotton material in the purple dye. Look at the red cabbage after the dye is made. Make coloured patterns on the material using lemon juice, vinegar (acids) and soap, bread soda (alkalis).
SAFETY	**Care is needed with very hot water.** **Adult should cut up the cabbage.**
FOLLOW-UP ACTIVITIES	Use left over cabbage water to test substances such as orange juice, Coca Cola, toothpaste. What does the colour change tell you about these things?

Dyeing with red cabbage, Soap & Vinegar

1. Cut up some red cabbage and put it in a bowl.
2. Add some very hot water and stir for about five minutes.
3. Remove the cabbage leaves from the bowl.
4. Place the cotton material into the purple liquid and stir for about five minutes.
5. Remove the material and dry between two pieces of kitchen paper.
6. Place the materials on an old newspaper or kitchen paper.
7. Use a dropper to make coloured patterns on the materials with vinegar or lemon juice, drops of bread soda solution or lines using a bar of soap.
8. Leave the material for a few minutes for the chemicals to react.
9. Rinse the material quickly in cold (preferably running) water.
10. Allow the material to dry.



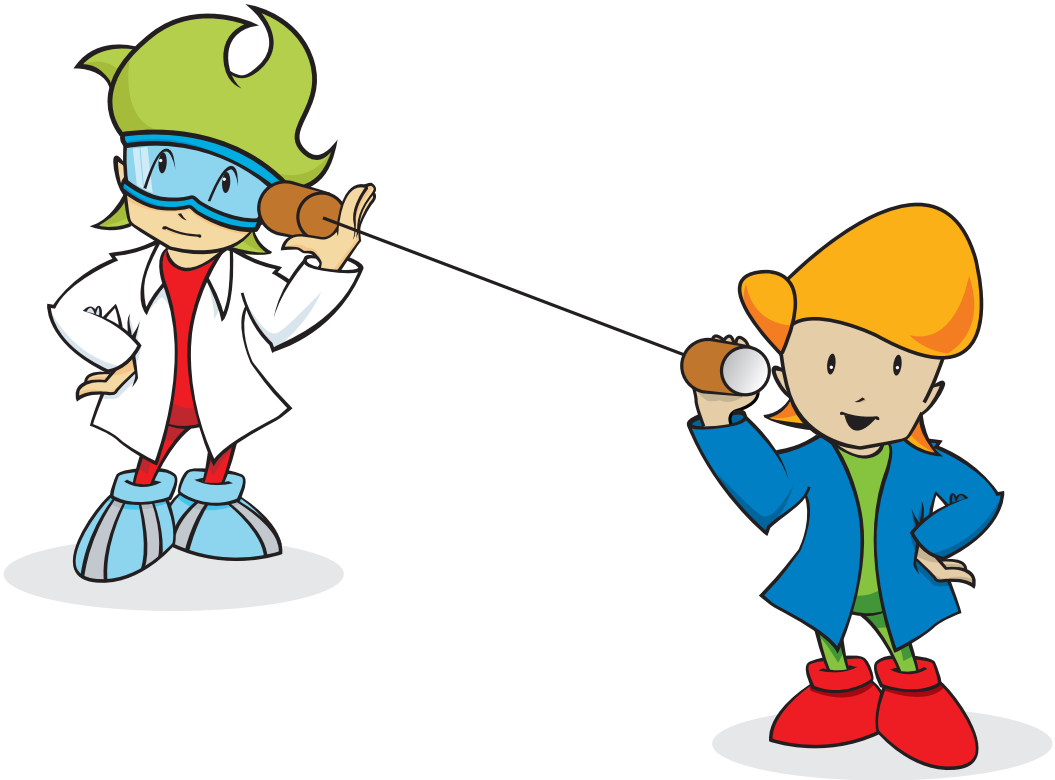
Growing Tomatoes from Seed

EQUIPMENT	Tomato seed from garden centres. Choose Bush or varieties suitable for container production like BALCONI, TOTEM or TUMBLER. (Obtain enough seed to provide a plant for each child to take home plus one or two for the classroom. Seed count is available on the packet - 90% germination/survival rate). Small flower pots or old yogurt containers Larger pot (4 litre container) Seed and potting compost Plant food Canes to support plants
PREPARATION	Source seed, seed and potting compost, old yogurt containers, a piece of clear plastic to cover the pots until seeds have germinated and a tray on which to stand the pots before starting the project.
BACKGROUND INFORMATION	Growing tomatoes shows the production of a common edible fruit from seed germination to flowering and fruit formation. It will help to explain the plant life cycle and the factors affecting growth. TIME SPAN. Sow seed in February; re-pot end of March, flowering April, fruit in June onwards.
SKILLS	Observing, investigating and experimenting.
ACTIVITY	The time span of this project will last from seed sowing in February through to the summer holidays. 1. Sow seed individually in old yogurt containers. Follow instructions on seed packet as to sowing procedure. 2. Keep in well-lit warm windowsill, water as necessary. 3. Re-pot into a larger container using full strength potting compost once the plant is approx. 10 cm tall. 4. Start using liquid fertiliser with each watering, following instructions on plant food container. 5. Support plant with canes if necessary as the plant grows. 6. This is a good activity to develop understanding, caring, responsibility... and like all gardening projects getting your hands dirty. Encourage pollination by stroking the flowers underneath with a paintbrush. Natural pollination by bees would be very limited in the classroom!
SAFETY	**Wash hands after sowing seed and after each stage of potting.**
FOLLOW-UP ACTIVITIES	Visit a local commercial grower of tomatoes. Ask questions about growing tomatoes to info@raringtogrow.com or visit the website www.raringtogrow.com.

String Telephone

SILVER

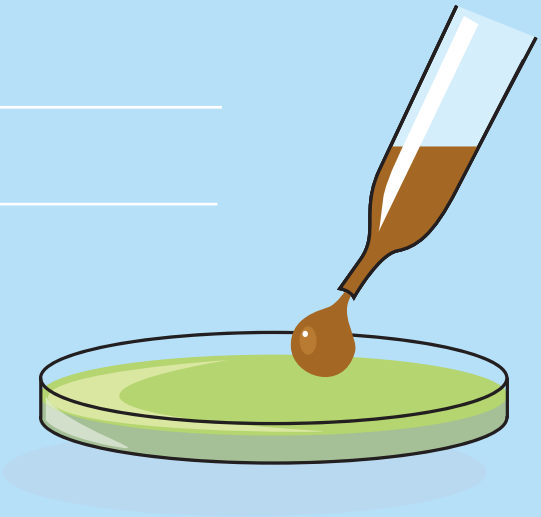
EQUIPMENT	Piece of string about 10 m long, 2 tins with metal bases, awl (borer)
PREPARATION	Make hole in bottom of tins using the awl.
BACKGROUND INFORMATION	Sound travels better and faster through a solid material than through the air.
SKILLS	Experimenting
ACTIVITY	To see how sound travels through solid things **(i)** Working in pairs – one person taps the table and the other listens, first normally and then with his/her ear on the table. Is there any difference in the two sounds? **(ii)** Make a small hole in the bottom of each tin, push the string through and tie a knot. With a person at each end pull the string tight, making sure it is not touching anything else. Take turns in speaking and listening. Try whispering. Can you hear?
SAFETY	**Care with piercing holes in tins.**
FOLLOW-UP ACTIVITIES	Investigate how long the string can be. Make a telephone exchange using two or more string telephones.



Starch is Everywhere

SILVER

EQUIPMENT	Tincture of iodine (available from chemists) Small dropper bottles (available from chemists) Measuring Jug Funnel Small samples for testing, such as paper, cardboard, polystyrene, plastic, bread, potato, apple, salt, cheese, rice, spaghetti, sugar, flour, biscuit, etc.
PREPARATION	Prepare the iodine solution for use by the children. Dilute the tincture of iodine with water (about 1:10 iodine: water). One dropper bottle per 4 children should be sufficient. Store the tincture of iodine away from the classroom. Take care – iodine stains. Cover the work surfaces with newspaper.
BACKGROUND INFORMATION	Starch is a carbohydrate. It is found in plants. Green plants make carbohydrates through photosynthesis. Starch is therefore in many foods, but also in other things as well, e.g. some paper. Starch is a white powder. Starch reacts with iodine to produce a blue or blue-black colour. It can therefore be used as an 'indicator', i.e. to test if starch is present in something.
TRIGGER QUESTIONS	**Where do you find starch?** (Most likely responses are: In food and for stiffening clothes) **Where do you think starch comes from?** (Plants)
CROSS-CURRICULAR LINKS	**SPHE:** Myself - Taking care of my body **SESE:** Geography - Natural Environments
SKILLS	**Predicting, experimenting, observing, recording, classifying, analysing** (what types of things contain starch?)
CONTENT	Plants and animals Materials



Starch is Everywhere (cont'd)

ACTIVITY

Add a few drops of iodine solution to each of the items and observe the change of colour of the iodine (if any). Anything that turns blue-black contains starch.

Record the results in a table:

ITEM	Did iodine turn blue or blue-black?	Was there starch in the item?
Tissue		
Kitchen paper		
Plastic mug		
Polystyrene mug		
Bread		
Potato		
Apple		
Biscuit		

SAFETY

Care with iodine – close adult supervision; handle with care - do not get into mouth, etc.
Store the tincture of iodine away from the classroom.
Care with clothes – iodine can stain.
Wash hands after activity.

FOLLOW-UP ACTIVITIES

CHILDREN CAN:
Find out the uses of starch.
(Starch has three main uses: It is a major food, can be used as a thickener for sauces, and can be used to stiffen clothes)

Look at food packaging to see which foods contain starch. You'll find that bread, pasta, cereals, potatoes and many other foods contain starch.

Find out about food, the food pyramid.

Discuss the main types of food and a balanced diet.
(The main food types are carbohydrates, proteins, fats, vitamins, minerals, etc.)

Design a healthy lunchbox for themselves or a younger child.

Find out about the types of starch eaten around the world.

Survey their own class to find out which starch they eat.

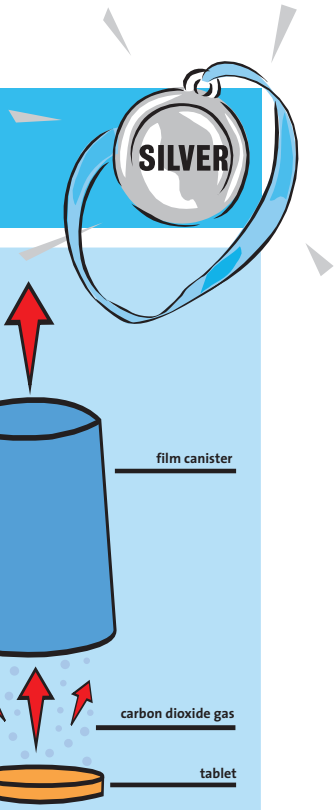
Find out about the Potato Famine of the 1840s in Ireland.

Make their own starch.

Make Starch Goo – this is very messy.

See www.primaryscience.ie for flashbased version of activity.

Make a Rocket



CLASS LEVEL	**Fourth - Sixth classes**
SKILLS	**Experimenting**
CURRICULUM LINKS	**English:** **Rockets and space can be used as a theme for different styles of writing about space** **Geography** **Art**
CONTENT	Materials and change Forces
MATERIALS/EQUIPMENT	Film canister (no hole), any tablet that dissolves and fizzes e.g. Alka-Seltzer, Vitamin C tablets, blu-tack, water
PREPARATION	Collection of materials, test the activity.
BACKGROUND INFORMATION	When water is added to the tablet the gas carbon dioxide is released. The pressure of the carbon dioxide gas builds up inside the canister until it becomes so great that it blows the canister from its lid. The gas rushing out of the end of the canister pushes it in the opposite direction. The 'rocket' can shoot up to 5 metres into the air.

Activity

TRIGGER QUESTIONS	**What is a rocket?** A cylinder full of materials which can produce gases. **What are rockets used for?** Signalling; sending space machines with great force into the air to get outside earth's gravity **What gives a rocket its energy to 'blast off'?** A jet of gases released from the back of the rocket sends it forwards. The children can blow up a balloon and let it go. Ask them which direction the released air goes and which direction the balloon goes. They go in opposite directions. Note: You may have done the Rocket Launch activity in the Activity Support Booklet. This works on the same principle.
SAFETY	**Keep the children (and yourself) well back from this activity as the lid can take off with some force and could damage eyes and faces. This activity is probably best done outside – it can be messy.**

ACTIVITY

Attach the tablet (one-quarter to one-half tablet) to the inside of the lid of the film canister.

Put water into the canister until it is about one-quarter full.

Put the lid (+ tablet) on the canister and turn it upside down.

Wait!

(The canister comes away from the lid with some force).

FOLLOW UP ACTIVITY

(1) Vary the temperature of the water and note if there is any difference in the height to which the 'rocket' shoots.

(2) Vary the 'fuel' mixture used in the 'rocket' (e.g. Vitamin C tablet and vinegar, and see if there is any difference in how the 'rocket' behaves). Be aware, vinegar leaves quite an odour!

(3) A launch pad can be made using a cardboard tube (e.g. a toilet roll) and a paper plate. Cut three slits about 2.5 cm high in the bottom of a tube. Bend the cardboard strips so that they can be taped to a paper plate. Place the launch pad paper plate down and the film canister on top of the tube.
Watch what happens.

Review

FOLLOW-UP ACTIVITIES

What is a rocket? According to NASA it is a long, narrow, jet-propelled device or vehicle that is used as a signal or weapon, for fireworks, or to provide the power for spacecraft.
http://www.nasa.gov/audience/forkids/glossary/index_r_s.html

What does your dictionary say?

Did you know? Rockets are used to send flares as distress signals, in fireworks and to launch spacecraft.

Did you know? Fireworks are illegal, apart from licensed fireworks displays. Fireworks are dangerous and can cause accidents to people using them. They also upset blind people and dogs. For more information look up http://www.ispca.ie/behaviour/fireworks.html.

Read about Irish children travelling to NASA Cape Canaveral as part of the FÁS Science Challenge. http://www.fas.ie/science/primary_diary.html

Other types of rockets to make:

Lemon juice rocket

http://pbskids.org/zoom/activities/sci/lemonjuicerockets.html

Why not try to make a straw rocket?

http://www.nasa.gov/audience/forkids/activities/A_Straw_Rocket.html

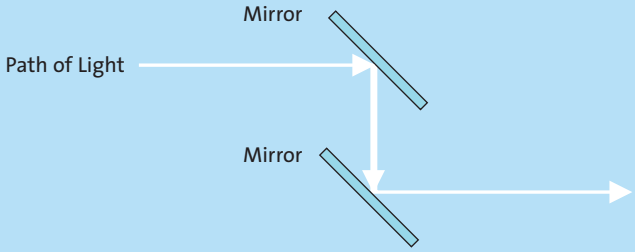
Here's a more advanced rocket to make:

Build a bottle rocket

http://teacherlink.ed.usu.edu/tlnasa/units/Rockets/18BottleRocket.pdf

See www.primaryscience.ie for flashbased version of activity.

Make a Periscope

SKILLS	Designing and Making
CROSS-CURRICULAR LINKS	**Maths:** – measurement, angles **SESE:** History – use in submarines, trenches
CONTENT	Light
EQUIPMENT	Cardboard (cereal packet) 2 small plastic mirrors (7.5 cm x 5 cm) for each periscope sellotape rulers protractors scissors
PREPARATION	Collection of materials. It's useful to make a periscope before you use the activity with a class. They have a model to use.
BACKGROUND INFORMATION	Mirrors can be used to help us see around corners. When light falls on a mirror at an angle it is reflected off the mirror at a similar angle. Therefore light falling on a mirror at an angle of 45° will bounce off it at 45°. So the total angle through which the light is turned is 90°. This means we can see what's around a corner.  A periscope uses two parallel mirrors facing each other to bounce light between them so that people can see round corners or look at things that are too high for them to see.
TRIGGER QUESTIONS	**When you throw a ball against a wall at an angle, in what direction does it bounce off the wall?** (At the same angle). **In what direction does light reflect off shiny surfaces?** (At the same angle as it hits the mirror, i.e. like the ball). **How can you get to see the back of your head?** (By using two mirrors). **How would you turn a beam of light through 90°?** (Using one mirror at an angle of 45°). **How do sailors in submarines see above the surface of the water?** (Using two mirrors at angles of 45°, i.e. using a periscope).
SAFETY	**Care with scissors**

Make a Periscope (cont'd)

ACTIVITY

Draw 3 lines on the cardboard to divide it into 4 equal strips (see diagram).

Cut squares (3 cm x 3 cm) in 2 of the strips as shown (1 cm from the top/bottom).

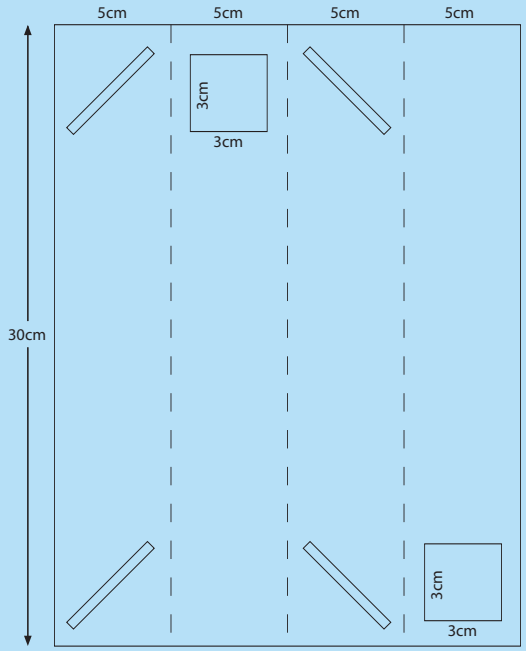
Cut 2 lines on each of the other 2 strips at an angle of 45° (see diagram) – again at a distance of 1 cm from the top/bottom.

Fold the card into a tube shape and stick it together with sellotape.

Slide the mirrors into the angled slits and tape them in position. One mirror should face upwards and the other should face downwards.

Test the periscope. Look into the bottom of the periscope under a table and see if you can see what is above the table. Use it sideways to see around corners.

Use the following diagram as a guide for constructing your periscope



FOLLOW-UP ACTIVITIES

Does it matter which end you look through? Try it the other way around.

Try using a milk carton to make a periscope.

How would see the back of your head? Can you think of how you might use mirrors?

See www.primaryscience.ie for flashbased version of activity.

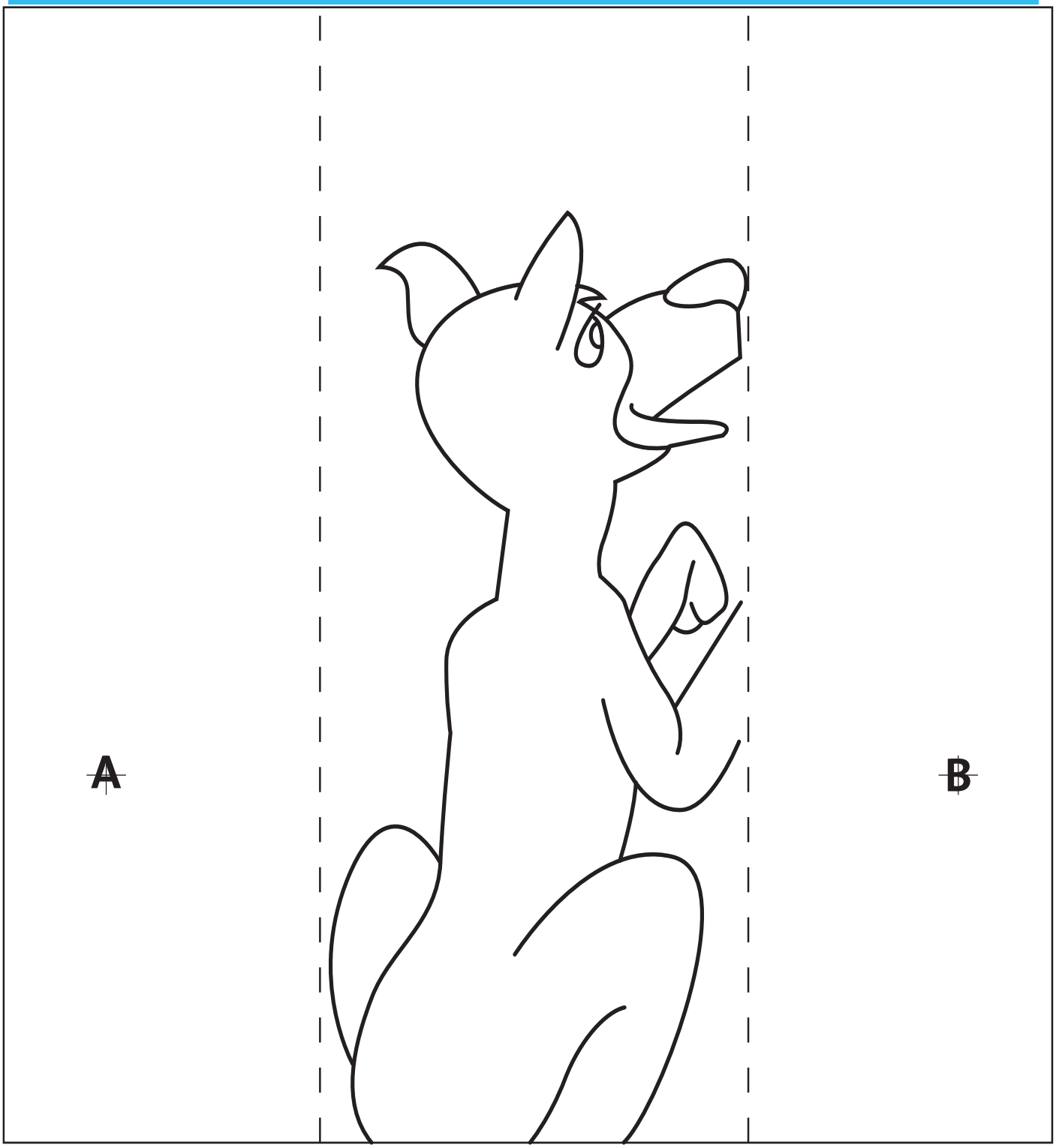
Make a Lever (Wag the Dog)

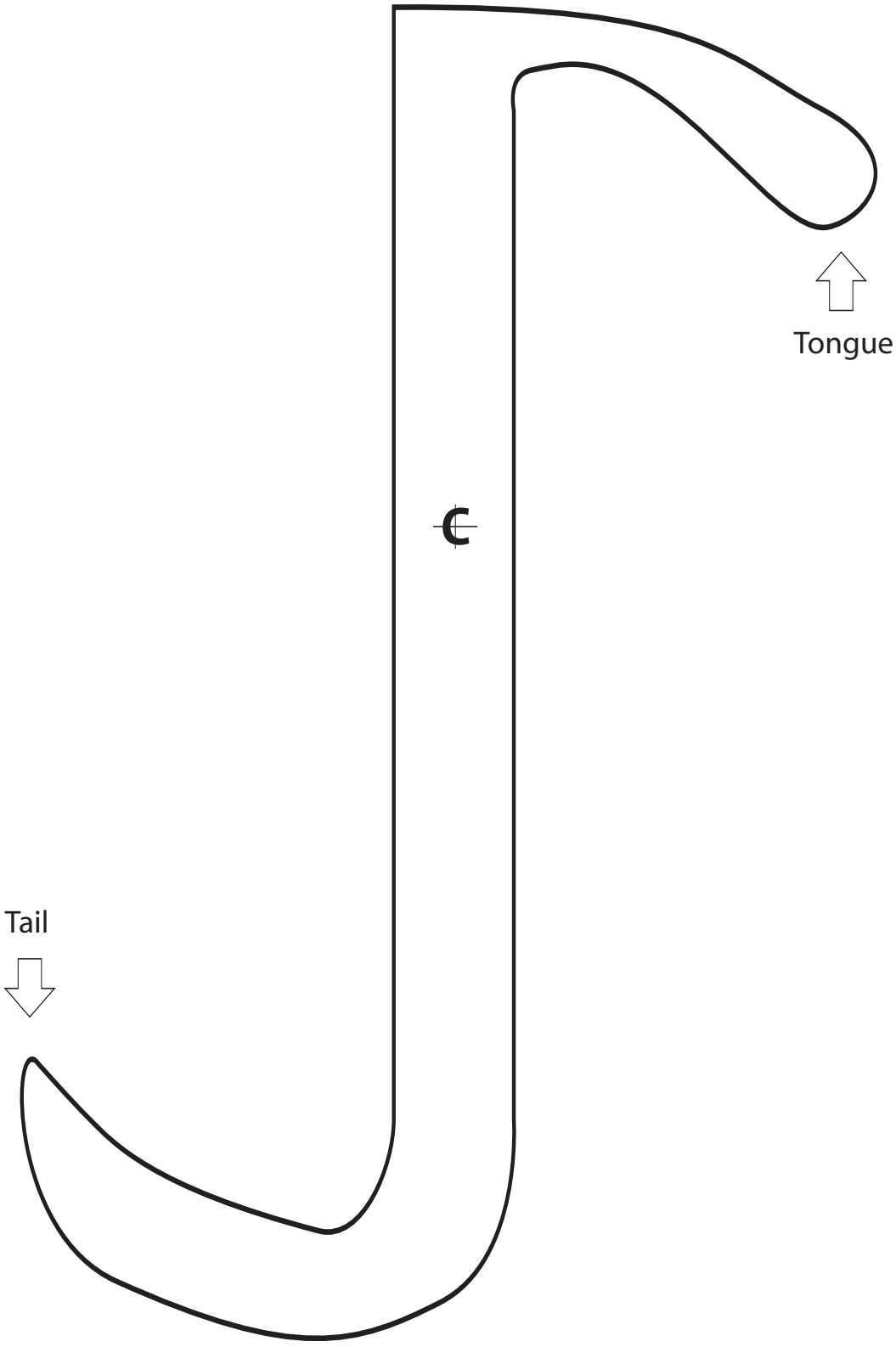
SKILLS	Designing and Making, Investigating and Experimenting
CROSS-CURRICULAR LINKS	**Visual Arts – Construction strand**
CONTENT	Forces
EQUIPMENT	Templates (dog + tongue/tail) cardboard (cornflake packets will do) scissors, coloured pencils/markers paper fasteners (split pin variety)
PREPARATION	Photocopy dog and tongue/tail templates onto paper and stick onto cardboard (e.g. cornflake packets), or photocopy directly onto card.
BACKGROUND INFORMATION	When you push or pull one part of a lever you make a push or pull on another part in the opposite direction. A lever is a simple machine consisting of a rigid bar that can turn about something called a pivot. Levers can be used to lift heavy weights or change the direction of a force (e.g. you sit on one end of a seesaw and the other end goes up; you press down on a screwdriver and the lid comes up). You can make toys which operate on this principle.
TRIGGER QUESTIONS	Molly wants to make a dog with a waggly tail that sticks its tongue out. She thinks she can do it with a lever. Ask the children questions about levers such as "If you have a tin with a lid which is stuck, how would you go about trying to get it off?" (They may suggest using a coin or a screwdriver). Talk about seesaws and ask questions about the direction of force, e.g."If you press down on one end by sitting on it what happens to the other end?"
SAFETY	**Care with scissors.** **Care with piercing holes in card for paper fasteners.** **(Care also if actually using real seesaws when the normal safety precautions would apply).**

Make a Lever (wag the Dog)

ACTIVITY	Make 'WAG' – a dog which sticks out its tongue when you wag its tail. Cut out the rectangular dog template along the solid purple line. Pierce holes at A and B for the paper fastener. Fold the card along the dotted lines. Cut out the mouth (along the solid purple line) after folding. Cut out the tongue/tail along the solid line. Pierce a hole in the tongue/tail at C. Slide the tongue through the mouth slot. From the inside put the paper fastener through the tongue/tail, then through A and B. Now wag the dog's tail and see what happens his tongue!
FOLLOW-UP ACTIVITIES	Can the children design another toy using a lever? Can they make a puppet? *See www.primaryscience.ie for flashbased version of activity.*

Make a Lever (Wag the Dog)




Tongue
Tail

Starting and stopping

CLASS LEVEL	**Fourth - Sixth classes**
SKILLS	**Predicting, experimenting, observing, recording, classifying, analysing**
CONTENT	Forces Living things – Myself – the ear
EQUIPMENT	1. Oranges (satsumas fit well into jampots), matchboxes, jampots, postcards. 2. 5 or 6 identical coins for each group of children, thick card e.g. postcard, rulers or flat knives. 3. Fresh eggs, hard-boiled eggs. 4. None.
PREPARATION	Hardboil eggs, collect rest of materials
BACKGROUND INFORMATION	It can be hard to get something to start moving. It can be just as hard to get something to stop moving. Things try to stay still if they are not moving – or keep moving if they are already moving.
TRIGGER QUESTIONS	**If you are standing on a bus which suddenly starts up, what happens to you? Which way do you tend to fall over? If the bus stops suddenly which way do you tend to fall?** *(When a car brakes hard or crashes, if the people inside it are not wearing seatbelts, they will keep moving forward even though the car has stopped; they can go through the windscreen).*

Starting and stopping (cont'd)

ACTIVITY	**1. Orange and Matchbox** Put the postcard on the jampot and place the matchbox cover vertically on top of it. Put the orange on top of the matchbox cover.Pull the postcard away quickly. What happens to the orange? *(It falls into the jampot. Heavy things, like an orange, are harder to move than light things, like the postcard and matchbox cover. The orange isn't moving, so it just falls into the jampot).* Try this as a 'double-decker' , i.e. 2 postcards and matchboxes! **2. Coins (See 'Safety' note)** Put a number of identical coins into a vertical pile. Can you remove the bottom coin without touching the others? *(Give the bottom coin a sharp horizontal blow with the card,ruler or knife and it flies off, leaving the others in a pile).* The pile of coins is heavy. It stays still when you knock out the bottom coin. The bottom coin on its own is light, so it moves easily when you hit it. This leaves a gap and the pile of coins falls to fill it. *(Magicians often use this trick using breakable things, e.g. whisking a tablecloth from underneath cups and saucers!).* **3. Eggs** Can you tell the difference between a fresh egg and a hardboiled egg? Set one egg spinning and then lightly touch it with your fingers to stop it. As soon as the egg stops take your fingers away. What happens? Repeat with the other egg. What happens? *(When you stop the fresh egg you only stop the shell but the white and yolk keep spinning. When you let go, the moving contents make the egg start spinning again. The hardboiled egg will not start spinning again because the egg is solid – there is nothing loose inside).* **4. Feeling dizzy?** Turn around a few times quickly. Do you feel dizzy? *(When you spin, liquid inside three tubes inside your ears spins too. When you stop suddenly, the liquid keeps on moving. Your brain thinks your body is still spinning, so you feel dizzy.)*
SAFETY	**Care with knives, rulers** **Care with 'flying' coins, i.e. that they do not injure another child.**
FOLLOW-UP ACTIVITIES	Take two similar-sized dolls and two similar toy cars or carts or skateboards which the dolls will fit onto. Tie one doll onto one car and leave the other doll loose on the other car. Ask the children to push the cars into a wall. What happens? *(The 'loose' doll will probably be thrown against the wall or out of the car, because it keeps moving even though the car had stopped.)* Discuss the use of seat belts in cars.

Which Paper Absorbs best?

CLASS LEVEL	**Fourth - Sixth classes**
SKILLS	**Investigating, Experimenting, Designing & making**
CONTENT	**Materials – properties and characteristics of materials** **Environmental Awareness and Care**
CROSS - CURRICULAR LINKS	Maths, Geography, Art
EQUIPMENT	Three different types of paper (e.g. serviette, kitchen paper, tissue paper), scissors, water, butter cartons, red food colouring and either a metre stick & blu-tack *or:* string and clothes pegs *or:* (for older classes): strips of wood, junior hacksaws, bench-hook, glue-gun, plasticine or blu-tack.
PREPARATION	Collection of materials.
BACKGROUND INFORMATION	Materials absorb water through capillary action. This means that water is attracted to the surface of the fibres and is drawn up into the spaces between them. The coarser the fibres the more easily the material absorbs water because there are more air spaces for the water to go into.
TRIGGER QUESTIONS	**Here are some questions to ask the children to set the scene for the activity.** If you spilt your drink what sort of material would you use to mop it up? Would you use an old plastic bag? Would you use a cotton rag? Would you use kitchen roll? Would you use a piece of rubber? What clothes dry the quickest on a washing line? Are those materials that absorb water the best? **You are going to be investigating -** What do you want to find out? (which paper absorbs the best) What will you change? (the paper) What will you keep the same? (size of piece of paper, amount of water, time) You are then experimenting, and observing. What do you see? What does this tell you about absorbing?

Which Paper Absorbs best? (cont'd)

ACTIVITY	Give the children 3 different kinds of paper and ask them to investigate scientifically which is the most absorbent. Show them what equipment is available to do it. Encourage the children to think of various ways in which this could be done with the available equipment. They need to design and make a support for their fair test. Then they need to see which paper absorbs the best. **A suggested way is as follows** Design a support for the fair test. Use a (metre) stick as a 'crossbar'. **OR** stretch string between two objects. **OR For older classes:** Cut the wood into three strips using the bench-hook and junior hacksaw and stick them together using the glue-gun to form a goal-post shape (or guillotine as some children call it!). See the note below on Design and make a support. Hang the three pieces of paper from the 'crossbar' or the string using blu-tack or plasticine. Put water into the butter carton (and a few drops of food colouring, which helps to show up the water) and hang the three pieces of paper so that they are just dipping into the water. Watch what happens. Display against the light for the best effect. How will the children decide which is the best absorber? (a discussion on what we mean by 'best' could follow, e.g. is it the paper which absorbs the fastest? Is it the paper which the water travelled furthest up? Encourage open-ended discussion, without right and wrong, etc.)
SAFETY	**Care with water.** **Care with the hacksaw and glue-gun (See 'Be Safe' booklet for safe use of these in the primary classroom). Adult supervision of these is essential.**
FOLLOW-UP ACTIVITIES	**Discuss what we use to absorb things –** paper vs cloths and their effect on the environment, hygiene. What should you use in your classroom? Children could try the activity with oil instead of water. Absorbing activities for younger children can be found at http://content.scholastic.com/browse/article.jsp?id=3370 **Additional Note**: *Design and make a support.* *Take a strip of wood 30cm long and either 8mm x 8mm or 10 x 10mm in diameter. (These can be purchased from many wood suppliers as 60cm lengths, or in packs of 30cm lengths by science suppliers).* *The object is to make a 'goalpost' shape from the strip of wood.* *The width of the goalpost needs to be greater than the length of the butter carton, say 20 cm.* *Measure and mark a length of 20cm from one end of the strip; then measure and mark the remaining 40 cm into two equal lengths for the uprights.* *Place the wood into the bench-hook and carefully saw the wood into three pieces.* *Using a low-temperature glue gun stick the three pieces together to form a goalpost shape.* *Leave it to settle for a few minutes to give it time to stick.* *The support can be made to stay in a vertical position by putting small pieces of blu-tak or plasticine under each 'leg'.*

Grow some crystals

SILVER

CLASS LEVEL	**Fourth - Sixth classes**
SKILLS	**Observing, Experimenting**
CONTENT	**Materials**
CROSS - CURRICULAR LINKS	Geography – Natural Environments, Rocks and soil
EQUIPMENT	Sodium bicarbonate *(bread soda)*, cream of tartar *(or Bextartar) (both obtainable in supermarkets)*, plastic container, stirrer *(e.g. plastic spoon)*, cold water, bowl of hot tap water. Hand lens to look at crystals.
PREPARATION	Collection of materials
BACKGROUND INFORMATION	Most solids are made up of lots of crystals. Crystals come in many shapes and sizes. Sometimes you cannot see them because they are too small or are stuck together. If you look at sugar under a magnifying glass you will see tiny glassy cubes. These are sugar crystals. We sprinkle tiny crystals of salt on our food. Diamonds are probably the most beautiful crystals of all. Their clear flat faces sparkle in the light. Crystals of a substance have a regular pattern; there are seven main crystal shapes. Crystals of the same substance are always the same shape. To make good crystals you need to make a concentrated solution of the substance, i.e. keep adding the substance to the water until no more will dissolve. Sometimes putting a small crystal of itself into the solution can act as a 'seed' to produce a large crystal.
TRIGGER QUESTIONS	**Here are some questions to ask the children to set the scene for the activity** What is a crystal? How would you describe a crystal? *(A crystal is a substance with a regular shape).* Do you know of any crystals? Where would you find crystals at home? *(salt, sugar, washing soda (take care), jewellery)* What shape are they?

Grow some crystals (cont'd)

ACTIVITY	Put one level teaspoon of bread soda into a plastic container. Add about 50 ml of water and stir well. Add one level teaspoonful of cream of tartar and stir well. What happens? *(Bubbles form. The two chemicals react together to form Rochelle salt).* Add a second level teaspoonful of cream of tartar and stir well. Repeat with a third level teaspoonful of cream of tartar. Stir well. To make sure the reaction has fully taken place put the container into a shallow bowl of hot tap water. Some solid will be left on the bottom; you can let it settle and pour off the clear liquid or else filter it. Leave the solution in a cupboard for several days for the water to evaporate and you should get some crystals of Rochelle Salt. Growing crystals takes time but the crystals are worth it.
SAFETY	**Sodium bicarbonate and cream of tartar are low-hazard chemicals, but, as with all chemicals, take care.** **Wash hands after activity**
FOLLOW-UP ACTIVITIES	**1. Try 'growing' your own sugar crystals as follows:** Tie a piece of string *(not nylon)* to the middle of a pencil and lie the pencil horizontally over the top of a jar with the string dangling into the jar *(but not touching the bottom or sides of the jar).* Fill a second jar with hot water and stir in sugar, a teaspoon at a time, until no more will dissolve. If you want coloured crystals add a few drops of food colouring. Now pour this solution into the first jar with the string. Put this jar in a place where it will not get disturbed. It could take a few days or weeks for the crystals to grow depending on the environment. **2. If you want to grow a mass of crystals or a crystal garden:** Pour your saturated solution over a rock, brick or sponge, cover with kitchen paper to keep out the dust and allow the liquid to evaporate slowly.

Exercise and your Heart

EQUIPMENT	Watch, paper, pencil, skipping rope (optional).
PREPARATION	None
BACKGROUND INFORMATION	Our hearts are pumping at a regular rate. This pumping can be felt by placing fingers across the pulse point at the wrist or the neck, and the rate can be counted. An adult's heart rate is around 70 beats per minute, and a child's is a bit higher. (A mouse's is about 500 per minute, and an elephant's 25!). Heart rate increases with exercise so that more of the oxygen carried in the blood can reach the muscles. The fitter you are, the quicker your heart rate returns to normal. (Some children may find it hard to find their pulse point, so it might be a good idea to encourage them to find it sometime before the lesson, e.g. after exercise in a PE class)
TRIGGER QUESTIONS	Where is your heart? What does it do? (Heart pumps blood to all parts of the body.) Why is it so important? (The blood brings oxygen to the muscles.) What is your heart rate? How would we measure it? Do you notice anything about your heart rate after you have been running? Or when you are frightened?
CONTENT STRANDS	Living things – Myself, Human lifeIntegration with SPHE - Taking care of my body, PE
SKILLS	Investigating, recording, analysing
ACTIVITIES	**1) Comparing heart rate before and after exercise.** Ask the children to take their own pulse. They can count the number of beats in 30 seconds and double this to get the number of beats per minute. They should record this. Then allow the children to run around or skip for 5 minutes and record their pulse using the same method. Finally let them rest for a few minutes and then take their pulse again and record it. How long did it take to return to the normal rate? Discuss with the children what happened to their pulse rate after exercise. Did it increase, stay the same or fall? The children can design a table or graph to show their results. Results can be collated to create a group or class chart. **2) See your pulse!** Find your pulse point on the inside of your wrist below your thumb. Place a piece of plasticine (or blu-tack) on this point and push one end of a drinking straw into the plasticine so that it stands upright from your wrist. Lay your arm flat on the table. If you keep your arm very still you may notice the straw rocking backwards and forwards slightly as the blood pumped by your heart passes through your wrist. If you have a watch you or your friend can count the number of times the straw rocks in one minute.

Exercise and your Heart (cont'd)

SAFETY	Children should be physically fit for this exercise. Children with medical problems should not be put at risk when investigating the effect of exercise on heart rate.
FOLLOW-UP ACTIVITIES	Measure breathing rate before and after exercise using a similar method. There are lots of lesson ideas and activities on HeartPower! This is the American Heart Association resource for teaching about the heart and keeping it healthy. You will find it at **http://www.americanheart.org/presenter.jhtml?identifier=300357**

5 Resources

Here are the curriculum resources referred to throughout this Activity Support Booklet and a comprehensive 'safety in science' reference.

Books

Government of Ireland. *Primary Curriculum. SESE: Science.* Dublin: Stationery Office, 1999, ISBN 0 7076 6327 X

Government of Ireland. *Primary Curriculum. SESE: Science Teacher Guidelines.*
Dublin: Stationery Office, 1999. ISBN 0 7076 6337 7

Irish Science Teachers' Association/Association for Science Education. *Be Safe Irish Edition.*
Dublin: ISTA/ASE, 2004. ISBN: 0 9547322 0 0

Children's science series such as *the Kingfisher, Dorling Kindersley, Usborne, Star Science, Hands On Science, Science Magic, How it Works, Discover Science, Start Science* are useful references and sources of ideas for activities.

Websites

Discover Primary Science
www.primaryscience.ie
This is the website for Discover Primary Science.

Science explorer, The Exploratorium, San Francisco,
www.exploratorium.edu/science_explorer/index.html
There are many science activities that children can try.

Kill o the Grange National School
The children and their teacher James Malseed have developed web pages on sound and light with information and activities.
homepage.eircom.net/~kogrange/sound_index.html
homepage.eircom.net/~kogrange/light_index.html

'Fionn' Primary School Science Films
This is the web page of the 'Fionn' science project based at Galway Education Centre. They show the work of the children in 35 schools. There are ideas for further activities.
http://www.scispy.ie/fionn_films/01.aspx

Sci-Spy Exploring the World of Science
www.scispy.ie

EUREKA This is a science magazine for primary schools, is published in association with the Irish Independent. For more information see
www.unison.ie/eureka

Other useful resources can be found in the Activities section of the website **www.primaryscience.ie.** Reviews of useful and relevant websites and books will be uploaded throughout the year.

Resources

List resources you have found useful for future reference:

Hints Pages

As you use this Activity Support Booklet in your classroom, you may devise useful hints for future use with activities (see examples below).

Use these pages to document your own ideas to share with other teachers using the Support Booklet.

Examples:

- Mirror Writing - can lead into Make a Periscope Activity.
- Cabbage Dying - boil prior to using; compare with onions.
- Dancing Raisins - smaller raisins work better than big ones.
- Making a Diver - make sure no hole in pen lid.
- Make a Rocket - ensure no hole in film canister.