Science & Technology Equipment News

Number 29
Spring 2004

For Primary Schools and Teachers of S1/S2 courses

STS National Support Services in Science, Technology, Safety

Helpline: 0131 558 8180 Fax: 0131 558 8191
Email: sts@sserc.org.uk Web:www.sserc.org.uk
ISE 5-14 website : www.ise5-14.org.uk/prim3/head2.htm

 ISSN 1369-9962

Child's play – maybe not!

We recently revisited one of our library boxes containing 5-14 publications and found a bundle, published by LTS that is pithily named Primary Technology in Scottish Schools (Education for Technological Capability) and National Guidelines Information and Communications Technology.

The Primary Technology booklets contained in this bundle do show some progression and give examples of well-known projects such as model windmills and lighthouses. However, these booklets raise the question of whether we should expect, or instruct, primary children to build towers from wood and Jinks corners! The use of card triangles to make a frame is an excellent idea, but surely not a tower or lighthouse. Consider both the time and resources required. Should we be using adult tools in primary education? Are the pupils strong enough? Are their motor skills developed enough? What educational benefit is there in having a child saw a piece of square section with a junior hacksaw - a tool not designed for the purpose and a tool with which an experienced adult would have difficulty in producing a square end in wood? We know that children enjoy using tools and would happily saw and hammer all day long, but does this engender technological capability? Probably not. It would be better to wait for an apprenticeship or DIY opportunities after buying a house to achieve this!

For primary technology projects, there are a multitude of non-resistive materials to work with. Modelling clay, corrugated plastic, paper and card to name but a few. The only adult tools required to work with these are a pencil, ruler and scissors. Cutting to a line, in such materials, with scissors or a craft knife gives adequate practice in producing a square end. Wood can come much later. In this way, modelling a recognisable object can become an achievable project.

A simple plasticine model ('fun' lamp) that can incorporate some progression from early years through to P4, was shown in News 20. Other ideas for modelling in paper or plasticine are a bedside lamp, an egg holder or, as the season approaches, Easter decorations.

Technology is indistinguishable from magic[1]

What follows is a simple technological project that could be incorporated into a lesson on magnetism. Our technology/ science project is a simple buggy made from a matchbox. No sawing, hammering or soldering is required. The items needed are: 1 matchbox; 1 drinking straw; 2 cocktail sticks; 4 reducers (4mm to 2mm); plasticine or blu-tack, and 3 magnets, see Figure 1 below.

Figures 2 and 3 show how the buggy is assembled. To make the buggy, cut the drinking straw to the width of the matchbox and tape it to the box as shown in Figure 2.

Break or cut the sharp ends from the cocktail stick axle, place through the straw and push on the reducers as wheels. Blu-tack two magnets inside the matchbox tray and replace the tray. You now have a magnet buggy (Figures 3 and 4 on page 2).

Once complete, students can be asked what they think will happen when the third magnet is placed near the buggy! What will happen if the magnet is turned around? Is this magic? Hint - it is easier to push than pull the buggy with a magnet.

Figure 1 *What you will need*

Figure 2 *Attaching straws for cocktail sticks*

Figure 3 *Magnets placed in tray*

Figure 4 *Completed matchbox buggy*

When the ear begins to hear and the eye begins to see [2]

In our experience there has been considerable goodwill from teaching staff in primary schools in coming to grips with ICT. This has, in the main, been directed at learning to understand and use word processors, e-mail, web browsers and spreadsheets. To date, we have not seen much evidence of the use of computers in control and certainly none with robot arms. Perhaps we have not been looking hard enough; if you do have a robot in your school an e-mail to SSERC would be most welcome. Information on the use of robot arms can be found in News 26.

What we have found in schools are 'ROAMERS' (Figure 5 below), lots of them, some underused because batteries are so expensive[3], others because the teacher who bought them has left and no-one has had time to dust them off and begin again. However, on a more positive note, we have been told that the employment of classroom assistants has helped teachers make more use of such equipment, as they are available to check batteries, lay out mats and supervise groups etc.

One method of addressing many of the outcomes in the strand Controlling and Modelling is to use Roamer. Consider the following simple exercise. Ask or 'command' a pupil to stand, turn right, walk forward two steps and then stop. What were the steps in this simple exercise?

Figure 5 *Roamer*

We used speech (sound) to tell our subject to move. Sound enters the ear (Figure 6 below) as a series of waves. These waves pass into the ear and vibrate a membrane called the eardrum. The vibrations of the eardrum cause some small bones (in fact the smallest bones in the body) called the hammer, anvil and stirrup to also vibrate. These vibrations are then passed to small hairs in the cochlea and converted to an electrical signal that passes along nerves to the brain. Further electrical stimuli are then sent via nerves to those muscles required to produce movement. This is a much-simplified version of what happens in the complex system that is the human body. However, could this simple investigation not be used to cover the senses, energy and ICT?

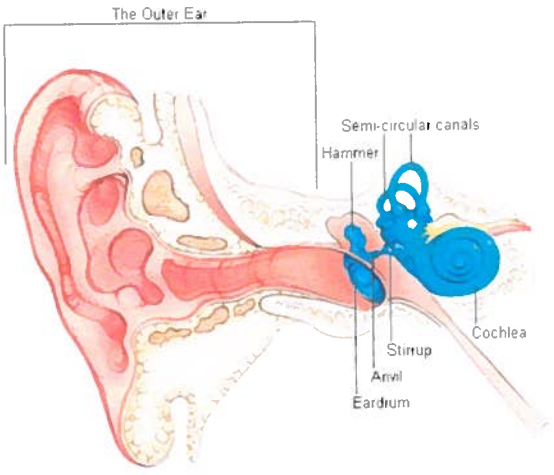

Figure 6 *Diagram of the ear*

Ever let the fancy roam [4]

What has all this waffle about ears and sound waves to do with controllers? The answer is, of course, electricity. Electricity is an easy form of energy to control. Think of a light switch at home or, for more sophistication, a switch at a pedestrian crossing. In the previous exercise, it was explained that, in humans, electrical signals are sent to the brain and muscles to produce movement. Using similar electrical signals, we can do the same with Roamer but in this case the electrical signals will be sent to an electric motor.

If a Roamer is told where to go and what to do it will 'remember' these instructions. When Roamers' switches are pushed, electrical signals are sent to its 'brain'. If they are input in the correct order the instructions will be carried out.

Imagine Roamer is going into a burning school to search the classrooms. How can it be asked to look in all the classrooms? To do this, Roamer must be given a set of instructions called a program. When writing programs remember that the computer carries out your instructions as you write them - first instruction, first action. The Roamer instruction booklet is easy to follow and is an excellent introduction for those approaching this type of programming for the first time.

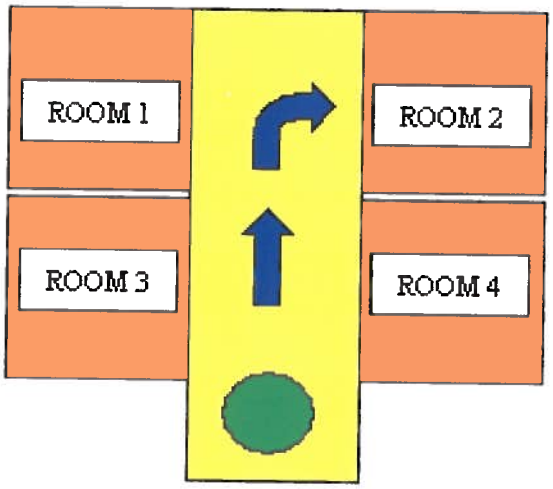

Figure 7 *Fire rescue template on scrap wallpaper*

A simple diagram drawn on a roll of surplus wallpaper can be used to simulate a 'burning school' to test out a Fire Rescue program, see Figure 7 above.

The part program shown in Figure 8 below, is one way of instructing Roamer to inspect each room - but what will this achieve? Is the robot equipped to be of any help in this situation?

Send in Roamer (Press Cm Twice before entering instructions)

Instruction (Program)	Meaning
5	Forward 5 lengths
9 0	1/4 turn right
3	Forward 3 lengths
1 8 0	Turn around
3	Back 3 lengths

Figure 7 *Start of program to search rooms*

One look at Roamer is all that is needed to generate a debate on this. How can the robot see, hear or help anyone trapped by the fire? What could be added to Roamer to make it more useful? Well, amongst other things, Roamer could be given a microphone/speaker for communication, a camera to provide 'vision', a fire extinguisher to fight the fire and a buggy to pull survivors from the flames.

Whatever happens remember - **DON'T PANIC** [5] this is a box containing passive electronic components powered by a low voltage battery, difficult to cause any serious damage.

[1] Arthur C.Clarke Lost Worlds of 2001

[2] Emily Bronte The Prisoner

[3] Batteries for Roamer can be purchased from Rapid Electronics - see below for details

[4] Keats Fancy

[5] Douglas Adams The Hitchhiker's Guide to the Galaxy

From an ancient Egyptian papyrus
A professor translated a virus
It was rather terrific
For an old Hieroglyphic
Now his computer is cursed by Osiris

anon

Supply details

Rapid Electronics - Roamer batteries
Severalls Lane
Colchester
Essex CO4 5IS
Tel. 01206 751166
Part Number PJ996/4R25
0 to 5 batteries - £1.60 each
6 to 23 batteries - £1.30 each
24 + batteries - £1.20 each

Available from SSERC -
4mm to 2mm reducers pack of 5 @ 25p - item 867
Ceramic magnet 12p each - item 823

Interesting web sites on the ear and hearing

http://www.rnid.org.uk/

http://www.bbc.co.uk/science/humanbody/body/factfiles/hearing/hearing.shtml

Components & Materials

Item	Description	Price
593	Miniature motor, 1.5V to 3V, 2mm dia. shaft	30p
614	Miniature motor, 3V to 6V, 2mm dia. shaft. Both motors above can be used for project work but they run at fairly high speeds, some gearing will be required. See worm/gear, item 811	45p
621	Miniature motor, 1.5V to 3V, now with 8 tooth pinion. The open body of this motor makes it ideal for showing how such a motor is constructed	25p
798	Pack of 24 gears, 6 each of 12, 20, 30 or 40 teeth, dia.15, 22, 32 and 40 mm. 12 tooth gear fits motor shaft and 40 tooth gear push fits in cotton reel	£2.00
799	Pack of 24 cams, 6 of each of 4 shapes	£1.00
800	Pack of 100 wheels, 39 mm dia., assorted colours, 3 mm axle hole	£5.25
811	Worm and gear, 34 to 1 speed reduction	35p
817	Axles 3 mm dia., nickel plated, round ends, push fit on SSERC plastic wheels, gears and pulleys: 70 mm long, per pack of 4	40p
818	As above but 95 mm long, pack of 4	40p
819	As above but 12 mm long, pack of 4	40p
820	Worms to fit 2 mm electric motor shaft, pack of 5	£1.00
821	Reducers 3 mm to 2 mm enables gears, pulleys and wheels, to be fitted to motor shaft, per 5	25p
867	Reducers, 4 mm to 2 mm, as above, per 5	25p
868	Reducers, 4 mm to 3 mm, as above, per 5	25p
723	Microswitch miniature, lever operated	40p
822	Plastic toggle switch, low voltage	40p
688	Crocodile clips, red, miniature, insulated	5p
759	As above, but black	5p
788	Crocodile leads, assorted colours, insulated croc. clips at ends,36 cm long. Pack of 10	£1.35
835	2 x AA Cell ('battery') holder	15p
845	2 x C Cell ('battery') holder	20p
729	Battery connector, PP3 type, snap-on press-stud, suitable for Items 835 and 845	5p

Item	Description	Price
789	MES (miniature Edison screw) bulbs 3.5 V	10p
691	MES battenholders for above	20p
866	Lens end lamps, 1.2 V MES. Ideal for use where a narrow, concentrated beam of light is needed. Bargain pack of 100	£3.50
508	LED (light emitting diode) 3 mm, red, per 10	50p
761	LED 3 mm, yellow, per 10	60p
762	LED 3 mm green, per 10	60p
790	3V buzzer (works with solar cell see Item 838)	55p
846	Sound module with 'melody' chip	£1.00
838	Solar cell, 100 x 60 mm, max 3.75 V per cell	£2.10
839	Solar motor, body 25 dia.12 mm long with shaft 2 mm dia 6 mm long	£1.70
840	Solar pack: one of each solar cell, solar motor propeller (801), and 3 V buzzer - with notes	£3.75
836	Motor mounts, plastic, push-fit with self adhesive base pad for SSERC motors 593 & 614, 10pk	£2.35
801	Propeller, 3 blade, to fit 2 mm shaft. Blade 62 mm long	35p
792	Propeller kit with hub and blades for ten 3 or 2 bladed propellers	£3.50
794	Cotton reels (for making buggies, rubber powered tanks etc.) pack of 20*	£1.25
796	Pack of 20 pulleys, 5 of each of 10, 20, 30 and 40 mm diameters.	£2.50
837	Ring magnet, 40 mm o.d., 22 mm i.d.	35p
815	Ceramic square magnet, 19 x 19 x 5 mm	15p
823	Ceramic magnets, poles at ends, 10 x 6 x 22 mm	12p
861	Bimetallic strip, 10 cm length	30p
882	Quartz clock movement , dimensions 56x53x17 mm, with wall hanging bracket, Suitable for dial thickness up to 10 mm. Includes plastic hands suitable for dial diameter to 200 mm. Requires an AA battery. See CD Clocks, Newsletter 18	£1.75
884	Onager kit. Wood cut to length etc.	£2.00
885	Chariot kit. Templates and parts	£2.00

Item 794* **Not *200 as previously stated in error*

A fully illustrated version of this list is posted on the "Shop" section of the SSERC members' website.
This Newsletter and previous issues can also to be found in web page format on
the Improving Science Education 5-14 website at: www.ise5-14.org.uk

Prices do not include VAT or carriage. Please do not send payment etc. but await delivery and then pay on our advice note or invoice.

SSERC, St Mary's Building, 23 Holyrood Road, Edinburgh, EH8 8AE Tel: 0131 558 8180 Fax: 0131 558 8191
Email: sts@sserc.org.uk Web: www.sserc.org.uk