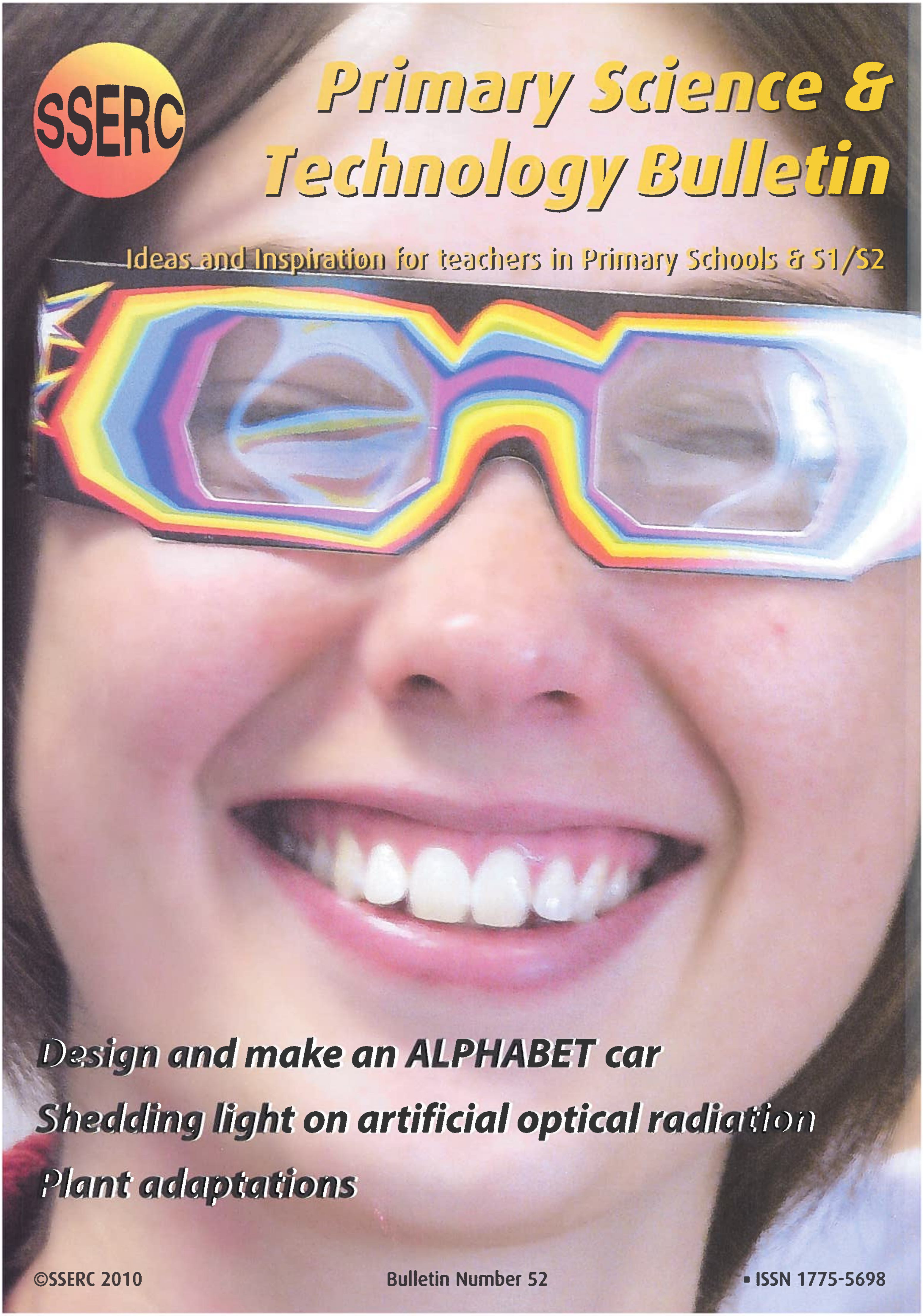
SSERC

Primary Science & Technology Bulletin

Ideas and Inspiration for teachers in Primary Schools & S1/S2



Design and make an ALPHABET car

Shedding light on artificial optical radiation

Plant adaptations

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Design and make an alphabet car

The capital letters of the alphabet can provide a good starting point for chassis shapes in an easy-to-do design and make project. The chassis is the framework that supports all the bits of a man-made vehicle.

The materials used in this project were Corriflute (also called Correx) [1], plastic wheels, 3 mm wooden dowelling, sticky tape and a balloon. We subsequently found that plastic "washers" and rubber bands were needed to solve some of the problems encountered during testing of the vehicle.

The task: design and make an air-powered vehicle which will travel at least 2 metres in a straight line.

Design decisions

Which capital letters of the alphabet would provide good shapes for the chassis of a vehicle? Think about chassis on vehicles you are familiar with. Once the letters have been selected consider how many wheels each should or could have. Which shapes lend themselves to 3 wheels, four wheels or even more?

At this stage you are ready to begin the process of designing and building your vehicle. We set the task so that the chosen letter had to be drawn on one A4 sheet of paper. By using squared paper it ensures that edges are kept straight and symmetry is maintained where necessary. When that is satisfactorily completed the shape can be cut out to provide a pattern to use when cutting the Corriflute. (See Figure 1)

The channels in Corriflute (3 mm thick) will hold 3 mm dowelling and using this provides an easy way to guarantee that the axles are parallel. It is therefore important to note which way the channels are running when cutting out the original shape.

The next decision concerns the number of wheels – in this case we chose to put 3 on the vehicle but it could have been 4 or more. To fit 3 wheels onto this chassis it was decided to cut a slot in the base of the letter to fit in the wheel (See Figure 2). Other solutions may be possible.

At this stage you need to fit washers either side of the back wheels to make the vehicle run smoothly. This can be seen in Figure 2.

Making it move

Here we use a power unit which is a balloon filled with air. How is this going to be mounted on the vehicle? Where should it be positioned? How should the balloon be fitted onto the mounting? In which direction will the vehicle move? See Figures 3, 4 and 5.

Figures 4 and 5 show the two options considered for the balloon. Can you suggest why the version in Figure 4 was the one chosen?

Problem solving

Two further problems were encountered with the vehicle. The first was keeping the balloon mounting sufficiently upright to hold the balloon and the second was that

Figure 1 - Ready to cut.

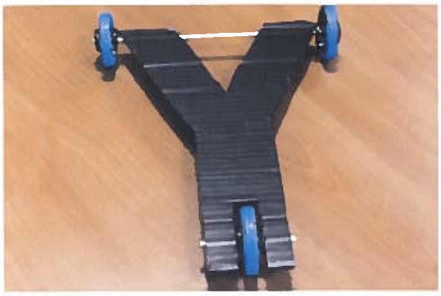

Figure 2 - The finished chassis.

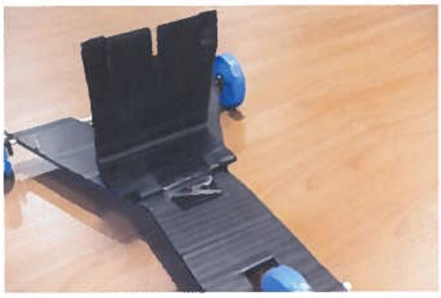

Figure 3 - Balloon mounting.

Figure 4 - Balloon position 1.

Figure 5 - Balloon position 2.

Shedding light on artificial optical radiation

If someone asked you, "Are you complying with *DIRECTIVE 2006/25/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 April 2006 on the minimum health and safety requirements regarding the exposure of workers to risks arising from physical agents (artificial optical radiation)?"* would you run off and hide in a cupboard? Hopefully not.

This is legislation designed to ensure that people are not exposed to artificial light that might harm them. It includes not just visible light but infrared and ultraviolet too. The chances are that all the lighting sources in your school are on the Health Protection Agency's "safe list" below:

- Ceiling lights
- Computer or similar display screen equipment
- Desk lamps
- Photocopiers
- Indicator LEDs
- Personal digital assistants (smart phones etc)
- Photographic flashlamps
- Interactive whiteboard presentation equipment

In general, therefore, you have nothing to worry about but there are two situations to watch out for. If a person stands at the front of the class giving a presentation using an LCD projector, make sure that they are not staring into the beam. Secondly, beware of laser pointers. Pupils should not bring them to school at all. If you see a pupil with a laser pointer, take it from them. Teachers can use laser pointers to highlight things on a board or chart, but should take the following precautions:

- Make sure your laser pointer has a sticker or certificate that says it is Class 1 or 2, but not class 1M, 2M, or any class greater than 2;
- Do not leave it lying around where pupils can pick it up;
- Do not point the beam at a person;
- Do not let the pupils use it;
- Beware of reflections.

A laser pointer is not very powerful, but the power is concentrated in a narrow beam. This makes it more hazardous. It is similar to the way that even a wee skelf of a person can hurt you if they stand on your foot with a stiletto heel.

Figure 1 - Eye protection not needed.

All their weight is concentrated on a small area. Class 1 or 2 laser pointers have a power level low enough that your natural reflexes – blinking or turning away – protect you even if the beam does get in your eye. Since there have been cases when people have deliberately over-ridden this reflex, it makes sense not to let young children use lasers. We've heard, too, of unclassified laser pointers that are nine times more powerful than they should be, so don't buy one without evidence of its laser class.

Any science or technology activities using unusual light sources should come with a risk assessment and safety information. If you have any doubts, contact SSERC.

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the vehicle would not move on the tiled floor. Can you see how these problems were solved from the photographs?

Further challenges

So far we have described the making of a basic vehicle but this simple design idea can be used to open up a wide variety of more challenging activities. See the Science3-18 website [3] for a full list of design considerations.

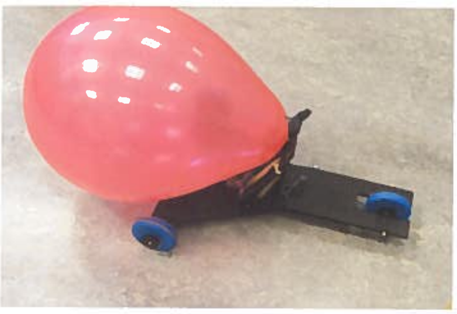

Figure 6 - The completed car.

This activity could be used to help teachers to address the Technologies Experiences and Outcomes:

I explore materials, tools and software to discover what they can do and how I can use them to help solve problems and construct 3D objects which may have moving parts. - **TCH 1-12a**

By applying my knowledge and skills of science and mathematics, I can engineer 3D objects which demonstrate strengthening, energy transfer and movement. - **TCH 2-12a**

Through discovery and imagination, I can develop and use problem-solving strategies to construct models. - **TCH 1-14a/TCH 2-14a**

Having evaluated my work, I can adapt and improve, where appropriate, through trial and error or by using feedback. - **TCH 1-14b/TCH 2-14b**

References

[1] http://www.technologysupplies.co.uk/catalog/search.aspx?keywords=Correx
[2] http://www.ypo.c.uk (Cat. No. 545228)
[3] http://tinyurl.com/alphabet-cars

Plant adaptations

When children visit an environment they can be encouraged to consider why certain animals and plants live there and not in other places. For example if they visit a seashore they will observe very different living things from the ones they might see in a pond or that they are used to seeing in the playground. They might be able to discuss the sea water's salty environment.

The following activity is a nice follow-up to a trip to the seaside and helps children to understand that some plants are not suited to a marine environment. You need to collect a small amount of sea water whilst on the visit and you will also need cress, or other fast-germinating seeds.

We used three Petri dishes, each lined with filter paper on which to germinate the seeds. One paper was soaked in seawater, another in tap water and the other in a 50:50 mixture of seawater and tap water. Make sure that the dishes are appropriately labelled. Twenty cress seeds were then added to each dish (see Figure 1) and all dishes were left on a window sill to germinate. Take care to ensure that the paper does not dry out but only add the previously used seawater and/or tap water to any dish that requires topping up.

Figure 1 - seeds in Petri dish.

Figure 2 - Seeds in tap water after 2 days.

This was repeated several times and similar results obtained. If groups in the class do the investigation, are their results similar to each other? – in other words are the results reliable? The investigation could be extended by using different dilutions of seawater - how does this affect the numbers of seeds which germinate? Although quite tricky to do with small plantlets, measure-ments of either root length or shoot length could be made to see if different salt water concentrations affect growth in these plants.

As well as developing inquiry and investigation skills this activity could be used as part of a programme to address Experiences and Outcomes from the Planet Earth organiser i.e.

I can distinguish between living and non living things. I can sort living things into groups and explain my decisions. **SCN 1-01a.**

I can identify and classify examples of living things, past and present, to help me appreciate their diversity. I can relate physical and behavioural characteristics to their survival or extinction. **SCN 2-01a.**

I can help to design experiments to find out what plants need in order to grow and develop. I can observe and record my findings and from what I have learned I can grow healthy plants in school. **SCN 1-03a.**

After 2 days	
tap water	18 seeds had germinated (see Figure 2)
50:50 tap:seawater	2 seeds had germinated
seawater	0 seeds had germinated

The SSERC Primary Bulletin is published by SSERC, 2 Pitreavie Court, South Pitreavie Business Park, Dunfermline KY11 8UB
Telephone: 01383 626070 Fax: 01383 842793 E-mail: sts@sserc.org.uk Web: www.sserc.org.uk & www.science3-18.org
Managing Editor - Fred Young