



DESIGN AND MAKE TRAFFIC LIGHTS

Equipment:

Older children:

Empty tissue box, black paper, scissors, sellotape or glue, cellophane paper (*red, orange and green*);
4 crocodile leads with clips (*or wires and screwdriver*),
3 bulbs + holders, battery.

N.B. The voltages of the battery and bulbs should be chosen carefully: e.g. 3 x 1.5v or 2.5 volt bulbs should light with a 4.5 volt battery.

For the switch: small piece of cardboard, 2 paper fasteners, 1 paper clip



Younger children:

Empty tissue box, black paper, scissors, sellotape or glue, cellophane paper (*red, orange, green*), torch.
Optional: tissue paper (*red, orange, green*).



Suggested Class Level:

5th/6th (*for electrical version*).
Younger classes (*for version using torch*).

Preparation:

This activity is time-consuming. Allow plenty of time for it, i.e. a double class.

As stated under 'Equipment' above, the battery and bulbs should be chosen carefully: **it will be important that the children only connect the bulbs to the battery after the bulbs have been connected up in series (i.e. in a line)**. If one bulb is connected up to the battery on its own it may 'blow' because it is getting all the energy from the battery, instead of the energy being shared out between the 3 bulbs.

Children should have carried out an activity on simple circuits, including a 'series' one (*i.e. three bulbs connected together in a line to a battery*), to see the effect of adding another bulb to the circuit. This should help them to understand the connection between the voltage of the bulbs and the battery (*the sum of the bulb voltages, e.g. 3 x 1.5v = 4.5v*) should not be a huge amount less than or greater than the voltage of the battery):

Too much voltage (*energy*): bulbs 'blow'

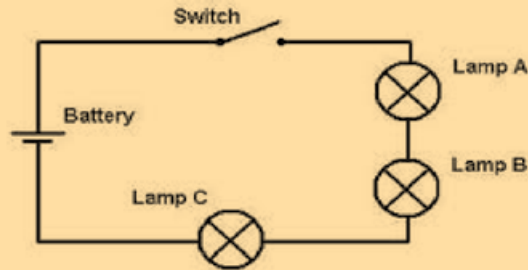
Too little voltage (*energy*): bulbs will not light



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Background information:

The electric circuit in this activity is a series one, i.e. the bulbs are joined together in a line with the battery.



In this arrangement, the electrical energy provided by the battery is shared out between the three bulbs, so the more bulbs you add, the less energy each bulb gets (*therefore the brightness of each bulb is diminished*).

The word 'amber' is often used for the orange light in traffic lights. In this activity the description 'orange' will be used.

Trigger questions:

Where do you see traffic lights? (*At road junctions*)
Why are they there? (*They control competing flows of traffic*).
Are they used anywhere else? (*To let pedestrians cross busy roads*).
What are the colours of traffic lights?
What does each colour mean?

What do red cards and yellow cards in football mean?
In what order are the lights arranged on the traffic signals; i.e. which is on top, middle and bottom? (*Red on top, orange in the middle and green on the bottom*).

In what order do the colours light up?
(*Red, green, orange*).

Is this the same in all countries?
(*No. In the UK, the lights go: Red, red and orange, green, orange*)

If you don't have a battery with enough voltage (*electrical energy*) what do you think will happen?
(*The bulbs won't light*).

If you have a battery with too high a voltage what do you think will happen? (*The bulbs will blow*).



Colour sequence in Ireland



Colour sequence in the UK



Content:

SCIENCE: Energy and Forces – Electricity, Light

MATHS: Number: operations
Shape and Space: 2-D shapes
Measures: Length, scale



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|--------------------------------|---|
| Skills: | Experimenting Designing and Making |
| Cross-curricular Links: | Art SPHE – road safety |
| Activity: | <p><i>Older children:</i></p> <p>Children can design and make (<i>remember: Explore, Plan, Make, Evaluate</i>) their own traffic lights.</p> <p>One possible way is as follows:</p> <ul style="list-style-type: none">• Cover the bottom and sides of the tissue box with black paper. Leave the top (<i>where you pull the tissues out</i>) uncovered, in order to insert the electrical parts in from the back.• Draw and cut out 3 circles, approximately 6 cms in diameter, at equal intervals and in a line vertically on the base of the box (<i>which is covered with black paper</i>).• Cut the 3 different colours of cellophane to fit over the holes. Glue them over the holes in the correct order. <p>Now for the electrical part:</p> <ul style="list-style-type: none">• Put the 3 bulbs in the bulb-holders, connect them in a line (<i>using crocodile leads or wire</i>) and attach them to the tissue box so that each bulb is opposite a hole with cellophane.• Connect the free ends of the crocodile leads or wire to the battery.• What happens? <p>An empty kitchen roll can be inserted into the box to make the post for the traffic lights to stand on.</p> <p>A switch can be inserted in the circuit as follows:</p> <ul style="list-style-type: none">• Insert two paper fasteners into cardboard, the length of a paper-clip apart.• Join them with a paper-clip so that the latter can swivel.• Join the wires from the circuit to each paper fastener at the back of the cardboard.   |



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Younger children:

Younger children could also do this activity:

- Instead of using the electrical circuits they could shine a torch behind the three different coloured cellophanes in turn.
- They could discuss the difference between transparent (*cellophane*) and opaque (*tissue box*) things.
- Coloured tissue paper could be used also. They may be able to put faces on the paper using appropriate materials.



Safety:

Careful with scissors cutting out the circles in the tissue box – this can be tricky if the scissors slips. An adult could start to make the hole for younger children.

Maths – mainly for Seniors

1. What shaped signs give:



2. Coming from a certain direction at a road junction: the green light is on for 20 seconds, the orange for 4 seconds, and the red for 20 seconds. How many times will the light go green in 5 minutes?
3. A set of traffic lights in Cork has the following measurements (*i.e. the rectangular part not counting the pole*): 100 cms high, 40 cms wide. The diameter of each of the 3 lights is 20 cms. Draw a plan of these lights to a suitable scale (*leave just a small gap between the lights*). What scale did you use?



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Follow-up activities:

1. Can the children think of other materials which could be used to make a set of traffic lights?
2. The more advanced children could try making a set of traffic lights in which only one light would be switched on at a time, using just the one battery with a 3-way switch.

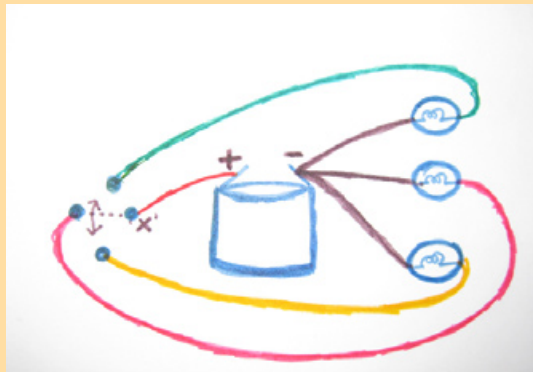
Hint: a 3-way switch can be made using 4 drawing pins or paper fasteners attached to cardboard in a diamond shape.

Connect the 3 bulbs separately to the negative terminal of the battery; the other side of the bulb-holders should each then be connected to a different drawing pin.

Connect the fourth drawing pin (*call it 'x'*) to the positive terminal of the battery. Attach a small metal object, e.g. a paper-clip, to drawing pin X and swivel it around so that it can touch each of the other 3 drawing pins, one at a time.

The children could try working the above out for themselves.

If they need a hint, the following diagram might be helpful:



3-way switch: The paper clip attached to 'x' can swivel around to touch any of the other three pins depending on which bulb you want to light up.

'Traffic light' (*stop/go*) games could then be played using the traffic lights as it would be possible to light just one colour at a time.