Support Resources

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Workshop Summary

The *Bright Sparks* workshop is designed to introduce pupils to the everyday uses of electricity.

The workshop opens with a discussion and demonstrations that explore electricity, how it works and how we use it. Pupils then work in groups to design and build a small electronic gadget designed to do a specific task. Higher ability or upper Key Stage 2 pupils have additional parameters set in their challenge.

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Acknowledgements

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Skills Development

The activities in the workshop and these support resources feature the following skills:
Electricity in School

In this activity, pupils investigate different uses of electricity and the materials used as conductors and insulators. Their investigation will lead them around the school, finding out about the uses of electricity.

What you do:
• Split the class into no more than six groups.
• Give each group one of the questions to investigate (two groups should have the same question).
• Give the groups a time limit to go around the school finding examples of uses of electricity in and around the school building.

Instructions to pupils:
In your groups, explore the school.
1. Can you find examples of conductors and insulators?
2. What ways do you use electricity in school?
3. Can you find things that use batteries?
Pupils could photograph the items they find to present to the class.
Mini Drivers

Four friends all want to drive in the toy car. Here is some information about them.

<table>
<thead>
<tr>
<th>Child</th>
<th>Date of birth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sion</td>
<td>23rd December 2009</td>
</tr>
<tr>
<td>Amanda</td>
<td>1st June 2005</td>
</tr>
<tr>
<td>Rhys</td>
<td>21st July 2011</td>
</tr>
<tr>
<td>Cathy</td>
<td>3rd November 2008</td>
</tr>
</tbody>
</table>

**Years 3 and 4**
- Sion weighs 24 kg. How much does the car and Sion weigh when he sits in it?
- How long will it take the car to travel 1 km at maximum speed?
- How long will the car take to travel half a kilometre at maximum speed?

**Years 5 and 6**
- If the date was 3rd June 2014 which children would the car be suitable for?
- If the car is fully charged how long will it take to travel 1 km? 2.5 km? 3 km?
- How long would it take a fully charged car to go 12 km? It must be fully recharged each time it runs out of power.

Colours available: - Red, Blue, Black
For use by children between 3 and 7 years old.
Battery charge time: 10 hours
Run time: 1 hour from a full charge
Maximum speed: 6km/h
Size: 105cm long, 70cm wide, 60cm high
Weight: 22Kg
Challenge

Ali and Beth are in their tree house reading comics. It started to get dark so Beth decided to make a circuit with a bulb in to light up the tree house. When she finished, Ali said, “It’s still not light enough for me to read my comic here.” Beth suggested Ali moved closer to the light. Ali replied, “This chair is comfy and it’s too heavy to move. Can you bring the light over here?” Beth said, “If I do, I’ll have to share your chair and there isn’t room. We need a brighter light.”

• Can you think of a way Beth and Ali can make the light brighter?
• Build a simple circuit with a bulb.
• Can you alter the circuit to make the bulb brighter?
Gather/Organise
This is the starting point for the activity. Pupils assimilate all their knowledge about the topic into their working memory. At this stage it is possible to identify what pupils already know and any gaps in their knowledge. It is also possible to begin differentiating between pupils.

Questions to ask pupils at this stage include:
• What do you know about this?
• Where have you met this before?
• What information do you have?
• How much do you understand?
• What questions do you need to ask?

Identify
Pupils explore their understanding of the task to make sure they know what is required of them. Pupils can also set the success criteria for the activity at this stage.

Questions to ask pupils at this stage include:
• What is the task?
• What are your goals?
• What are your obstacles?
• What do you need to know?
• What do you need to do this?

Generate
This is a creative and open-ended stage. Pupils may engage in brainstorming. Here all ideas about how to approach the task are valid.

Questions to ask pupils at this stage include:
• How many ideas can you find?
• Who can help you?
• Where can you find out more?
• What do other people think?
• Is there another way?

Decide
This is a logical, rational, left-brained process, in contrast to the previous stage. Pupils consider time constraints, available resources, health and safety, as well as whether the idea fulfils the brief, when making decisions.

Questions to ask pupils at this stage include:
• Which ideas are important?
• Which is the best idea?
• What will happen if…?
• What is your plan?
• What else do you need to do?

Implement
Pupils test their idea in an attempt to fulfil the criteria for the task. Teamwork is key to their success at this stage. Pupils may work to a structured plan. The focus for this stage is ‘maximum thinking, minimum recording’. This stage is all about developing thinking.

Questions to ask pupils at this stage include:
• How do you do it?
• How do you check your progress?
• Are you doing it correctly?
• Is your plan working?
• What do you do next?

Evaluate
Pupils should be realistic about their achievements and identify the next steps for improvement. Self and peer evaluation are key elements of this process.

Questions to ask pupils at this stage include:
• What have you done?
• How well did you do?
• How could you do better?
• Did you solve the problem?
• Did you work well in your group?
Communicate

Pupils present their findings to an audience; this could be within the class, the school or beyond. This stage can increase the pupils’ motivation and engagement.

Questions to ask pupils at this stage include:
• Who will you tell?
• How will you tell or present?
• What will you say?
• How will you explain?
• How will you interest others?

Learn from Experience

This final stage focuses on metacognition; this is ‘thinking about thinking’. In this stage pupils reflect on and discuss their learning. This stage can significantly enhance the impact of the learning experiences.

Questions to ask pupils at this stage include:
• What have you learned?
• How have you changed?
• What do you think and feel now?
• How can you use what you have learnt?
• How would you use this again?
Concept Photos

These ‘concept photos’ have been developed to promote discussion and to stimulate scientific thinking. They show different people discussing an everyday situation and presenting alternative explanations for what can be observed. Because of this, they are a good tool for demonstrating real life applications of science. Each concept photo shows one of Techniquest’s exhibits or an everyday situation linked to the science-based topic. Open questions can be used to stimulate thinking and discussion. All pupils’ ideas and points of view should be treated equally.

Developing your own images

To do this:
• Use everyday contexts that pupils are familiar with.
• Provide three or four alternative statements for discussion.
• Use positive rather than negative statements.
• Refer to research on common pupil misconceptions for guidance on statements.
• Include the scientifically acceptable viewpoint.

Photo 1

The following questions can be used:
• Do you agree with any of the people in the picture? Who? Why?
• Do you disagree with any of the people in the picture? Who? Why?
• Can you think of any other explanations that are not included here?
• How can we find out which point of view is the most suitable?
• Is it possible that more than one point of view is suitable here?
• Why do you think different pupils have different points of view?

Photo 2

For this activity, only one of the speech bubbles has been filled in. The following open questions can be used:
• Do you agree or disagree with this statement? Why?
• Can you think of any other explanations that are not included here? These should be filled in on the image.
• Now we have some explanations, which do you agree or disagree with? Why?
• Is it possible that more than one point of view is suitable here?
The switch turns the lamp on and off.

I think the switch needs to be on the other side of the lamp to turn it off.

I think the switch can be anywhere in the circuit.
I think it will be brighter if we use a bigger lamp.
Curriculum Links

Range

The Sustainable Earth
Pupils are also given some opportunities to study:
• A comparison of the features and properties of some natural and made materials.
• The properties of materials relating to their uses.

How Things Work
Pupils are given opportunities to study:
• The uses of electricity and its control in simple circuits.

Skills

Communication
Pupils are given opportunities to:
• Search for, access and select relevant scientific information, from a range of sources, including ICT.
• Communicate clearly by speech, writing, drawings, diagrams, charts, tables, bar charts, line graphs, videos, and ICT packages, using relevant scientific vocabulary.
• Use standard measures and S.I. units, e.g. kg, s, N, m.

Enquiry

Planning
Pupils decide upon and give some justification for each of the following:
• The choice of success criteria.
• Predictions using some previous knowledge and understanding.
• Where and how to find relevant information and ideas when carrying out a fair test, the key variables that need to be controlled and how to change the independent variable whilst keeping other key variables the same.

Developing
Pupils are given opportunities to:
• Use apparatus and equipment correctly and safely.
• Make comparisons and identify and describe trends or patterns in data and information.
• Use some prior knowledge to explain links between cause and effect when concluding.
• Form considered opinions and make informed decisions.

Reflecting
Pupils think about what they have done in order to consolidate learning and transfer skills by:
• Beginning to evaluate outcomes against success criteria.
• Deciding whether the approach/method was successful.
• Describing any amendments made to the planned approach/method.
• Suggesting how the approach/method could have been improved.
• Describing how they have learned and identifying the ways that worked the best.
• Linking the learning to similar situations, within and outside school.
Skills Framework

Developing Thinking

Plan
- Asking questions.
- Activating prior skills, knowledge and understanding.
- Gathering information.
- Determining the process/method and strategy.
- Determining success criteria.

Develop
- Generating and developing ideas.
- Valuing errors and unexpected outcomes.
- Entrepreneurial thinking.
- Thinking about cause and effect and making inferences.
- Thinking logically and seeking patterns.
- Considering evidence, information and ideas.
- Forming opinions and making decisions.
- Monitoring progress.

Reflect
- Reviewing outcomes and success criteria.
- Reviewing the process/method.
- Evaluate own learning and thinking.
- Linking and lateral thinking.

Developing Communication

Oracy
- Developing information and ideas.
- Presenting information and ideas.

Reading
- Locating, selecting and using information.
- Using reading strategies.
- Responding to what has been read.

Writing
- Organising ideas and information.
- Writing accurately.

Wider Communication Skills
- Communicating ideas and emotions.
- Communicating information.

Developing Number

Use Mathematical Information
- Using numbers.
- Measuring.
- Gathering information.

Calculate
- Using the number system.
- Using a variety of methods.

Interpret and Present Findings
- Talking about and explaining work.
- Comparing data.
- Recording and interpreting data and presenting findings.

Developing ICT

ICT Skills Framework
- Finding and developing information and ideas.
- Creating and presenting information and ideas.

Key
- Main focus
- Incidental focus
- No intended focus

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