Support Resources

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Summary
In this workshop, pupils take the role of designers and engineers. The pupils, working in eight groups, are given a design brief to follow and must produce a vehicle to the specifications given by a communications company. In their groups, pupils must design and build a communications vehicle within a set budget. Pupils will then test their vehicle to see if it meets the safety requirements and will pitch their final design to the rest of the class.

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About this book
Pupil activities can be found on pages 3-7. Answers to the activities can be found on pages 8-9. Curriculum links for the workshop and these activities can be found on pages 10-11.
Vehicle Varieties

There are many different vehicles that are used to do different jobs from transporting people to moving equipment and digging. In this activity you will explore different types of vehicles, investigate how they are used and the design features they have to enable them to do certain jobs.

1. Carry out research to compile a list of the different types of vehicles.
2. What design features do these different vehicles have?
3. Choose one of the vehicles listed. Can you think of one feature that would improve the vehicle design?
4. Carry out a survey into vehicles owned by families of pupils in your class. What questions will you need to ask in your survey? Ask at least 12 people as part of your survey.
5. Draw a graph of your results using the grid.
6. What conclusions can you draw from your graph?
7. Why do you think this type of vehicle is most popular?
Designing Robots

Remotely operated equipment is used to assist with different jobs. For example, bomb disposal teams sometimes use robotic arms to help defuse bombs safely. For this activity you will design and build a robotic arm. Build your arm from the materials provided. Your arm will be operated mechanically to pick up a plastic cup.

1. Why do bomb disposal teams use equipment like robotic arms?

2. You will need the following:
   - Sticky tape
   - Cardboard strips (approximately 30cm long and 5cm wide) x 5
   - Cardboard scraps of different sizes
   - String
   - Fishing line
   - Rubber bands x 20
   - Craft straws or sticks x 10
   - Wire coat hangers x 2
   - Split pins (paper fasteners)
   - Paper clips
   - Pencils
   - Plastic vending cup

Looking at the materials you have been given, discuss design ideas as a group for building a robotic arm.

Draw a sketch of your design on the design sheet before you begin building.

3. How will you decide if your arm is successful?

4. How could you improve your robotic arm?
Communication Careers

Most people use a particular type of communication device each day, a mobile phone.

1. Overleaf are some careers that are involved in the manufacture and use of mobile phones. Put them in a career tree in the order starting with the first career in the tree.

2. Explain why you have placed the careers in this order.

3. Choose one of the careers. Write a brief explanation to explain the impacts if no one were employed to fill the job (for example, if there were no antenna installers).
Antenna Installer
Installs the masts for the mobile phone network

Radio Frequency Engineer
Ensures the mobile phone can connect to a network

Electronics Engineer
Designs and creates the circuitry for the mobile phone

Designer
Designs the shape and style of the mobile phone

Materials Engineer
Selects and manufactures the materials required for components

Assembly Line Worker
Builds the various components to make the completed mobile phone

Production Line Manager
Plans, directs, and coordinates production to ensure products are made on time and to a high standard

Software Engineer
Designs and programs the software and applications

Quality Inspection Officer
Checks the finished products to ensure they meet a minimum standard before shipping

Marketing Manager
Advertises and markets the finished products

Sales Manager
Manages sales of finished products to mobile companies and the consumer

Customer Service Manager
Manages issues that arise with the product after it has been sold

Logistics Officer
Organises the dispatch and delivery of completed products
**Page 3: Vehicle Varieties**

1. Sources for lists of vehicles include Wikipedia and car sales newspapers.

2. Features include:
   - Energy systems
   - Braking systems
   - Chassis, suspension and steering systems
   - Exterior body
   - Doors and glazing
   - Interior
   - Passenger controls
   - Control and guidance systems

3. Depends on pupils’ choice.

4. Sample questions include:
   - What kind of vehicle does your family own?

5. Depends on the results obtained.

6. The graph should show the most popular vehicle owned among those surveyed.

7. Depends on which vehicle is most popular.

**Page 4: Designing Robots**

1. The main reason is that it is safer, as those operating the robots can do so from a greater distance than if they had to disarm the bomb manually.

2. Depends on the design.

3. Pupils should set their own success criteria. For example, it can pick up a cup.

4. Depends on the design.
Page 6: Communication Careers

1. 

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<thead>
<tr>
<th>Role</th>
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<tbody>
<tr>
<td>Designer</td>
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<td>Materials Engineer</td>
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<td>Electronics Engineer</td>
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<td>Software Engineer</td>
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<td>Production Line Manager</td>
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<td>Quality Inspection Officer</td>
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<td>Antenna Installer</td>
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<td>Logistics Manager</td>
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<td>Customer Service Manager</td>
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2. Depends on the order pupils have chosen.

3. This activity should highlight that if any of the career roles were vacant then it would cause problems.

Research career profiles can be found at: http://www.rcuk.ac.uk/researchcareers/percase/Pages/home.aspx

RCUK Careers in Research hosts an online suite of stories providing an insight about life as a researcher and the different career paths researchers take. The stories feature researchers from all seven Research Councils and cover a broad range of disciplines. New case studies will be added to the site regularly.

Career stories relating specifically to this topic include:

Justyna Janiec-Anwar
### 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
Science: Key Stage 3

Skills

Communication
Pupils should be given opportunities to:
• Search systematically for, process and analyse information for a specific purpose, including ICT as appropriate.
• Communicate logically by speech, writing, drawings, diagrams, charts, tables, bar charts, line graphs, videos and ICT packages using a wide range of scientific vocabulary, terms, symbols and conventions.

Enquiry
Planning
Pupils decide on the most suitable type of enquiry to carry out, deciding upon and justifying each of the following when appropriate:
• The choice of success criteria
• Predictions using previous knowledge, understanding and preliminary work.
• A range of options as to where and how to find relevant information and ideas.
• The number of observations or measurements that need to be made and their range and values to ensure reliability of evidence.
• Any potential hazards in their work.

Developing
Pupils follow the planned approach/method, revise it where necessary, and where appropriate:
• Use a range of apparatus and equipment safely and with skill, taking action to control the risks to themselves and others.
• Use scientific prior knowledge to explain links between cause and effect when concluding

Reflecting
Pupils think about what they have done in order to consolidate their learning and transfer skills, knowledge and understanding to another context by:
• Evaluating how far outcomes reflect success criteria.
• Justifying any improvements made to the planned approach/method.
• Identifying the learning/thinking strategies they have used.
• Linking the learning to dissimilar but familiar situations, within and outside school.

Range
Interdependence of Organisms
• Applications of science, medicine and technology that are used to improve health and the quality of life, including those in countries with different levels of economic development.