



## Rain Chain - Teacher's Notes

### Rain Chain

#### Short sharp STEM/STEAM activity

This can also be a PPP activity and sent home with students for them and their parents to enjoy.

We shall be using our knowledge of Science, Technology, Engineering, English and Mathematics to create a model "rain chain", test its effectiveness and suggest improvements.



*These are some ideas for "rain chains"*

At the top of each chain is an inverted cool drink bottle with the base cut off to represent the down pipe from a roof gutter.

Far left Plastic rotor blades \$3.99 for a pack of 12 or cut them out of plastic milk containers. To be effective the rotor blades have to be fairly



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close together.

Left of center Thread bobbins. These are not very effective unless almost touching.

Center right Waxed paper cups strung on knotted string. The shapes are fine but paper collapses after being wet. Plastic cups, planter pots, yoghurt tubs or plastic bottle bottoms may be better.

Far right Chain links for shower curtains. \$2.00 from supermarket or Reject shop.

I used cotton rope because it is easier to cut. Before you cut, bind the spot with sticky tape then cut through the tape and rope. This stops ends unraveling. Strips of empty chaff or seed bags plaited together can also be used. The lower end of rope needs to be weighted or pegged down as it can flash about in wind and rain.

The end of the chain should hang into a water-collecting container.

### **MOST IMPORTANT POINTS**

The idea of using a prototype (test model) is that it permits you to work out how your model could be improved. This saves money and time.

It is as useful to find out what doesn't work as it is to find out what does.

### **Method**      **Read everything before you start!**

#### **1. Select a design and materials**

Students are asked to quickly brainstorm ideas or consult the Internet to "rough out" a diagram of their chain and to present this along with a list of the materials and tools they will need to their teacher for approval. (see worksheet). There are many short YouTube ideas.

Some classes may need selected groups to be each presented with a prepared idea of design and equipment. This may save time and permit you to "fast-forward" to the hands-on section.

What web site did you use? \_\_\_\_\_

What materials and tools will you need to assemble your prototype?





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(Please give numbers and sizes). Ask another student to see if anything has been missed out before handing this list to your teacher for their approval.

### 2. Assemble the prototype (test model)

Before students start, ask them to think about what they will need to do. They must write down any safety concerns and how you will overcome them on their worksheet.



Students collect their equipment and assemble their prototype noting any changes they made to improve their original design.

Good working scientists always note what didn't work so that later experimenters will not try the same wrong approach again.

#### **ASIDE** for teachers

*From the times of Ancient Greece to the Middle Ages, before medicine became a science, sick people were treated by opening their veins and bleeding them. They believed that sickness was caused by having too much blood. Many died from loss of blood and sepsis. It was only when scientists found out that losing blood weakened people and that bacteria, viruses and fungi caused illness that this practice has stopped caused diseases!*

### 3. Trial the prototype (Adjust Adapt Improve)

Pour 200 ml of water into the inverted cool drink bottle at the top of your chain and observe the effect of water on the ground below. (sandpit or soil). Adjust the equipment until it works well. Note the adjustments you have made and why you made them in the worksheet.

### 4. Measure against a standard (FAIR TEST)

Measure the effectiveness of your chain against the standard downpipe. A plastic cool drink bottle with the base removed, held at the same height in the same weather conditions and filled with the same amount of water as your prototype will represent this. What measurable data





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can you collect that will show which worked best?

What tools can you use to measure this data?

A ruler to measure depth and width of the sand or soil eroded away.

A camera to take a photograph for erosion for comparison.

If there is poor weather and students cannot go outside, then a tray of sand can be placed on widely spread newspaper on the classroom floor or, better still, out on the veranda.

5. Write a short tone poem about your rain chain

Pitter, patter falling rain

Sliding down my lovely chain.

Hear the music, water falling

Hear the sound of Nature calling

6. Suggest a "catchy" name for your invention.

These chains make a bright and eye-catching display. They move in response to both wind and rain. They may be hung from tree branches during school open days. If you tie them to coat hangers they are easier to hang up and tidy away.

Rain chains are very popular in Japan as they use Nature to "make music".





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### STEM or STEAM concepts covered

#### TECHNOLOGY

- Students consult the Internet to find some useful guides on creating the prototype. (Model for testing) for a rain chain
- Students use tools safely
- Students assemble the equipment to create a prototype rain chain.
- Students list the processes used

#### ENGINEERING

- Students create a labeled sketch of the prototype chain
- Students select appropriate materials and tools
- Students assemble the chain and adjust to improve performance

#### MATHEMATICS

- Students ensure the equipment ordered is sufficient for their purpose.
- Students provide standard measurements of the materials used for their prototype
- Students report any changes they made to improve their results

#### SCIENCE

- Students compare the down flow from their prototype against the down flow from a standard downpipe (A bottle with the bottom removed and held at the same height).
- Students plan to ensure a "Fair Test".
- Students collect data (measured findings) that is observable, measurable and repeatable.

#### ENGLISH

- Students create a report on their findings
- Students suggest an attractive name for their rain chain





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- Students write a short poem about their invention

### CRITICAL THINKING

- Students provide evidence of changes they have made to their prototype to make it work better and suggest further improvements.

### ART

- Students experiment with a selection of appropriate materials to create an artwork
- Students respond to artworks
- Students present and display artworks.

