



Create Your Own Archimedes Screw

Aim: To enable students to become aware of the engineering techniques used throughout the waterways of Ireland.

The Archimedes screw worksheet consists of an introduction to the engineering technique, some activities and a question & answer section. All of which can be carried out within a classroom setting. The worksheet aims to link in with the following curriculum links:

STEM (Science, Technology, Engineering and Maths)

4th Class

Strand: Science, Technology, Engineering and Maths

- Talk and discussion
- Active learning
- Collaborative learning
- Problem solving
- Skills through content
- Free exploration of materials
- Investigative approach
- Using the environment



KS2

Strand: Thinking Skills and Personal Capabilities (TSPC) Framework

- Managing Information
- Thinking, Problem Solving and Decision Making
- Being Creative
- Working with Others
- Self-Management





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What is an Archimedes Screw

Archimedes of Syracuse was an ancient Greek Mathematician and engineer who invented a device known as the

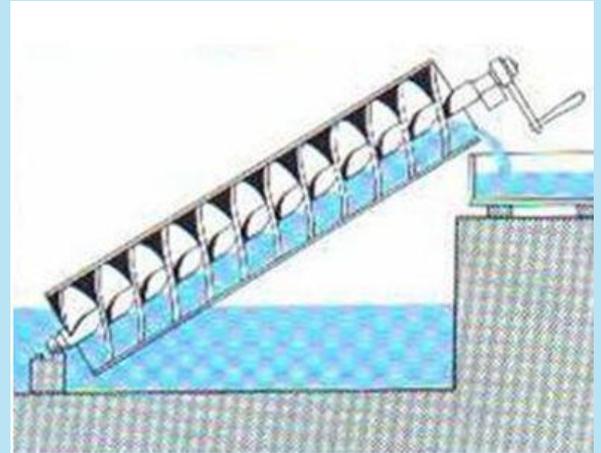
'Archimedes Screw' that pumps water and may have been used to irrigate the plants in the Hanging Gardens of Babylon.

How does it work?

Did you know water normally falls backwards due to gravity? If you want water to go in another direction you have to apply pressure to it. So if you put your thumb to the tap when it is running you can squirt water up and across the room!

An Archimedes' screw is a type of pump which lifts water up when it is turned. Used since ancient times it lifts water from a lower to a higher level e.g. in rivers or lakes and can be used to irrigate fields or for draining water out of mines.

The lowest portion of the screw dips into the water, and as it turns water is scooped up into the tube. As the screw turns, the water slides along the tube until it comes out of the top of the tube.



Let's build a simple version of a water pump



Equipment per group:

- Plastic drinks bottle or a round plastic pipe
- Narrow plastic tubing to wrap around the bottle
- Two bowls or basins
- Water
- Waterproof tape e.g. duct tape
- Food dye (optional)
- Book or something similar to raise one bowl higher than the other



Making the Archimedes Screw

- 1) Tape one end of the narrow tubing onto one end of the plastic bottle. Make sure to leave 1cm hanging over the end.
- 2) Carefully wrap the tubing around the bottle until it reaches the other end. You will need to tape down the tubing at intervals as you go along.
- 3) Cut off the tubing leaving about 1cm hanging from the end also.



Preparing the Bowls

- 1) Mix a few drops of food colouring with one cup of water in one of the bowls. This makes the water easier to see.
- 2) Place the other empty bowl on a book (or any object) to raise it up. Place it where it will catch the water which comes out the top of the tube.

Operating the Screw

Place one end of the screw in the bowl of coloured water, with the other end resting on the higher bowl.

Turn the screw slowly.



Result

Water goes into the tube, up to the top of the tube and falls into the bowl. Try turning the screw in one direction, and then the other. Does this make any difference?

Math Activity

- How much water can be moved from the lower bowl to the higher bowl in 2 minutes? Calculate the rate i.e. the number of millimetres per minute.
- Time how long it takes to move half a cup of water from the lower bowl to the higher bowl.
- Work out how many turns it takes to move half a cup of water up to the top bowl. Use a permanent marker to mark on top of the tubing. When this mark comes round to the top again, that counts as one turn.



Follow-up Activities

Investigate whether the following makes a difference to the rate at which the water comes out of the top of the screw:

- The length of the screw
 - The diameter of the tubing
 - The number of turns of the tubing (if turned too fast the water does not have time to get into the tubing)
 - The angle at which the screw is placed in the water
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Troubleshooting

Q: My screw pump is not picking up any water when I turn it. What am I doing wrong?

A: Try readjusting your pump. It will need to be positioned in a way so that the entire opening of the tubing is underwater when you turn it. If that doesn't help, try turning the pump the other direction.

Q: How high should the second bowl be raised off the table?

A: You can use any flat object you want, but the height you are aiming to reach between 1 and 2 inches. A thick book or piece of wood will work fine.

Background Information & Other Resources

www.primaryscience.ie

Additional activities for the classroom

<http://www.bbc.co.uk/news/uk-england-lancashire-29039779>

Short 2 minute film showing the fitting of a giant Archimedes screw

