

TECHNOLOGY



Watermill

SEQUENCE 1

Age group	6-9 y.o.
Prior knowledge	None
Material needed	syringes, garden hose, watering can, flexible hose, balloon, water pistols, storytelling elements, yoghurt pots, scissors, scotch tape, a camembert box (or a similar box), a fairly thin stick and two large plastic bottles.
Subjects	hydroelectric power, water power, water mills
Skills involved	Scientific method, understanding the power of water through the senses
Time to carry out the sequence	3 h

Step 1: Imagine water power

Get the students into groups of 3 or 4 and distribute an A3 sheet to each group. Ask the pupils to imagine a situation where they can feel the force of water (they can imagine the situation completely). Then, the pupils come and explain their drawings to the class, describing what they can feel in this situation (we talk about the sensations and effects of water in the situation described).

Step 2: Feel and sense the power of water

Offer simple materials so that the pupils can feel the force of the water (syringes, garden hose, watering can, flexible hose, balloon, water pistols).



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Example experiment:

- Feel the stream of water from a syringe or hosepipe and try to apply resistance;
- Feel a balloon being inflated by water pressure;

After each experiment, ask the pupils to describe or write down what they felt, asking them to be precise (sensation, distance, force, direction, speed).

At the end of this stage, the pupils should have understood that water can exert a force and can resist a force.

Step 3: Observing the force of water

Pooling: Ask the pupils how the force of water can be seen using a simple glass of water and a few small objects.

Suggest some small experiments to see how the force of water can cause movement.

Example of an experiment:

- Spin a ping-pong ball using a syringe, a straw, and a cup and test the conditions under which the ball spins faster or slower.

Conclusion: The rotation works better when the jet is directed at the centre of the ball);

- Leave a trace in the sand with different objects;
- Move objects (of varying weight) in a plastic tray using different water flow rates.

Conclusion: The higher the flow rate, the faster and further objects move). The idea is to vary different parameters, flow rate, and height of the waterfall and observe the differences that it produces.



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Step 4: Water mill - Introduction

Ask the pupils if they know of anything that turns using the force of water.

Gather the students' initial ideas and ask them: "What do you think a water mill looks like? Give them time to draw a small sketch.

Ask the pupils to share their sketches with the class.

Note the common elements: wheel, river (stream), building.

Step 5: Discovering the box

Let the students explore the elements in the box freely.

Ask them to formulate hypotheses about what they will do with the box. Then, draw up a joint construction plan.

Form groups of 3-4 students and let them build their mill. Each group can test their mill with a different flow of water to observe the difference in the speed of the blades.



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SEQUENCE 2

Age group	9-12 y.o.
Prior knowledge	None
Material needed	Yoghurt pots, scissors, scotch tape, a camembert box (or a similar box), a fairly thin stick and two large plastic bottles.
Subjects	hydroelectric power, water power, water mills
Skills involved	
Time to carry out the sequence	3 h

Step 1: Introduction

You can start the sequence by reading the story from the storytelling element to dive into the subject and raise the pupils' attention.

Gather the pupils' initial ideas and ask them: "What do you think a water mill looks like? Give them time to draw a small sketch.

Ask the students to share their sketches with the class.

Note the common elements: wheel, river (stream), building.

Step 2: History of water mill

Now, ask the students to explain what windmills were used for when they were invented. Let the students come up with their own hypotheses.

Then, ask them to check their hypotheses by doing some research on the Internet or in a collection of documents.

The pupils can then share their research with the rest of the class and produce a joint summary.



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It was during the Middle Ages in Europe that mills were developed to replace human or animal labour. Mills were first used to grind cereals, particularly wheat.

But mills were also used for a number of other purposes:

- Grinding cereals (the oldest use);
- extracting oil from oilseeds: walnuts, rapeseed, etc. ;
- in the forestry industry, hydraulic sawmills;
- for textiles: weaving looms;
- for metalworking: grindstones, forges;
- for woodturning;
- to drive pumps, particularly for mining;
- paper mills: from the 13th to the 18th century

Step 3: Understanding the basic principles:

Show photos or videos of watermills.

In pairs, ask the pupils to formulate hypotheses about how watermills work (orally or in writing).

Share their hypotheses and check them using internet research.

Explanation of how they work

Watermills are based on three scientific principles.

- A. Energy: Water is a natural source of energy that we can use again and again (known as renewable). When water falls on the blades one by one, it makes them move, which turns the shaft. This movement creates energy called kinetic energy, powered by how fast the water flows. The water pushes the blades, transferring its energy to them, and they work by moving.



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- B. The mechanism: The mechanism is how different parts are connected to make things move. The energy source makes the mechanism move by rotating an axis. In this case, the mechanism is a paddle wheel attached to a shaft. When water is poured onto the blades, its weight causes the mechanism to start moving.
- C. Motion: In a water mill, the mechanism moves in circles. The water's force makes it move. If the force is strong, the wheel spins faster. But if the wheel is heavy, it spins slower. How fast the wheel spins is measured in revolutions per minute.

Step 4: Discovering the box

Let the students explore the elements in the box freely.

Ask them to formulate hypotheses about what they are going to do with the box.

Then, ask them to draw up a construction plan for the windmill.

The teacher validates each group's construction plan and starts building.

Each group can test their mill with a different flow of water to observe the difference in the speed of the blades.

SOURCE:

Le moulin à eau des CM1 – Productions M1 Vannes & Lorient. (2021, March 29).

<http://blog.espe-bretagne.fr/prodm1vannes/le-moulin-a-eau-des-cm1/>



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