Year 6: Science

Lesson Plan 3: How do turbines work and where do we find them?

Introductory Activities (Engage)

(10 minutes)

As a class group brainstorm:

What is a turbine? How do turbines operate? Where can we find turbines? What do turbines and water wheels have in common?

Did you know?
Water wheels have been around for centuries, dating back to Greek and Roman times (more than 2,000 years ago).

Collate answers for reflection at the end of the lesson.

Lesson 1 (Explore)

(30 minutes)

Students will consider the historical development from windmills to wind turbines and water wheels to modern turbines. They do this by researching the different designs of windmills and water wheels and discover that factors such as blade size and shape and wind resistance affect the speed and propulsion of a turbine. This knowledge can be applied when building their water wheel.

Materials	Quantity
Whiteboard or Smartboard.	1
AS3 Build a water wheel.	1 each
Internet access.	

How do turbines work?

Watermills and turbines

- In a water mill, a water wheel spins when falling water pushes vanes or paddles. A shaft connected to the water wheel turns gears to drive machinery (e.g. for grinding wheat into flour and machines that spin cotton.)
- Hydropower turbines spin when water pushes on the vanes. The turbine is connected to a shaft that spins a generator, producing electricity.

Windmills and wind turbines

- Windmill blades spin in the wind. These are connected to a shaft that drives a pump, pumping groundwater up to the surface.
- Wind turbines blades spin in the wind. The blades of a wind turbine are connected to a shaft that spins a generator, producing electricity.

1. **Investigate**

   Ask the students to seek answers to the following questions about water wheels, windmills, and water turbines. They may seek information from their library or by researching the internet.

- How do they operate?

- Explain what makes them turn (there must be fluid or air).
- Why do we have turbines?
- What was the purpose of windmills and water wheels in the past? How are they currently used? (Converting wind or water movement to usable energy).
- What do different turbines have in common?
- What similarities and differences between windmills and water wheels have you noticed? (Each is driven by the wind or water, but the blade size and designs are very different).

2. **Refine**

Explain to the students that they will be required to conduct a research project. This may be as a mini poster or a presentation. The topic will be water wheels, windmills and turbine power.

Establish some key questions for the students to investigate further, for example:

- Are some turbine designs better than others?
- How has the historical development of turbines, water wheels and windmills helped society?
- What role do the turbines play in a hydropower station?
- What types of turbines are used in Tasmania's hydropower stations? Why?

Discuss how they will contribute to the class project in the planning, researching and reporting stages.

Options for assessment and extension

	Option 1
SCIENCE **Science & Understanding** **Group Activity**	Research online for different types of turbine designs that can be run by blowing air through a straw. Source the materials and construct. Find out which ones work best when blown with a straw from the top and from the end. Use materials that are available to you for example; aluminium cans, icy pole sticks, plastic bottles, plastic spoons, milk cartons, cups, corks and wire. Use the **AS Build a water wheel** to provide ideas. Experiment with: • Different paddle sizes • Numbers of paddles per turbine • Shapes of blades • Size of the turbines Use the following criteria to assess the performance of the turbines: • Make one of the blades and count its revolutions per minute. • Measure the time taken for the turbine to completely stop after one good blow through the straw. • Weight the turbine and multiply the mass by the turbines revolutions per minute. This will give a rough measure of the momentum of the turbine directly related to the power output of the generator. Write up the results and outline which turbine worked the best in each case. Describe why it worked so well. What materials could you use to improve the turbines?

Elaborate and Review

As a class group review:

How has the development of water wheels, windmills and turbines helped society? What role do turbines play in power stations? Develop a time- chart to help illustrate those changes over time.