

Lesson Plan

Learning Objectives

To increase knowledge and understanding of different types of wind turbines	To apply that knowledge to the design and production of a model turbine for lifting
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Learning Outcomes

Students will be able to:	
Describe the differences between turbines and explain the advantages and disadvantages of each.	Apply that knowledge to turbine design

Resources

Scrap card
Plastic bottles of different sizes
Masking tape
Pencils
Scissors
String
Paper cups
Weights (gram weights or pennies)

at least one hairdryer.

Activity

Task: To design a simple wind turbine capable of lifting a cup off the floor up to bench height. The winning team will be the one producing a machine that lifts the most weight.

Introduction – 15 minutes

Slides and video can be used to cover these points

- how has wind power has been used throughout history?
- sailboats, milling grain for flour, pumping water etc.
- now it is seen as one of the solutions to the major problem facing society today – that of producing a sustainable, renewable energy source.
- this video covers types of blades <http://www.ourplanet.org.uk/turbine-blades-video.asp>
- the images of different types of wind turbines, compare their design and discuss how they work
- main difference in design - turbines producing electricity need to spin fast so have fewer (typically three), thinner blades. Those that harness wind power to drive machinery, such as water pumps and windmills, need a higher torque and to be more stable. They generally have a higher number of smaller blades
- Show examples of model turbines

Set the challenge and discuss the variables that will be involved in making design decisions

- Shape of the blades
- Size of blades
- Thickness of blades
- Number of blades
- How the shaft is attached to the desk

Think about how they want to make it a 'fair' test. This could include

- Limiting the amount of materials (card, sellotape, string) that can be used for each group
- Ensuring all the hairdryers are of the same power rating
- Ensuring the hairdryer is a fixed distance away from the blades
- Allowing or not allowing students to touch the machine when it is operating

Discuss the design process. Students should be encouraged to research, design, build, test, evaluate then redesign.

Main task – 30 minutes

Divide the class into groups of about 4-6 and give them a time limit of 20 minutes to complete the challenge.

Ask each group to demonstrate their machine in turn and briefly describe the process they went through in reaching the final design.

Review – 15 minutes

Each group to decide which they think was the 'best' and why (not just about lifting the weight)

Discuss how the design could be made as sustainable as possible, e.g. Think about these questions

- What materials were used?
- How much material was used?
- How much waste was there?
- What will happen to the materials when the turbine is 'decommissioned'?
- Reusing scrap material rather than new
- Reducing waste to a minimum (card, sellotape, string)
- Do they need to use a hairdryer?

You could introduce a prize for the most sustainable design as well as the one which lifts the most weight.

Complete the section in the S4S workbook 'What did I learn in this lesson?' and 'How does Ethical Science or Technology Justice apply to this lesson?'