

Technology

Efficiency Design

Overview of Session



Session Length | 60 mins



Age Group | 10-14 Years

Learning Outcomes

Due to increases in the use of pollution reducing measures, such as electric cars, students will be looking at how increased electricity demands are to be met in the future. The energy sector recognise that electricity generation and distribution has ecological and social consequences; students will look at how these technologies can be made more efficient. They will be required to look at aerodynamics, types of materials and aesthetics and they will then be required to present their ideas. The key is for students to be innovative and are encouraged to reformulate the problem to enable them to explore solutions.

Learning Outcomes

- To amend a current design or design a new turbine that will work towards increasing efficiency.
- To research past and current designs and evaluate their design.
- To communicate ideas using annotated sketches, CAD (if available) through oral and digital presentations.

Lesson Overview

This project demonstrates to students how design and technology can play an important part in solving social and environmental problems.

Northern Powergrid are committed to looking at alternative sources of energy for meeting the increase in future electricity demand. This lesson highlights how efficiency is a key area that can be explored with all energy sources. It also demonstrates how Northern Powergrid utilise the energy from turbines and how they are connected to the network. It will require students

not only to consider various aspects when creating their design but also to be able to verbalise these and explain their ideas, a key skill in a variety of contexts.

The task supports areas of the design and technology curriculum within the design, evaluate and technical knowledge sections.

In addition, it will address social responsibility, link to aerodynamics and materials used in science and improve students' oral skills in their presentation feedback.

The key question it gets students to consider is: How do we, as a society, prepare for the future?

Key Terms and Principles

Turbine, aerodynamics, RPM, efficiency, design, symmetry, tessellation, research and evaluation, presenting findings

Resources

- PowerPoint presentation
- A3 paper
- Presentation assessment sheets (1 per student)

OK, Let's Go!



Part 1: Introduction



Suggested length | 10 mins

Introduce Northern Powergrid.

Students are shown a selection of pictures of different turbines and as a class discuss the following questions:

1. What do the images show?
2. Where are they found?

Resources



- PowerPoint slides

Extension task

What aspects of their design help them to function effectively?

Part 2: Body of Lesson



Suggested length | 50 mins

Setting the Scene

- Class led discussion on how we are trying to reduce emissions in the future. This will lead to the idea that there will be an increased demand for electricity.
- Students will discuss ways in which this problem could be solved and feedback to the class.
- Describe how Northern Powergrid are committed to looking at ways to reduce emissions in the future.



Group Task

- Students will be looking at the wind turbine blade design to discuss the efficiency of the turbine. They will discuss what makes it efficient and look at any possible improvements they could make, thinking about how they will store the energy to help solve the increase in demand for electricity.
- Discuss as a class what a turbine is. They are then shown various wind turbines and different factors that may affect their design. (Students will need to consider the ecological design as well as the industrial design element of the blades. Students are encouraged to consider how tessellation or symmetry can be used).
- Aerodynamics is looked at in more detail with discussions regarding pitch of blade, blade length, number of blades and shape of blade.
- Students are then put into small groups to investigate current designs and evaluate their improvements against them. Although many of the turbines in use are a similar design, they shouldn't let this prevent them from being creative.
- They will then present their ideas which can be supplemented with posters or an ICT presentation. Students to deliver their presentations in groups and are peer and teacher assessed using the presentation assessment sheets.

Resources



- PowerPoint Slides



- Peer assessment worksheet

Next Steps



- For homework, students should research how else the efficiency of wind farms can be optimised and should be led to look at factors such as the placement of the turbines.

