STEM Project

Chapter 4: Resources

Pages 61–78

Renewable energy – I'm a big fan

The role of a designer is to create. Designers work in many different fields, from fashion, to architecture, to web design. They shape the way products look and feel to make them as useful and appealing as possible.

Engineers often have a design element to their role. They are regularly required to create technical designs that will be useful and appealing.

Wind turbine design

Wind turbines are a controversial source of energy. While everyone acknowledges the advantages they offer in harnessing a clean and renewable source of energy, some people do not like how they look and sound, and do not believe that their use is justified.

In this activity, you will take the role of a design engineer tasked with designing a wind turbine that rotates quickly to provide maximum energy, while also being as aesthetically pleasing as possible.

Materials:

- A pencil
- A cotton reel or other small cylinder
- A fan
- Scissors and glue/tape
- A selection of possible blade materials (eg. coloured paper, cardboard, plastic bottles, etc)

In your design, you will focus on the design of the blades of your turbine only. Your pencil will act as an axle and the cotton reel (or other cylinder) will provide the rotating base for your blades. Your aim will be to create blades that will make the cotton reel spin on the pencil when placed in front of a fan.

The engineering design process

The engineering design process has five major steps:

1 Think Consider the problem or objective from all angles, research it and brainstorm ideas.

2 Design Develop a possible solution and design a prototype.

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3 Create Build the prototype.

4 Test Evaluate the prototype to see if it meets the objective.

5 Improve From the test results, identify how you could make your design better.

You will use these five steps to help you design your wind turbine blades.

1 Think

Your objective is to create wind turbine blades that catch the wind and get the cotton reel to spin as quickly as possible, while also being pleasing to look at.

First, think about what you will need to know to tackle this task. Follow the questions in the table below to help guide your thinking. If you do not know the answers, do some research to find out.

Add any additional questions of your own at the end.

Question	Answer
Draw a picture of what you think of when you think of a wind turbine. What are some of the features that you have drawn?	
What other objects can you think of that need to spin quickly? What features do they have?	
What features do you think people might find appealing for wind turbine blades? (Think about colour, size, shape, etc.) Do a quick opinion survey in class to generate ideas.	
What materials could you use to make your blades? Brainstorm all your ideas, no matter how unlikely.	
In what ways could you attach your blades to your cotton spool?	
Other question:	

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Other question:	

Now you have done some thinking, brainstorm ideas for your wind-turbine blades, thinking specifically about what visually appealing materials could be used, their shape and how they could be attached.

2 Design

Choose your best idea and develop it further. Write up a description of your blade design showing the blade components and how they will be attached. Include a labelled diagram. Use the following questions to help you create your design.

- What materials will you use?
- What will your blades look like? (colour, shape, etc.)
- What tools will you need?
- What safety issues are involved in creating and testing your turbine?
- What features will your blades have that will make them visually appealing?

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3 Create

Build a prototype of your wind turbine. A prototype is a 'first try' to test if your concept will work. Write down the steps you took to build your prototype below.

Steps:

4 Test

Once your blades are attached to your cotton reel, check to see if your wind turbine works by placing the reel on your pencil and placing it in front of the fan.

Write down your observations about how smoothly and quickly your turbine spins. If there are problems, note these down.

Now ask five classmates to rate the visual appeal of your turbine blades from 1 to 10 (1 = not appealing, 10 = very appealing). Find the average of these five ratings.

Student 1 rating: _____ /10

Student 2 rating: _____ /10

Student 3 rating: _____ /10

Student 4 rating: _____ /10

Student 5 rating: _____ /10

Average visual appeal rating: _____ /10

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5 Improve

Based on your test observations, how could you improve your design? What needs improving the most – the spinning ability of your turbine or its visual appeal?

Note down any ideas you have that could make it better.

If you have time, repeat steps 4 and 5 to implement your ideas for improvement, and assess how effective your changes have been.

Discussion and reflection

What challenges did you face while creating your design?

What are some of the challenges involved in making something visually appealing? How can you make sure everyone agrees on how visually appealing something is?

What do you think is more important for wind turbine design – how well it generates energy or how visually appealing it is? Why?

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