

Guiding Question: What are some different variables that affect wind blade effectiveness?

Learning Goal: Design a wind blade that produces the most amount of power

### Agenda

- 1) Daily Science Review-Review-alternative Ener
- 2) Finish Hydropower (purple day)
- 2) Wind Energy Introduction
- 3) Engineering Blades
- 4) Exit Ticket

Words of the day

Innovation



## DESIGN YOUR OWN BLADES

### Design

1. Sketch and describe the design of your blades (length, shape, number, materials, etc).
2. Explain why you designed your blades this way. Use data from Lesson 10 (if completed) to support your initial design.

### Test Run 1

Test your blades 1 meter from the fan for 30 seconds and record your data below.

Power=Voltage × Amps

	VOLTAGE	AMPERAGE	POWER OUTPUT
<i>High Wind Speed</i>			
<i>Low Wind Speed</i>			

### Modifications

3. What modifications could you make to your blade set to increase the power output?
4. Why do you think these blades would work better?

### Test Run 2

Test your modified blades 1 meter from the fan for 30 seconds and record your data below.

	VOLTAGE	AMPERAGE	POWER OUTPUT
<i>High Wind Speed</i>			
<i>Low Wind Speed</i>			

WOD

## Innovation

a new idea, device, or method. : the act or process of introducing new ideas, devices, or methods.



## H<sub>2</sub>O Solutions: Hydroelectric Power Project

You are working for H<sub>2</sub>O Solutions, an engineering design firm that works mostly with waterwheels and water energy! Your city wants to use hydropower instead of coal to make energy because they are worried about air pollution. The city hired *you* to design an efficient watermill. The firm (your class) split into several engineering teams (student groups) so each team can design and test a slightly different design. You will calculate power and work by measuring force, distance and time for your waterwheel. Then, H<sub>2</sub>O Solutions will present the most efficient design to the city.

### 1. Materials:

List the materials YOU used

### 2. Procedure:

Describe in a list of steps  
You used to make the fins

### 3. Design Sketch: (use the back of this paper if needed)

### 4. Calculate the work and power of your waterwheel:

Work = force x distance

Power = Work ÷ time

$$\text{Force} = .02 \text{ kg} \times 9.81 \text{ m/s}^2$$

## **5. Questions:**

What is hydropower?

How does hydropower work?

Why do you think your team's design will be efficient?

-Post a picture of your waterwheel

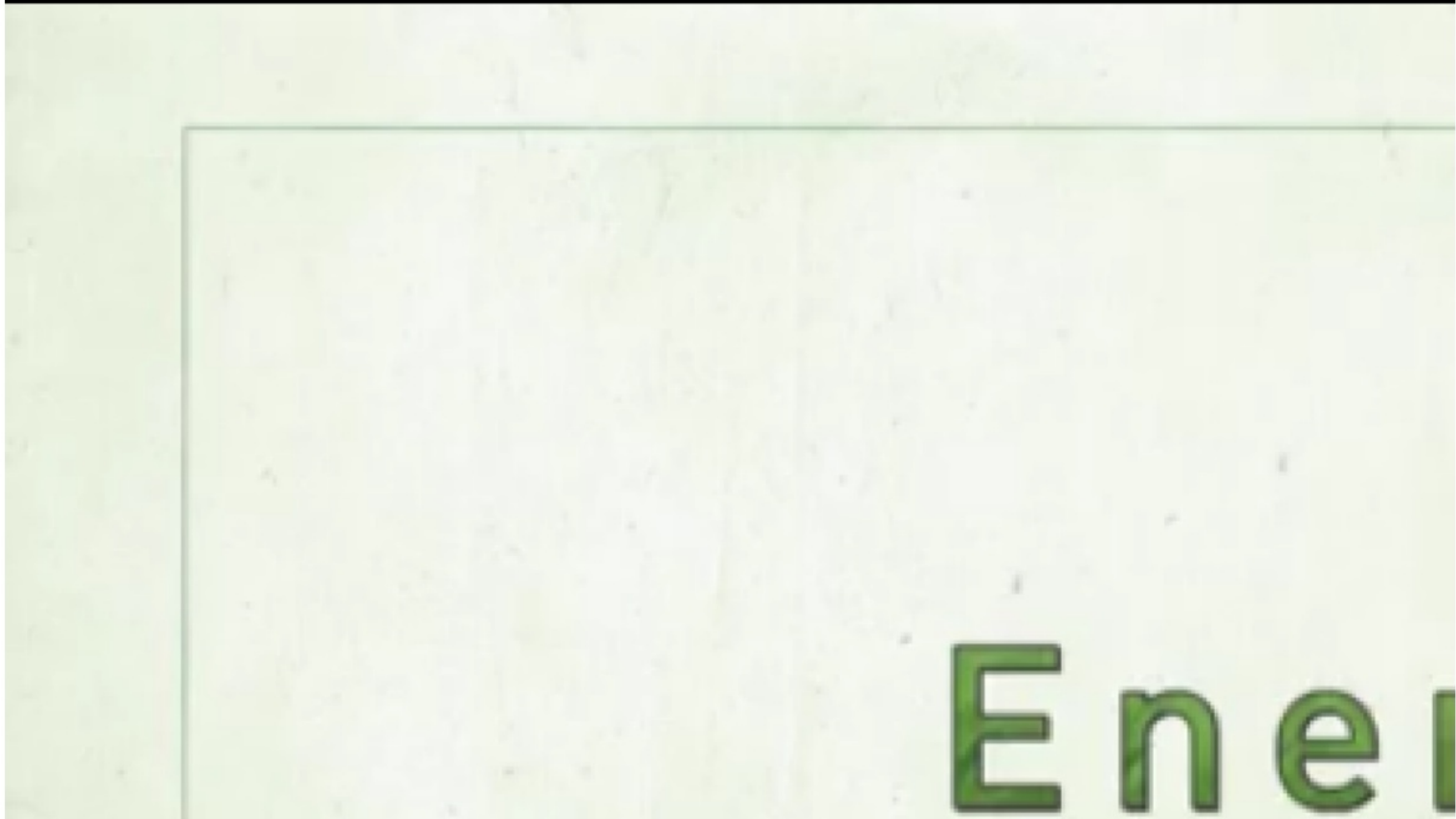
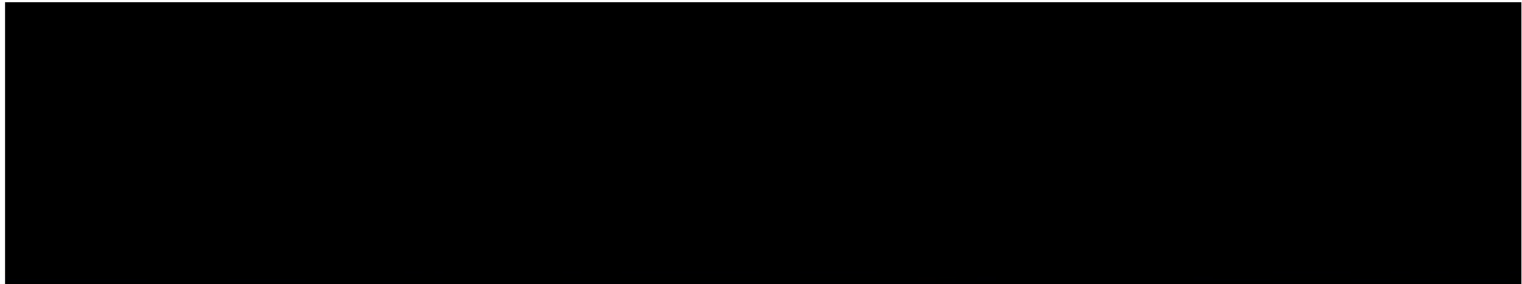
-Open the picture and write ON THE PICTURE your Power.



A screenshot of the 'showbie' app interface. The top header is blue with a back arrow, the text '4th Period Physics', a wrench icon, a hamburger menu icon, and the 'showbie' logo. Below the header is a 'Back to Classes' button. The main content area is titled 'ASSIGNED' and lists an assignment named 'Hydropower' with 'no due date' and a right-pointing arrow. The bottom right of the screenshot shows a greyed-out image of a laptop.

DSR Today





Ener



Open a web Browser on you iPad and Google: **Wind Turbine Design**, look at images or pick a website to Scan.

What features did you find when looking at different wind turbines and blades?

Open "More Power: Improve your blades"

Read about features to consider when planning your blades

Discuss in your group which design features you will want to try,  
Consider the cost of supplies when deciding what to do.

**Blade Design Shop (Each group has \$ to spend)**

**Styrofoam Plates**

**Cardboard Plate**

**Paper Plate**

**Straws**

**Toothpicks**

**Craft Sticks**

**Cardboard**

**Plastic Cardboard**

**Plastic Tape:**

**Duct Tape:**

**Transparent Tape:**

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**Complete #1 and #2 BEFORE you get Supplies**

# Testing Your Wind Blade<sub>s</sub>

You can do a few unofficial tests today of your wind blades.

You will read the voltage off the multimeter bigger the number = more power



Using the quick hub



Using The Blade Pitch Protractor



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**Redo your answers to #1 and #2 based on your unofficial trials.**

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**Final designs will be judged on the following features**

- Amount of power produced
- Quality of Construction
- Innovation (Creative thinking)

## **Exit Ticket**



- 1. How did you change your designs throughout your unofficial tests?**
- 2. What constraints (things that limit what you want to do) did you find in your design?**
- 3. What changes are you going to make to your design for your official tests?**