


Appendix 7A: Educational Resources for Renewable Energy : Wind Lesson

	<p>E C O - E N E R G Y</p> <hr style="width: 50%; margin: auto;"/> <p>É C O - É N E R G I E</p>	<p>Timeframe</p> <p>Daily <input type="checkbox"/></p> <p>Weekly <input type="checkbox"/></p> <p>Unit <input type="checkbox"/></p>
<p>School Name : _____ Developed by: <u>Julia M. Feltham, Energy Project Coordinator /</u></p> <p>Date(s): <u>February 2023</u> Grade level: <u>4</u> / Subject: <u>Science/ Unit: 1: Life Science Habitats</u></p>		

Universal Design for Learning
Representation
<input type="checkbox"/> Lecture <input type="checkbox"/> Pictures <input type="checkbox"/> Lab <input type="checkbox"/> Group Discussion
Action and Expression
<input type="checkbox"/> Written Response <input type="checkbox"/> Illustrated Response <input type="checkbox"/> Oral Response <input type="checkbox"/> Model Creation or construction
Engagement
<input type="checkbox"/> Cooperative work <input type="checkbox"/> Manipulatives <input type="checkbox"/> Movement <input type="checkbox"/> Role Playing or simulations <input type="checkbox"/> Gamification <input type="checkbox"/> Independent Work

Outcomes
<p>Students will be able to</p> <ul style="list-style-type: none"> Demonstrate and use new vocabulary on work sheets & identify parts of wind turbine Discuss properties and used of materials i.e. where energy comes from in New Brunswick Propose questions to investigate and practical problems to solve State a prediction and a hypothesis based on an observed pattern of events Understand place from a local context to a global context Make decisions about observations & carry out an investigation Plan & carry out tests, control variables, identify aspects of procedure that can be improved Define a design problem reflecting on constraints for success, materials, time etc.

Required Materials, Tools and Technology
<p><u>Wind Turbine Kit from Excellence NB-</u> The wind turbine kit includes wooden dowels (~40), turbine hubs (10) , a digital multimeter, alligator clips and a small motor, mounted on a stand. Students can use the wooden dowels to attach their homemade blades to a wind turbine hub which then attaches to a wind turbine stand.</p> <p><u>You will also need:</u> Multiple group stations, an electric fan, an outlet for testing station, Masking tape, cardboard, and scissors for each group, Wind turbine challenge worksheets & vocabulary sheets.</p> <p><u>You may want:</u> Flash Cards of New Brunswick energy sources, Media to support connecting to the local environment. i.e. Wind resource map of New Brunswick/ Canada's wind atlas, Wind Farm atlas of Canada, and/or windy.com (real time wind speeds) [available in EOS's Teacher Guide for teaching Renewables]</p>

Assessment (formative/summative, self/peer)
What prior data is informing your instruction?
What assessment strategies will measure the learning from the outcomes?
<ul style="list-style-type: none"> - Written/Drawn responses on the Wind Challenge worksheet - Vocabulary worksheet - Model creation and construction


During	60 minutes
<ul style="list-style-type: none"> - Split the class into groups of two (accommodate for those who want to work alone or with an EA) - Give each student worksheet & vocabulary sheet - Give each group a turbine hub, three dowels, a piece of cardboard and make sure they have access to scissors and masking tape. - Give students 10-15 minutes to discuss their designs, fill out their vocabulary sheets, and write their predictions and hypotheses and draw their initial design. <p>(Set multimeter to 2v setting and get ready to test, give masking tape to each group)</p> <ul style="list-style-type: none"> - Students cut cardboard, tape turbines to dowels and bring their turbine design to the testing station with their worksheet to get tested, get the students to record the highest amount of energy produced from their turbine design, and repeat. 	
Practice (Individual / Guided) (Opportunity for individual/small group instruction)	
<p>-Teachers and EAs can encourage groups to try different angles, ask students about the shape of their design, how wind works, the amount of spaces between turbine blades (are the spaces even? Is it heavier on one side?). Reiterate as many times as possible in the allotted time.</p>	
After (Closing)	15 minutes
<p>Give at least 15 minutes to clean up cardboard. put away kits, take apart dowels from turbines.</p>	

Reflection (How did it go? / Changes for next time)	
<p>Collect worksheets with written or drawn reflections on students' hypothesis, results, design changes.</p>	

Other Comments	

EOS Eco-Energy and the Centre of Excellence for Energy

Renewable Energy: Wind



New Brunswick
Your Environmental Trust Fund at Work
Votre Fonds en fiducie pour l'Environnement au travail

EOS ECO-ENERGY
ECO-ENERGIE INC.

Centre of Excellence
ENERGY

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Teachers at this school who have used this kit or delivered this lesson:

Reach out if you are seeking further resources, workbooks or help delivering the contents of this kit!



What's Inside

The wind turbine kit includes wooden dowels, turbines hubs, a digital multi-meter, alligator clips and a small motor, mounted on a stand. Students can use the wooden dowels to attach their homemade blades to a wind turbine hub which then attaches to a wind turbine stand.

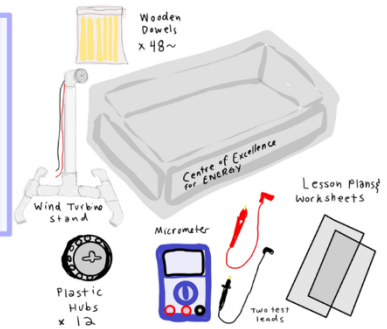
You will also need:



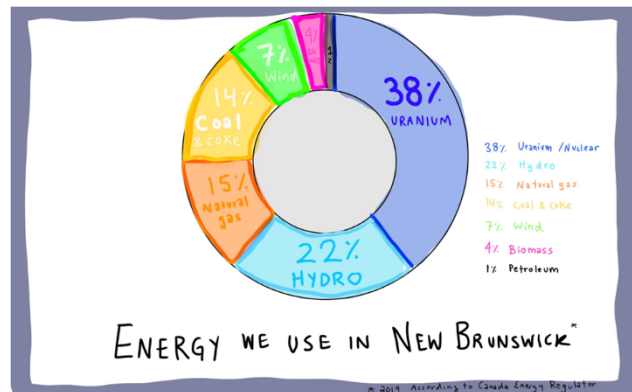
What you'll need

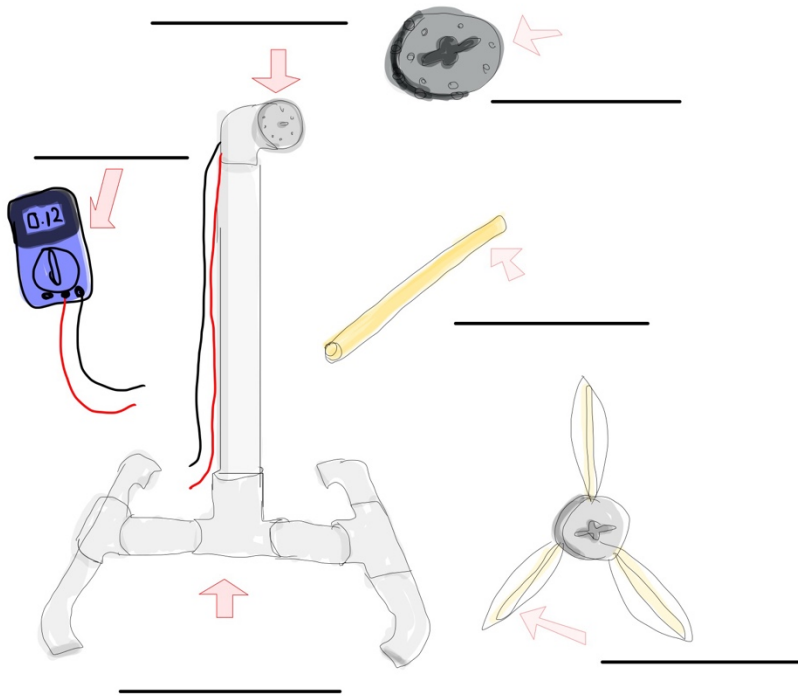
- ⊕ Masking Tape
- ⊕ Scissors
- ⊕ Cardboard
- ⊕ A fan
- ⊕ An outlet to set up your testing station

WHAT IS IN THE KIT:



ENERGY SOURCES





Wind Turbine Stand

Turbine Hub

Multi-Meter

Wooden Dowels

Generator

Blades



Wind Turbine Design Challenge Worksheet

Group Name _____

Group members

Hypothesis (Before you start, what assumption or idea are you testing)

Draw your blade design

How many blades are you going to use? _____

What material are you going to use to build your blades?

Wind Turbine Testing: Keep track of how you change your design!

Trial	# of Blades	Shape	Size (bigger or smaller)	Angle	Output
1					
2					
3					
4					
5					
6					
7					
8					
9					

What was your greatest output? _____

Why do you think this design worked best?

Did this prove or disprove your hypothesis?

What did you learn?
(Doodle, draw or write your answer!)