the CEED

THE CENTER FOR ENERGY EFFICIENT DESIGN

Investigating Wind Speed

Grade Level	2	**Subject**	Science/Math

Objective(s):

-observe and record daily weather conditions, such as…windy…

-measure and record weather data, using weather instruments…

-describe weather in terms of…wind…

-construct wind anemometers

-identify the connection between the number of spins of the anemometer and the speed of the wind.

-observe if the wind speed changes when the location of the anemometer changes

-construct a table of data observations

-construct a bar graph of data observations

SOL Addressed:

Science 2.6 The student will investigate and understand basic types, changes, and patterns of weather. Key concepts include

b) the uses and importance of measuring, recording, and interpreting weather data;

c) the uses and importance of tracking weather data over time.

Science 2.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which

a) observations and predictions are made and questions are formed;

c) observations are repeated to ensure accuracy;

g) conditions that influence a change are identified and inferences are made;

h) data are collected and recorded, and bar graphs are constructed using numbered axes;

i) data are analyzed, and unexpected or unusual quantitative data are recognized;

j) conclusions are drawn;

k) observations and data are communicated;

l) simple physical models are designed and constructed to clarify explanations and show relationships.

Math 2.17 The student will use data from experiments to construct…bar graphs.

Math 2.18 The student will use data from experiments to predict outcomes when the experiment is repeated.

Math 2.19 The student will analyze data displayed in picture graphs, pictographs, and bar graphs.

Common Core Standards:

K-ESS2-1 Use and share observations of local weather conditions to describe patterns over time.

3-ESS2-1 Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

<table>
<tr><td>Materials Needed Per Class of 30

and

Prior Knowledge</td><td colspan="2">Materials:

Book: The Wind Blew by Pat Hutchins, 2 packages of straws, 1 box of 3 oz. paper cups, 4 timers (1 per team),1 pencil for each anemometer, 1 push pin for each anemometer, marker to color one cup, electric fan, stapler, calculators, centimeter paper, notebooks, pencil for writing, Windguide Plus Anemometer

Teacher Note: The Windguide Plus Anemometer can be purchased from:
http://www.scientificsonline.com/

Prior Knowledge:

Students should have an understanding of wind as a type of weather phenomena.
Students should know that 60 seconds = 1 minute.
Students should be familiar with how to use a timer.
Students should be familiar with the term anemometer and its use.</td></tr>
<tr><td>Ways to differentiate this lesson plan</td><td colspan="2">EXTENSION: 1. For the wind speed, students can change the revolutions per minute to miles per hour by using calculators and the formula, RPM X 0.2142 = MPH.

2. Teams can test the anemometers in various locations to determine if the location affects wind speed.

MODIFICATIONS: The lesson can be a structured, guided, or open inquiry lesson depending on the needs of the students, since weather is an early Science unit in second grade.</td></tr>
<tr><td>Introduction/ Anticipatory Set</td><td>Anticipatory Set:

Show students the book, The Wind Blew by Pat Hutchins. Show students the picture on the book's cover.

Questions to ask students:
• Why are the objects above the people's heads on the book's cover?
• What is wind?
• Why did the wind snatch the umbrella, balloon, and hat?
• Have you ever had an item taken far away from you by the wind? If so, why did the object go so far away?</td><td>Introduction:

*Read the book, The Wind Blew by Pat Hutchins to the students. Have students identify items snatched by the wind.

*Give an "I Wonder…" statement: "I wonder how fast the wind was blowing to take away all of those items in the book."

*Ask students, "How can we determine the speed of the wind?" (Think-Pair-Share)

*Ask additional questions as needed based on pairs' responses.</td></tr>
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Guided Practice	*Give students one set of materials to make a team anemometer. Have students work together to construct an anemometer. The teacher will use questions to guide students as they construct the anemometer. Teams can test to see that the anemometers work by putting them in front of a fan. Teams can make changes to the anemometers as necessary. *Questions for students: "What will the anemometer help us do?" "How will the anemometer measure the wind speed?" (Talk to your team.) *Students make predictions in their notebooks about how fast the wind is blowing today. Discuss the unit used to measure wind speed (mph). **Teacher Notes: The following website has information on how to make anemometers: http://www.ciese.org/curriculum/weatherproj2/en/docs/anemometer.shtml** **The students will use push pins instead of straight pins when making the anemometers.**
Independent Practice	*Students will take their anemometers, pencils, and a notebook outside to test the wind speed. One student will keep track of the time (set the timer for 1 minute and let team know when the minute is complete), one student will hold the anemometer, one student will count the number of times the cups make a complete revolution in one minute, and one student will record the information in the notebook. *Questions for students: "How many times did the cups spin in one minute?" "What do you notice about the cups on the anemometer?" "What part of the cups receives the force of the wind?" "How fast do you think the wind is blowing today?" "How do you know?" "Is the wind blowing more or less than your team predicted?" *Students will test the anemometer daily for one week and record their results on a table and bar graph of their creations. *Students should rotate jobs daily.
Closure (Summary of Lesson)	*The teacher will compare the wind speed results of the students with the Windguide Plus Anemometer. Ask students, "How is this anemometer different from the anemometers you made? the same?" *Students will compare the wind speed data to a shortened version of the Beaufort Wind Scale on the following website: **http://www.ciese.org/curriculum/weatherproj2/en/docs/anemometer.shtml**

CEED Building Application/ Sensor Data	*Go to the CEED Dashboard: http://ceed.frco.k12.va.us/ *Click on "Vertical Axis Wind Generators." Next, click on "More Pictures." *Compare the wind speed and force at the CEED building with the students' anemometers.
Assessment	*The teacher will take an informal assessment of students' understanding from answers given to questions, construction of a data table, and construction of a bar graph.

INQUIRY LEARNING RESEARCH PROCESS GUIDELINES

The following table is just one guideline to use for developing your own inquiry materials. The seven steps in the Learning Research Process include not only how people learn but also how research is conducted. The heart of the design, the three-stage learning cycle of exploration, concept invention or formation, and application is embedded in the middle. In addition to these three stages, this design takes into account that learners need to be motivated to spend the time required for understanding complex subjects and that learners need to build this new knowledge onto prior knowledge. These are similar to the 5E and 7E learning models.

The Learning-Research Process

Steps in the Learning-Research Process	7E Equivalent	Component of the Activity
1. Identify a need to learn.	Engage	An issue that excites and interests is presented. An answer to the question *Why?* is given. Learning objectives and success criteria are defined.
2. Connect to prior understandings.	Elicit	A question or issue is raised, and student explanations or predictions are sought. Prerequisite material and understanding is identified.
3. Explore	Explore	A model or task is provided, and resource material is identified. Students explore the model or task in response to critical-thinking questions.
4. Concept invention, introduction, and	Explain	Critical-thinking questions lead to the identification of concepts, and understanding is developed.

formation		
5. Practice applying knowledge.		Skill exercises involved straightforward application of the knowledge.
6. Apply knowledge in new contexts.	Elaborate and Extend	Problems and extended problems require synthesis and transference of concepts.
7. Reflect on the process	Evaluate	Problem solutions and answers to questions are validated and integrated with concepts. Learning and performance are assess

Hanson, D. (2006). POGIL Instructor's Guide to Process-Oriented Guided-Inquiry Learning. Lisle, IL: Pacific Crest

Data Collection: Investigating Wind Speed
Name_____

Date	Number of Anemometer Revolutions	Wind Description*

***Wind Description: Calm, Light, Moderate, Strong**

Data Collection: Investigating Wind Speed
Name_____

Date	Number of Anemometer Revolutions	Wind Description*

***Wind Description: Calm, Light, Moderate, Strong**

2-Centimeter Squares