



the CEED

THE CENTER FOR ENERGY EFFICIENT DESIGN

Weather			
Grade Level	4 th grade	Charlotte Jordan	Subject Science
Objective(s): Understand the use of meteorological tools. Make and use meteorological tools to measure, collect and graph weather data. Compare weather data at current location to the weather data at the CEED Building location. Use the weather data to create graphs and make predictions. Compare cloud coverage and temperature to the amount of watts produced on the solar collectors at the CEED Building location.		SOL Addressed: 4.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which c) appropriate instruments are selected and used to measure length, mass, volume, and temperature in metric units; e) predictions and inferences are made, and conclusions are drawn based on data from a variety of sources; i) data are collected, recorded, analyzed, and displayed using bar and basic line graphs; k) data are communicated with simple graphs, pictures, written statements, and numbers 4.6 The student will investigate and understand how weather conditions and phenomena occur and can be predicted. Key concepts include a) weather phenomena; b) weather measurements and meteorological tools; and c) use of weather measurements and weather phenomena to make weather predictions.	
		Next Generation Science Standards: 3-ESS2-1. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.	
		Materials Needed Per Class of 30 and Prior Knowledge	

CEED
Instructional Activities

<p style="text-align: center;">Ways to differentiate this lesson plan</p>	<ul style="list-style-type: none"> • EXTENSION for Higher Level Learner • The students could create the graphs using Excel on the computer. • The students could design their own data collecting charts. • The students could make their own anemometer. • MODIFICATIONS • The line graphs will be created and labeled. The students will only need to fill in the information. • The students may construct bar graphs rather than line graphs. • The students could work in small groups rather than in pairs. 	
<p style="text-align: center;">Introduction/ Anticipatory Set</p>	<p>Anticipatory Set: How will the teacher introduce the lesson to the students? Read the book <u>Cloudy with a Chance of Meatballs</u>.</p> <p>Questions to ask students:</p> <ul style="list-style-type: none"> • What meteorological tools and information are used in predicting the weather? • Why is it important to know the weather forecast? • What is solar energy? • Do you think cloud coverage and temperature affect solar energy? 	<p>Introduction:</p> <p>Have students bring in weather lore that they have heard in their home or family. Discuss the use of weather lore in making predictions. Compare this to the actual weather predictions using meteorological tools and instruments. Discuss the role of the meteorologist in weather forecasting.</p>
<p style="text-align: center;">Guided Practice</p>	<ol style="list-style-type: none"> 1. Day 1 – The teacher will introduce the new vocabulary and meteorological tools. The teacher will also demonstrate the use of the CEED Dashboard. The teacher will explain to the students that they will be collecting and recording weather data at their current location using the weather instruments and from the CEED Building by way of internet for a period of five days. 2. Day 2 – The students will make their own rain gauge to take home. (see attached directions) The teacher will demonstrate again how to use each weather instrument to collect data from their school and show the students how to record this information on their observation charts. 3. Day 3 - The teacher will again show the students how to access the CEED Building Dashboard and Weather Bug Station and how to use the information to complete the observation charts. 4. The teacher will access the CEED Dashboard Solar tab and discuss how the daily cloud coverage and temperature might affect the watts produced. The teacher will show the students the different types of solar collectors and data that is being collected on the dashboard. The students will make predictions as to what might affect watt production. 5. Once the information is recorded for both locations on the charts, the teacher will lead the class in a discussion pointing out the similarities and differences between the two locations. The students can infer as to why they think there are differences. They may also make predictions about the weather for the next day. 	

CEED

Instructional Activities

Independent Practice	<ol style="list-style-type: none">1. The students will work in pairs to collect the weather data and record this information on the Weather Observation Charts. They will use the meteorological tools at their school as well as the Weather Bug Station at the CEED Building. The CEED Dashboard will be used complete the Solar Observation chart. They will continue to collect this data for five days. After each day of data collection the student pairs can make predictions about the next day's weather. The teacher will monitor the groups and facilitate as needed.2. At the end of each lesson the students will share their findings and their predictions with the class.3. Once the Weather Observation Charts and Solar Observation Charts are complete the students will work with their partner to construct line graphs comparing their school weather data to the weather data from the CEED Building.4. The students will complete a different line graph for each. (precipitation, temperature and wind speed)5. The data from the Solar Collection chart will also be put into a line graph to show any change in watt production.
Closure (Summary of Lesson)	<ul style="list-style-type: none">• The students will share their graphs with the class and discuss the similarities and differences between their school and the CEED Building.• The students will share the conclusions they formed from completing the Solar Observation Chart.
CEED Building Application/ Sensor Data	<ul style="list-style-type: none">• The students will access the CEED Building Weather Station daily to complete the observation chart.• The class will look at the CEED Dashboard to discuss the different types of solar collectors and the information on the various graphs. The teacher will show the different components of the dashboard and lead the students in a class discussion.• The students will access the dashboard each day at the same time to complete the Solar Observation chart. The students will be asked to make a prediction whether or not temperature and cloud coverage affects watts produced.
Assessment	<ul style="list-style-type: none">• Students will be assessed on their completion of the Weather and Solar Observation Charts for their school and the CEED Building. The students will also be assessed on the completion of the line graphs.• Unit Test

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 <i>Why?</i> 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 formation	Explain	Critical-thinking questions lead to the identification of concepts, and understanding is developed.
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

Solar Observation Chart

Name: _____

Week of: _____

	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
Solar Collector <hr/> (Watts Collected)					
Cloud Coverage					
Time of Day					
Temperature					

1. Did the temperature and cloud coverage affect the watts collected on the solar collector?

Weather Observation Chart

Name: _____

Week of: _____

Location: _____

	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
Temperature					
Humidity					
Clouds					
Wind					
Precipitation					
Air Pressure					

4th Grade Weather

Rain Gauge

What you'll need:

- A plastic (soft drink) bottle
- Some stones or pebbles
- Tape
- Marker (felt pen)
- A ruler

Instructions:

1. Cut the top off the bottle.
2. Place some stones in the bottom of the bottle. Turn the top upside down and tape it to the bottle.
3. Use a ruler and marker pen to make a scale on the bottle.
4. Pour water into the bottle until it reaches the bottom strip on the scale. Congratulations, you have finished your rain gauge.
5. Put your rain gauge outside where it can collect water when it starts raining. After a rain shower has finished, check to see how far up the scale the water has risen.