Title: Weather Tools

Grade Level	4th	**Subject**	Science

Objective(s):

The students will be able to create meteorological tools.
The students will be able to record and analyze data.
The students will be able to read and explain the use of the meteorological tools.

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

a) distinctions are made among observations, conclusions, inferences, and predictions;
b) objects or events are classified and arranged according to characteristics or properties;
c) appropriate instruments are selected and used to measure length, mass, volume, and temperature in metric units;
d) appropriate instruments are selected and used to measure elapsed time;
e) predictions and inferences are made, and conclusions are drawn based on data from a variety of sources;
f) independent and dependent variables are identified;
g) constants in an experimental situation are identified;
h) hypotheses are developed as cause and effect relationships;
i) data are collected, recorded, analyzed, and displayed using bar and basic line graphs;
j) numerical data that are contradictory or unusual in experimental results are recognized;
k) data are communicated with simple graphs, pictures, written statements, and numbers;
l) models are constructed to clarify explanations, demonstrate relationships, and solve needs; and
m) current applications are used to reinforce science concepts.

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

<table>
<tr><td colspan="2"></td><td>tools; and
c) use of weather measurements and weather phenomena to make weather predictions.</td></tr>
<tr><td colspan="2"></td><td>NGSS:

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

ESS2.D: Weather and Climate
Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (3-ESS2-1)

3-ESS2-1. Represent data in tables and graphical displays to c conditions expected during a particular season.</td></tr>
<tr><td>Materials Needed Per Class of 30

and

Prior Knowledge</td><td colspan="2">Barometer Material:
• small coffee can
• plastic wrap
• scissors
• straw
• index card
• rubber band
Thermometer Reading Lab:
• 5 Thermometer
• Containers of water
Rain Gauge Material:
• A plastic (soft drink) bottle
• Some stones or pebbles
• Tape
• Marker (felt pen)
• A ruler
Anemometer
• five 3 oz. plastic cups
• two plastic soda straws
• one pencil (with unused eraser)
• single-hole paper punch
• scissor
• tape
• one push-pin
• permanent magic marker</td></tr>
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<tr><td>Ways to differentiate this lesson plan</td><td colspan="2">

EXTENSION for Higher Level Learner
The teacher can have the students try out to use their tools and collect weather data over a period of time.
MODIFICATIONS
The teacher can level the students by ability groups and have an aid work with the lower level group or the teacher can work with them.

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<tr><td>Introduction/ Anticipatory Set</td><td>Anticipatory Set: The teacher and students will discuss weather.

Questions to ask students:
What is weather?
Why do we need to measure weather?
What kinds of things in weather should we measure and keep track of?
What are important reasons that we want to know what is going on with the weather?
How can we record weather data?
What are the tools that you are aware of or have used?</td><td>Introduction:
The teacher will explain the activity with the students:
Stations:
Make a Anemometer
Make a Barometer
Read a Thermometer
Make a Rain Gauge</td></tr>
<tr><td>Guided Practice</td><td colspan="2">The students will be investigating many parts of weather. They will build a weather tool and figure out how it works. The teacher will ONLY give them the supplies and steps, no assistance will be provided.

The students will be broken into small groups. They will be given a station assignment. They are to have 15 minutes to build the weather tool they are assigned to. They will then test out the tool and figure out how to use the tool to record data.
Station 1: Build a Barometer
Station 2: Create a Thermometer
Station 3: Build a Rain Gauge
Station 4: Create an Anemometer

What process will students follow to collect information that can be used to answer the question(s)?
The students will present their weather tool by answering the following questions:
How do you build your given weather tool? (Demonstrate quickly)
How do you collect the data from the tool?
How could you use the data that was collected?
What benefits do we receive from your tool?
As the students are building their weather instruments, the teacher will walk around from group to group and ask questions such as:
Please explain what you are doing. Why are you doing that? What does this tell us? In what ways would your weather tool benefit our knowledge.</td></tr>
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Independent Practice	- The students will work in their assigned group to build their given weather tool. - The students will present their weather tool to the class. The students will answer the following questions in the presentation: What is your weather tool? How do you use this weather tool? Why is this weather tool useful?
Closure (Summary of Lesson)	The teacher and students will review what the tools do and how they are important to the concept of weather. The teacher and students will walk around the room to view the different weather tools/ weather activities that were created.
CEED Building Application/ Sensor Data	The student will identify their tool on the dashboard site. The students will interpret the information that the CEED building has collected over a week or so. The teacher and students will discuss things that they are able to tell by viewing the dashboard readings.
Assessment	The students will be assessed on how well they built the tool and how well they "teach" the class.

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 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