What's Going to Happen at Any Given Barometer Reading?

Summary

Students will learn to recognize simple weather patterns.

Main Core Tie

Science - 4th Grade

Standard 2 Objective 2

Additional Core Ties

Science - 4th Grade

Standard 2 Objective 3

Materials

The Orchestrated Weather

Aneroid Barometer

Science journal and pencil

Activity One - Patterns and Air Pressure

- Graphic organizer, "Fall, Winter, Spring Scenario Patterns of a Traditional Storm"

Charts of recorded basic weather elements for 30 to 60 days during the fall, winter, or spring

Temperature, barometric pressure, precipitation, wind direction, wind speed, cloud type, cloud cover

Graph paper

Pencil

Additional Resources

Books

- *Dr. Fred's Weather Watch*

, by Fred Bortz, ISBN 0071347992

- *Weather Forecasting*

, by Mark Breen, Kathleen Friestad, Michael P. Kline, ISBN 1885593392

Videos

- *Forecasting and Weather Instruments*

VH 2001 United Learning

- *Weather Station: Backyard Science*

VH 1996 United Learning

- *Weather: Changes and Measurement*

VH 1999 Educational Videos

- *All About Clouds*

VH 2000 Schlessinger Media

Background for Teachers

Changes in air pressure are what cause our different weather. The constant changes of air pressure change the temperature, wind speed, types of clouds, amount of clouds, wind direction, and precipitation. Meteorologists watch for patterns when they measure these items. When they see certain patterns they are able to predict what type of weather is upon us. There are many patterns they need to be aware of. They have put these patterns into their computers. When they give the computer current data of these basic elements the computers are able to compute an upcoming

forecast.
Many years ago before computers, meteorologists could look at the combination of patterns and predict fairly well the weather from their own knowledge and looking at data charts. Elementary students, too, are able to observe, measure, and record basic readings of the weather instruments. After keeping track of these basic elements of weather for a few months, they will recognize simple patterns that must exist to be able to predict an oncoming storm or that fair weather is on the horizon. The goal is that each student can take readings of the barometer, air temperature, wind speed, wind direction, precipitation, and cloud type and be able to interpret the information (see a pattern) and predict the weather. The activities in this part are to help you recognize simple weather patterns and be able to teach them to your students.

Intended Learning Outcomes

1- Use Science Process and Thinking Skills
3- Understand Science Concepts and Principles
4- Communicate Effectively Using Science Language and Reasoning.

Instructional Procedures

Invitation to Learn
The Orchestrated Weather
Have the students take out their science journals.

On a new page have the students write as many words they can think of that are related or associated with weather. Don't have them generalize by writing "wind". Have them be specific such as "north wind" or "light wind". This way they will write many words. Give them two to three minutes.

Examples:

Rain	Light wind	Hail	Hurricane
Cirrus cloud	North wind	Barometer	Low air pressure
Strong wind	High air pressure	Tornado	Snow
Cold temperature	Hot temperature	Cumulus cloud	Blizzard

As a class or individually have the students classify these words into groups by putting them in the basic weather areas--wind direction, wind speed, cloud type, cloud cover, air temperature, barometer, precipitation, and severe weather.

Barom.	Temp.	Precip.	Wind Direction	Wind Speed	Cloud Type	Cloud Cover	Severe Weather
High	Warm	Rain	North	Calm	Cirrus	Clear	Hurricane
Low	Hot	Snow	South	Strong	Cumulus	Partly	Blizzard

Tell the students that the categories they have listed are the weather areas that meteorologist measure. The words they have listed are the types of weather we get when these basic weather areas mixed together in certain ways called patterns. We are going to be learning about these patterns so we can learn to predict the weather.

Instructional Procedures

Activity One--Patterns and Air Pressure

In groups of four or five students, for at least a month during any of the months of October through April, have the students take readings in their journals of all the weather areas listed on

the chart below. Be sure to read the barometer as falling or rising. (These months bring in cold fronts causing air pressure change.)

Using a line graph, graph the results of each of the weather areas, either on the same graph paper or different graph paper. (The graph making can be divided up between the individual groups.)

With the graph results, and by looking at only two graphs at a time, list the patterns you see when comparing the two weather areas. (A falling barometer also shows more clouds coming in; high pressure shows hardly any clouds in the sky; 32 degrees and below shows snow precipitation; etc.) Try to compare as many graphs as possible. Be sure they are written in their journals.

Compare the barometer reading (observing either a rising or falling barometer) with each of the weather areas. (Low barometer shows precipitation, rising barometer has a light north wind, etc.)

Stress that we want to see what the weather is going to be like at different barometer readings.

With the data that has been collected from fall, winter, or spring storms, fill in the chart as to the patterns observed connected with the type of air pressure change.

Fall, Winter, Spring Scenario Pattern of a Traditional Storm*

Basic Weather Elements	Dropping Barometer	Low Barometer	Rising Barometer	High Barometer
Cloud Type				
Cloud Cover				
Wind Direction				
Wind Speed				
Temperature				
Precipitation				

When done with the chart, write a conclusion for each one of the barometer readings.

Have the students continue to record the weather data day by day for a week or two. Have them make a prediction as to what the weather will be the next day by using the conclusions they wrote. At noon they can watch a weather TV forecast or read a newspaper forecast to see how close they are to their predictions.

Look at the weather the next day to see how close you were to you the actual weather.

Activity Two--Low Pressure and Clouds

Tell the students that they are going to see how a changing air pressure from high to low will make a cloud. A pattern exists for clouds to form.

Discuss with the students that are three basic elements that must be present for a cloud to form.

- Water
- Dust
- A low pressure

Ask, "Why is water needed?" (The water will evaporate to put water vapor in the air.)

Ask, "Why is dust needed?" (When the water vapor condenses back to water droplets, the water droplets need something to attach themselves to.)

Ask, "Why is a low pressure needed?" (The low air pressure provides cold air to change the water vapor back to water to form a cloud.)

Let's make a cloud.

Put some warm water a two-liter bottle. (You may want to put it under a lamp for a while for

the water to evaporate.

For dust, light a match and blow it out. Quickly stick the match into the two-liter bottle for the smoke to go in, but don't drop the match into the bottle.

Stick a ball needle in the hole of the rubber stopper.

Put the rubber stopper on the two-liter bottle.

Tell the students that we have two out of the three ingredients to make a cloud. All that is needed is a high pressure and change it to a low pressure. Ask, "How do you think we are going to do this?" (With the ball pump.)

Attach the ball pump onto the ball needle.

Ask, "What will pumping air into the bottle do?" (It will pack the air molecules together causing a high pressure inside the bottle. The high pressure will produce heat causing more evaporation.)

Ask, "What do you think will cause a low pressure in the bottle?" (Taking the stopper off the bottle.)

Ask, "What will happen when the air pressure changes?" (The students probably will not know this answer.) Tell the students that when high pressure suddenly changes to low pressure, cold air is automatically produced.

Ask, "What will happen when the air in the bottle turns cold?" (The cold air will change the water vapor in the bottle into water droplets forming a cloud.")

Turn out the light and turn the flashlight on and shine it into the bottle.

Pump air into the bottle (one or two small pumps) causing a high pressure. The air in the bottle should be clear because the high pressure is producing heat evaporating any water droplets in the bottle.

Quickly take the stopper off the bottle. A cloud will form in the bottle.

Recap again how the cloud was made.

Put the stopper back onto the bottle. Ask, "What do you think will happen to the cloud when I pump air back in the bottle causing a high pressure again?" (The cloud will disappear because the high pressure produces heat evaporating the water droplets that formed the cloud.)

Pump air into the bottle again. Take off the stopper and the cloud will form again.

The same thing happens when we have high pressure over us for a while. The temperature rises because the air molecules are being packed together rubbing against each other in a locked in area.

Suddenly low pressure enters in from the northwest carrying a lot of cold air. When the cold air hits our hot air, it changes all the water vapor in the air into water droplets forming a sky full of status clouds. When enough water vapor has changed to water droplets, the water droplets will group together into water drops and it will begin to rain or snow depending on the temperature of the air beneath the clouds.

Extensions

Curriculum Extensions/Adaptations/Integration

Have the students find other ways to make clouds.

Have the students watch a weather report to see the highs and lows on the weather map.

Have the students watch a weather report to see where storms are forming, and to see if they are going to come over Utah.

Have the students watch a weather report to hear the forecast to compare it with their own forecast.

Have the students continue to watch the weather to see if the patterns they have learned fit the storms that come in.

For regular and advanced learners, have them learn more about air pressure and storms.
For learners of special needs, gather them together and show the experiment again giving the simple explanations of what is happening and asking simple questions to answer.

Family Connections

Send home the experiment directions on how to make a cloud in a bottle. Have the students do it at home with their parents present and let them explain what is happening in the experiment.
Have the students share what they have learned about the patterns of storms.
Send home questions about the weather patterns. Have the students ask their parents the questions.
Have the students go to an internet site to read more about storms and share what they have learned with their parents.

Assessment Plan

As the teacher is asking the questions, the students can be writing in their science journals the answers to the questions about making a cloud. Check their journals for accuracy during the discussion.
Have the students draw pictures of the cloud experiment and label the parts. Have them write captions under the pictures of what happened in the experiments.
Divide the class into groups of three or four students and ask them to discuss and answer these questions about weather patterns in their journals or on paper. Let them use their chart to answer the questions.

What would you expect to happen to the wind speed, wind direction, and temperature when a low pressure is entering an area?
What would you expect to happen to the wind speed, wind direction, and temperature when a high pressure is forming in an area?
During what type of pressure is it usually raining or snowing?
What type of clouds brings rain or snow?
During what type of pressure are there usually a few or no clouds?
Which type of clouds usually precedes an approaching storm?
When the barometer is showing a low pressure which type of clouds should we be expecting to come?
When the barometer is showing a high pressure which type of clouds should we be expecting to come?
During what type of pressure is there a strong warm wind blowing from the south?
During what type of pressure is there a wind blowing from the north?

Have the students tell what is needed to make a cloud and how a cloud is made by nature.

Bibliography

Gilbert, J., Kotelman, M., (2005), Inquiry, five good reasons to use science notebooks. *Science and Children*, Volume 43 (Number 3), Page 28

There is a need for all students to journal their investigations. Notebooks help in literacy with these ideas:

Notebooks are thinking tools--Students construct their own conceptual understanding that empowers them to become active in their own learning.
Notebooks guide teacher instruction--Notebooks give teachers access to students' thinking: what they do and don't understand. This will help guide the next teacher lesson.
Notebooks enhance literacy skills--The ideas students write in their journals enhance their written, visual, and oral communication skills.
Notebooks support differentiated learning--Notebooks help all learners to achieve.

Notebooks foster teacher collaboration--Teachers are able to build on others successes. Sharing strategies provide a wider repertoire for each other. Conversation exists between teachers that can bring them together.

Klentschy, M., (2005) Science notebook essentials. *Science and Children*, Volume 43, (Number 3), Page 24

A science notebook is more than a record of data. It is a record of students' questions, claims, conclusions and reflections all leading to an understanding of a big idea. It is a scientific method of questions/problems/purpose, prediction, planning, observations/evidences, stating what is learned, and next steps/new questions. Journals are the voice of students leading to increased student achievement in science with the tools of reading and writing.

Authors

Utah LessonPlans