

Investigation Four – Air Pressure/Making and Observing a Barometer

Standard II Students will understand that the elements of weather can be observed, measured, and recorded to make predictions and determine simple weather patterns.
Objective 1 Observe, measure, and record the basic elements of weather.
Intended Learning Outcomes <ol style="list-style-type: none">1. Use science process and thinking skills2. Manifest scientific attitudes and interests3. Understand science concepts and principles4. Communicate effectively using science and language and reasoning

Standard II

Objective 1

Background Information

Air pressure is the weight of air in our atmosphere pressing down upon Earth's surface. It can be compared to the weight of water pressing down on a person's eardrums as he/she dives deep into a pool of water. People can also feel the effect of air pressure on their eardrums as they hike up and down a large mountain. There is a huge amount of air above us that goes up as high as 100 miles. With all that air on top of us, it is like being at bottom of the deep end of the swimming pool. But instead we are at the bottom of an ocean of air. Just like there is pressure at the bottom of a swimming pool, there is pressure caused by the weight of the air on all objects (including humans) on and above Earth's surface. At sea level there are about 15 pounds of air pressure per square inch.

Air is a substance that takes up space, and moves as wind. It also causes pressure that is sometimes higher and sometimes lower. Sometimes there is a high pressure around us. Sometimes there is a low pressure around us. The instrument that measures the air pressure is called a barometer. A barometer helps us notice if there is a change in the air pressure. Watching it closely from day to day predicts what the weather will be like in the next day or two. If the needle of the barometer is 30 or higher, it means that we will have fair weather for a while with increasing temperature. If the needed of the barometer drops below 30, this means there will be a change soon in the weather that could cause wind, clouds, and/or precipitation. Low pressure always precedes a change in the weather.

Pre-Assessment/Invitation to Learn

Air pressure in Utah changes constantly. On some days it is a high pressure. On other days it is lower pressure. We usually can't feel it when it changes. But, when the air pressure changes, the weather changes too.

Tell the students that there is an instrument called a barometer that measures air pressure. Show them the numbers on a barometer – 28, 29, 30, and 31. When the needle on the barometer points to 30 and above, it tells us that we will have fair weather for a while with increasing temperatures. When the needle on the barometer points to the numbers below 30, it tells us that there will be a change in the weather. The change could be increasing clouds, strong winds, temperature change and/or precipitation. Watching the barometer closely from day to day helps us predict what the weather will be like in the next day or two.

Tell the students that we will be making a barometer today. We will also be keeping a record of the changes of a barometer for the next two weeks. We will see that when the air pressure is high, we will have fair weather. We will also see when the barometer is low, there is a change in the weather with increasing clouds, strong winds, temperature change, and/or precipitation. (If you want to know about the first barometer, go to www.askjeeves.com. It will explain the mercury barometer and how it relates to the barometer we use today in our homes.)

Instructional Procedure

Tell the students that today we are going to make a barometer. Then for the next few days we are going to see if the air pressure rises or falls or stays the same. (This can be done as a whole class, groups, or individually.)

1. Cut off the neck of a nine-inch balloon.
2. Stretch it over a jam jar (or any wide mouth bottle).
3. Put a rubber band around the bottle to hold the balloon on and keep the air out.
4. With a type of cement glue (Liquid Nails), glue a straw on the top of the balloon with the end in the middle.
5. Glue a toothpick in the opening of the outstretched straw.
6. Write the existing barometric pressure on the bottle.
7. Put a chart on the wall that has lines and numbers on it.
8. Point the toothpick to one of the middle numbers.
9. Check the barometer each day. If the toothpick points above the initial position, there is an increase in air pressure. Air pressure is pushing on the balloon. If the toothpick points below the initial position, there is a decrease in air pressure. Air pressure is less, letting pressure inside the bottle push it up. When there is a change in the air pressure, watch to see if there is a change in the weather in one or two days.
10. Observe and record air pressure for a few days.
11. Compare results of student-made barometer and commercial instrument.
12. Discuss differences.

Materials

- Open-mouth jar without lid (any size)
- Nine-inch balloon
- Cement glue
- Straw
- Toothpicks
- Rubber band
- Number chart

Curriculum Extensions

Math –

- Graph the results of the daily barometric readings over a period of two weeks. (Standard V, Objective 1)

Science –

- Write about how accurate the barometer readings have been in predicting the change of weather. (ILO 4)

Language Arts –

- Find a trade book about air pressure and read it to the students. Have them take notes about the facts they hear as you read it. Discuss the facts. Make a journal with facts and draw pictures with labeled parts. (Standard VIII, Objective 6)

Assessment Suggestions

- Performance Test – The Cup and the Plastic Wrap
 1. Get a large cup.
 2. Cut off a piece of plastic wrap big enough so it lines the inside of the cup. Have it big enough so some of it hangs down around the outside of the cup evenly.
 3. Tape the plastic down that is hanging out around the outside of the cup so it is airtight.
 4. Have the students write on a piece of paper.
 - a. Title – The Cup and the Plastic Wrap;
 - b. Purpose – To pull out the plastic wrap;
 - c. Prediction – (Have the students write a prediction.)
 - d. Observations – (Have the students write their observations.)
 - e. Conclusion – (Have the students write their conclusion.)
 5. Tell the students that in a moment they will reach into the cup and pull out the plastic wrap. Have them predict what is going to happen.
 6. Have each student reach down inside the cup and try to pull the plastic out.
 7. Have the students write what they observed about the experiment.
 8. Have the students explain why they couldn't pull the plastic out of the cup.
 9. Have them draw pictures of the experiment of the different steps writing captions under each picture of what is happening.
 10. Have them write their conclusions explaining why it happened.
 11. Put hole in cup. See and discuss what happens.

Resources

Libraries –

- Check your local school libraries for books about air pressure and weather.

Media Centers –

- Check your district or school media center for videos about weather. There are also commercial weather videos available.

Contacts –

- If you want more air pressure experiments, e-mail Paul Nance at www.jordandistrict.org and he will send you more experiments by e-mail.

Homework & Family Connections

- Students with Internet connections at home can be asked to visit weather Web sites.
- They can be assigned to watch the evening weather forecast on one of the TV news channels.
- If students have barometers at home, have them watch it daily for changes they see and report in class. They are fun to watch.