

How Cold Is It?

Integration: Science; Art; Language Arts

Grade Levels: K-2

Time: 3- 4 class periods (4 separate lesson topics)

Materials:

- Map of Antarctica
- Thermometers (for air & liquid temperatures)
- Access to a refrigerator, freezer
- Paper
- Drawing materials
- Ruler
- Markers
- Water
- 8.5 x 8.5-inch sheets of paper (one for each student)
- Pins (one for each student)
- Pencils with erasers (one for each student)
- Marble or ball (optional)
- Access to a sloped surface (optional)

Objectives:

Students will:

1. Explain the weather conditions in Antarctica.
2. Compare the weather in Antarctica with the weather they experience where they live.
3. Describe how the weather affects Antarctic exploration.

Lesson:

1. Ask students what they think the weather is like in Antarctica. List the student's responses.
2. Inform students that they will first look at the temperature.
3. Tell students that Antarctica is the coldest place on earth.
 - a. Ask students for an estimation of the current temperature where they live.
 - b. Tell students that the average temperature in Antarctic ranges from -40°F to -94°F (-40° to -70°C) during the coldest months and from -4°F to -31°F (-20° to -35°C) in the summer.
 - c. The coldest it has gotten (that anyone knows of) is -129°F .
 - d. Tell students that this is really cold. Water freezes at 32°F (0°C).
4. Give a comparison by informing students of or allowing them to find out the average temperature where they live.

5. Demonstrate the difference in temperature by placing thermometers in areas where there will be different readings. Allow the thermometers enough time to adjust to the temperature.
 - a. Place a thermometer on a radiator or in a cup of hot liquid.
 - b. Place a thermometer indoors in the classroom
 - c. Place a thermometer outside.
 - d. Place a thermometer inside a refrigerator
 - e. Place a thermometer inside a freezer
6. Have children hypothesize about whether the temperatures will be higher or lower compared to each other.
7. Check the thermometers and advise children if they were correct or incorrect. Older students can place the locations in order from lowest temperature to highest temperature.
8. Bring students to the conclusion that even the freezer is warmer than Antarctica.
9. Have older students graph the average temperature of Antarctica and the average temperature of the area where they live.

Lesson #2

10. Review what students learned about the temperature in Antarctica.
11. Ask students for examples of other elements of weather. Lead them to a discussion of wind.
12. Tell students that Antarctica is also the windiest place on Earth.
 - a. Inform students that the wind in Antarctica comes from the center of the continent and blows out toward the coast. Illustrate this with the map.
 - b. Tell students that the center of Antarctica is higher than the coast.
 - c. Ask students what happens to a marble or a ball when it is rolled down a hill (it moves faster and faster). Demonstrate this concept to students who cannot visualize it.
 - d. Tell students that the same thing happens to the wind in Antarctica. It starts off at the top of a hill (interior of Antarctica) and moves faster and faster until it reaches the bottom (the coast).
 - e. Tell students that the strong winds in Antarctica are called *katabatic winds*.
13. Tell students that the wind in Antarctica can reach 75 mph (120 km/hr) and gust up to 185 mph (300 km/hr). Compare this to an automobile and normal wind speeds where students live.
14. Tell students to imagine what it would be like to live with the winds of Antarctica. Have students perform the “Walking In the Wind” exercise.

- a. Have students stand and walk in place normally.
 - b. Next tell them that a breeze is starting to blow. They should adjust their walk if they think they need to.
 - c. Tell students that the wind is starting to pick up and it is getting harder to walk normally.
 - d. Next tell students that the winds are about to become katabatic winds.
 - e. Finally tell students that the winds have started to gust up to 185 miles per hour.
 - f. Bring the students through this exercise by alternating back and forth through the movements.
 - g. End the exercise by having the students to walk normally in place.
15. Ask students if they feel warmer or cooler when the wind blows. (cooler)
- a. Tell students that they feel cooler because the wind helps to remove heat from their bodies.
 - b. This is called the wind chill effect. The wind chill effect is how cold you feel because of the temperature and the wind.
 - c. Give an example it may be 35°F outside but if the wind is blowing it will feel much colder.
16. Have students create pinwheels to visualize wind.
- a. Have students decorate both sides of the paper before the pinwheel is assembled.
 - b. Teacher will have to assemble the pinwheels for younger students.
 - Draw diagonal lines from corner to corner on an 8.5 x 8.5-inch sheet of paper.
 - Punch a hole in the center where the lines cross with a pencil.
 - Cut along the diagonal lines from the corner to about 1 inch away from the hole in the center of the sheet.
 - Using a pin, punch a hole in the upper left-hand corner of each flap.
 - Curve the corner of a flap with the hole toward the center hole and secure it with a pin. Repeat with each of the flaps.
 - Place a pencil on the table and carefully lift the paper so that the flaps stay in place.
 - Push the pin into the side of the pencil's eraser.
 - c. Allow time for students to use their pinwheels outside or in front of a fan. The wind must hit the center of the pinwheel to turn it properly.
17. Have students draw a picture or write a few sentences about what they like and don't like about wind.

Lesson #3

18. Tell students that the final element of the weather they will discuss is precipitation.
- a. Precipitation is moisture that falls to the ground as rain or snow.
19. Ask students if it rains and/or snows where they live.
- a. Tell students that the rain and the snow are forms of precipitation.

20. Ask students to describe a desert. They may respond hot, dry, sandy, etc.
 - a. Ask students if it rains or snows in a desert.
 - b. Tell students that it does not rain or snow very much if at all in a desert.
21. Inform students that a desert is a place that is very dry. It does not have to be hot. In fact, Antarctica is considered a desert because it receives very little precipitation.
22. Inform students that precipitation is measured by the number of inches (cm) that would cover the ground if it remained on the surface like a puddle.
23. Have students compare the precipitation where they live to the precipitation in Antarctica. Inform students or allow them to research the average annual precipitation in their country, state, or locality.
 - a. Tell students that Antarctica receives less than 3 inches of precipitation a year.
 - b. In groups, have students measure and mark the precipitation level of Antarctica on the side of a clear jar. Younger students can have this done for them.
 - c. Have students repeat the same for the area where they live.
 - d. Next have the students pour in a liquid (water or water with food coloring) up to the measured line.
24. Have older students write down their observations, have younger students draw a picture of what they see.

Lesson #4

25. Review and discuss the elements of weather students have been learning about and the conditions in Antarctica.
26. Lead a discussion about what it is like for Antarctic explorers like Ann Bancroft and Liv Arnesen.
 - How do you think it feels to be outside in the cold for many days?
 - Do you think that the wind affects their expedition?
 - Do you think the wind can be dangerous? Why?
 - What do you think they do to keep warm (wear many layers of clothes, try not to stop very often, eat and drink warm foods, etc.)
27. Have students draw a picture of themselves in the weather conditions of Antarctica or write a few sentences about how they would feel in the weather conditions of Antarctica.

EXTENSION: Older students can divide into groups and develop and perform weather forecasts for Antarctica based on their knowledge of the average weather conditions.

Assessment:

Teachers will assess:

1. Student's ability to explain the weather conditions in Antarctica.
2. Student's ability to compare and contrast the Antarctic weather with that which they experience where they live.
3. Student's application of weather information to Antarctic expeditions.