Experiencing the Weather

Summary

Students will understand basic concepts about weather.

Group Size

Large Groups

Materials

- *What Will the Weather be Like Today?*
- *My Weather Book*

Prism, flashlight
Construction paper
Crayons
Wax-coated Sand
Cotton Balls
Water bottle
Hot water
Ice cubes
Wax paper
Aluminum foil
Fake snow
Hot plate
Pot of water
Pie tin
Bubble solution
Bubble wands
Paper fan

- *Windmill Outline*
- *Windmill Blades*

Brads
Fluorescent light bulb
Rubber balloon
Paper sack

Additional Resources

Books

Can it Rain Cats and Dogs?: Questions and Answers about Weather, by Melvin and Gilda Berger; ISBN 0-590-13083-8
Franklin and the Thunderstorm, by Paulette Bourgeois; ISBN 0-590-02635-6
Scholastic Atlas of Weather, by QA International; ISBN 0-439-67865-X
Scholastic Science Emergent Readers: Sun, by Susan Canizars; ISBN 0-590-10731-3
Scholastic Science Emergent Readers: Water, by Susan Canizars; ISBN 0-590-10727-5
Scholastic Science Emergent Readers: Weather, by Pamela Chanko; ISBN 0-590-10730-5
Scholastic Science Emergent Readers: Wind, by Susan Canizars; ISBN 0-590-10726-7
Scholastic Science Readers: Thunder and Lightning, by Wendy Pfeffer; ISBN 0-439-26988-1
Scholastic Science Readers: Tornadoes, by Brian Cassie; ISBN 0-439-26990-3
Snow? Let's Go!, by Karen Berman Nagel; ISBN 0-439-09906-4
Super Storms, by Seymour Simon; ISBN 0-439-46685-7

The Best Book of Weather, by Simon Adams; ISBN 0-7534-5584-6
The Magic School Bus Kicks up a Storm, by Joanna Cole and Bruce Degan; ISBN 0-439- 10275-8
Weather: A National Geographic Action Book, by Tom Kierein; ISBN 0-7922-2782-4
Weather Words and What They Mean, by Gail Gibbons; ISBN 0-590-44408-5
Welcome Books: Cold Days, by Jennifer S. Burke; ISBN 0-516-23870-1
Welcome Books: Rainy Days, by Jennifer S. Burke; ISBN 0-516-23869-8
Welcome Books: Windy Days, by Jennifer S. Burke; ISBN 0-516-23868-X
What Will the Weather be Like Today?, by Paul Rogers; ISBN 0-590-72617-X
World Book Encyclopedia, by Field Enterprises Educational Corporation; ISBN 0-7166-0073-0

Background for Teachers

We want to make sure that we give our students correct information about what causes weather. Due to their developmental age, kindergarten students have limited abilities to understand complex ideas and theories about the weather. As early childhood educators, we need to find a way to make the concepts of weather more tangible so that our students can begin to comprehend the world around them. Remember that "weather" is the condition of the air and the atmosphere at one place at one time while "climate" is the usual weather for an area at a given time of year.

The air around Earth creates the weather. The layer of Earth's atmosphere that is closest to Earth is called the troposphere. The troposphere is where the weather forms. The sun heats Earth's surface unevenly. Areas around the equator are warmer than areas near the polar regions. Air moves based on high and low pressure areas. The moving air creates the winds, which, in combination with the water cycle, creates the weather. Air moves mostly in large blocks called air masses. Depending on where the air mass forms and which direction it moves, it brings with it different weather. Cold, dry air masses that form over cold land areas tend to move towards Earth's equator. These air masses usually mean clear, dry weather. Cold and moist air masses form over the cold ocean waters. As they move towards the equator, they usually bring rain or snow with them. Warm and dry air masses form over tropical land and tend to move away from the equator. They frequently bring in hot, dry weather. Warm, moist air masses that form over warm ocean waters also have a tendency to move away from the equator. These air masses typically mean clouds and/or rain showers.

Here are some quick explanations of some of the types of weather that the students will be learning about. Naturally, there is more to it than these quick explanations, and there are many factors that affect the weather. However, these explanations should suffice for most kindergarten lessons.

Clouds: Clouds are formed from tiny droplets of water or ice crystals. As water vapor rises in the air, it cools and condenses into the droplets. A cloud is formed when there is enough water vapor that has condensed into billions of droplets or ice crystals. The varying shapes of clouds are due to the fact that clouds are formed in a variety of ways depending on air temperature and the amount of moisture in the cloud. Different types of clouds are indicative of different types of weather.

Fog: Fog is also made up of tiny droplets of water like clouds. However, fog is formed at ground level while clouds are formed higher in the sky. Fog occurs when there is calm weather during a cool night when the ground or a body of water is also cold. Because of the cool air and cold ground, water vapor in the air condenses into the tiny droplets of water near the ground (or over a body of water). The droplets of water are so small that it takes about seven trillion of them to fill one tablespoon of water.

Rain: As the sun warms bodies of water on Earth, some of the water evaporates into water vapor. This water vapor rises into the atmosphere and forms clouds as it cools down into tiny water droplets. As the water droplets bunch together, they become larger. Once the droplets become too heavy, they fall to Earth, usually as rain. There is a tiny bit of dust at the center of each raindrop because the water vapor condenses around specks of dust.

Snow: Snow is made up of ice crystals that develop when it is too cold for rain to form. When the temperature is cold enough, the water vapor in the clouds condenses into ice crystals instead of

water droplets. If the temperature of the air that the ice crystals fall through remains cold enough, the crystals hit the ground as snow. Each snowflake is unique because it is formed from thousands of the ice crystals that have joined together in a unique way.

Lightning and Thunder: Lightning is formed as droplets of water or ice in cumulonimbus clouds bump and rub against each other, creating tiny electrical particles. When the charge from this bumping and rubbing becomes large enough, it creates lightning. Lightning bolts can jump between the clouds and the ground or between several clouds. Lightning in turn creates the thunder. The loud noise of thunder comes from the heat of the lightning. The sudden burst of heat that comes with the lightning makes a powerful explosion. The sudden movement of air is what we hear as thunder.

Wind: Wind is simply moving air. As air gets warmer, it rises and colder air moves in to take its place. As the colder air warms, it also begins to rise. However, now the warmer air that moved first has cooled and moved back down. It is the exchange of cold and warm air that creates the wind. Another way to look at it is that wind is created when air flows from an area of high pressure to an area with low pressure. If there is a big difference in the high and low pressure, it creates a strong wind. If there is only a small difference in the pressure, then the result is more of a light breeze.

Rainbow: While not a type of weather in and of itself, a rainbow can be the end result of a rainstorm. Rainbows are formed when the sun comes out after a morning or evening rainstorm. You can only see a rainbow when the sun is behind you. While it looks white, (sun)light is really made up of the whole spectrum of colors. When the sun's rays hit the tiny drops of water that are in the sky after a rain shower, the drops break up the light into the colors of the rainbow. Frequently, there are 2 rainbows that appear. There is an inner bow that is usually easier to see (the primary bow) and its "double" that tends to be paler (the secondary bow). The colors are always the same red, orange, yellow, green, blue, indigo and violet, with the colors going in reverse order in the secondary bow due to a double reflection in the raindrops.

Intended Learning Outcomes

1. Demonstrate a positive learning attitude.
5. Understand and use basic concepts and skills.

Instructional Procedures

Invitation to Learn

Tell the students that they get to be scientists. As a class, they will be conducting a number of science experiments as they learn about the weather. In addition, they will have the chance to make a science book about the weather. Because it is a science book, they will need to make sure that they do their best work and make it "real". Show some examples of science-type books if needed.

Instructional Procedures

For each page in the weather book that the students will be making, talk about the different properties of each type of weather. Do the coordinating science experiment or sand and water activity. Through each experiment, ask students questions about what is happening and have them explain it in their own words. Demonstrate to the students how to create each page. Always discuss with your students the different types of activities that the students can do in each type of weather (e.g., fly a kite when it is windy). Discuss safe behavior for each type of weather. Collect the pages as students finish each one and compile all pages together in book form.

2. *My Weather Book*

   --Cover page with rainbow. Discuss how the cover of a book always has the title, the author's name, and the illustrator's name. Because the students will be writing the book and doing the illustrations, just their name will be on the cover. Explain to students how rainbows are formed. Ask students to very carefully color the rainbow in the correct rainbow color order. Have them

write their names on the cover.
Teacher-Directed Coordinating Science Experiment: Show the students a prism and ask them to imagine that the prism is a raindrop. Use a flashlight to represent the sun. Dim the lights in the classroom. Shine the flashlight through the prism and find the resulting rainbow.
Sunny and Warm--Discuss with the students all of the different activities that they can do when the weather is warm and sunny. Some ideas are: bike riding, swimming, hiking, visiting the playground, going to the beach, etc. Make sure to explain that it can be sunny and cold, like in the winter, but for this page in the Weather Book that they are making they are focusing on warm and sunny weather. Using the light blue construction paper and construction paper crayons, have student draw a picture of themselves doing one of the activities that the class discussed. Have students label the page "Sunny and Warm".
Coordinating Sand and Water Table Activity: Put wax-coated sand (such as Delta Sand or Moon Sand) in the sand and water table and have the students pretend that they are at the beach by building sandcastles, etc.
Clouds--Discuss with the students how clouds are formed. Have students break up cotton balls so they appear cloud-like and glue them onto blue construction paper. Have students label the page "Cloudy".
Teacher Directed Coordinating Science Experiment: Fill a clear plastic water bottle with very hot water. Let it sit for about five minutes to make sure that the bottle gets warm as well. Pour out about half of the water. Place an ice cube on the opening of the bottle. Put the bottle in front of a sheet of black construction paper. Watch for the formation of "clouds" on the inside of the bottle's surface. Ask students to help you explain what happened (the evaporated water rose up and then cooled down and condensed into the water droplets that created the "cloud" in the bottle).
Fog--Discuss with students how fog is formed. Remind them that it is like having a cloud near the ground. Have student draw a picture on the light gray construction paper with construction paper crayons of either a car with its lights on or the seashore with a lighthouse. Label picture "Foggy". Have students tear strips of wax paper and glue the strips over their pictures to represent fog. Remind students of the experiment that you did for clouds and how it is similar to fog.
Rain--Teach students about the water cycle and why it rains. Using the light gray paper, have student draw dark rain clouds. Give students a small piece of aluminum foil. Have them cut raindrop-shaped pieces of foil and glue the pieces under the rain clouds that they drew. Label page "Rainy."
Teacher Directed Coordinating Science Experiment: Tell students that you are going to make it rain (just a little) in the classroom. They will need to use their imaginations. Show students the hot plate, the pot of water, and the pie dish that is filled with ice. The hot plate represents the sun. The pot of water represents a lake, an ocean, a stream, or a puddle. The pie dish filled with ice represents the cold clouds. Start heating the pot of water on the hot plate (remember not to let students get too close). As the steam starts to rise, explain to students that this is the evaporated water (or water vapor) that goes up into the sky and forms the clouds. Place the pie dish over the pot of boiling water. In a few moments, show students how the water is condensing on the bottom of the dish. Explain that as water vapor cools down in the clouds it condenses back into drops of water. As more steam condenses on the bottom of the pie dish, the droplets will get larger and heavier and soon will fall off the pie dish as "raindrops". Show students as this happens. Explain that the water cycle happens over and over again.
Snow--Explain to students how snow is formed the same way as rain, except it is frozen. Have students tear small pieces of the white construction paper to create a snow picture on the blue construction paper. They may draw pictures of themselves in the picture as well. Possibilities for

pictures include building a snowman, sledding, skiing, ice-skating, etc. They have to tear the white paper to make the snowman, snowflakes, and piles of snow. Have students label their picture "Snowy".

Coordinating Sand and Water Table Activity: Put mixed up fake snow (such as Super Snow or Insta Sno) in the sand and water table for students to play with.

Wind--Explain to students how wind is formed. Remember to tell them that while we cannot actually see the wind, we can see what the wind does. For example, we can see how the wind bends the branches of trees and how it helps us fly a kite. But the actual wind itself cannot be seen. Show students the Windmill Outline and brad and demonstrate how to assemble it. Have students glue the windmill building on a piece of blue construction paper and attach the blade with a brad so it will spin around. Label page "Windy."

Coordinating Sand and Water Table Activity: Fill sand and water table with bubble solution. Provide students with bubble wands of varying sizes. As they blow bubbles, ask them to pay attention to which way they blow the bubbles. Their blowing is similar to the wind; the direction in which they blow causes the bubbles to go different directions. Use a small hand-held fan or paper fan to redirect the direction of the bubbles as the wind would.

Lightning and Thunder--Explain how lightning and thunder are formed. Clarify that you see lightning but you hear thunder. Discuss with students how to be safe during a violent storm. Search the Internet for lightning pictures or video clips to show the students. Have students draw a picture of their house with a thunder and lightning storm on black construction paper. Use the construction paper crayons or dark paper colored pencils for intense colors. Label paper "Lightning and Thunder."

Teacher-Directed Coordinating Science Experiments: To make "lightning" in your classroom, turn off the lights in the classroom. Rub a blown-up balloon on your hair for a few seconds. Hold the balloon near the end of a fluorescent light bulb. The light bulb will briefly illuminate. Why? Once you have rubbed the balloon on your hair, the balloon gets an electrical charge on it. When the balloon touches the end of the light bulb, the charge jumps from the balloon to the bulb. That is what illuminates the light bulb. Lightning is an electrical discharge in a thunderstorm. When the voltage becomes strong enough, the electricity leaps across the air from one place to another, and we see lightning. To make "thunder" in your classroom, blow up a paper sack. Twist the end tight and hold it in one hand. Use your free hand to quickly hit the bottom of the sack. The sack will burst with a loud "pop". Remember that when lightning strikes, it heats the air around it. The hot air expands and produces waves of air that make the loud sound. Similarly, hitting the blown up sack causes the air inside the bag to compress so fast that the pressure breaks the bag. The air in the bag rushes out and pushes the air around the outside of the bag away, resulting in the "popping" sound that you hear.

Collect and assemble all of the students' pages into book form for them to take home and enjoy with their families.

Extensions

Curriculum Extensions/Adaptations/ Integration

Add extra pages to the weather book about weather that we may not experience as much in Utah, (e.g., tornado, hurricane, etc).

Invite students to read their books to peer reading buddies, parent volunteers, other school personnel, or a sibling's teacher.

Assemble a book of photos of students playing, in different weather. Show safe things to do in different types of weather, such as what to do during lightning storms.

Have students write in their classroom journals about different types of weather.

Family Connections

Ask students to read their books to their families.
Ask students to look with their families on-line, in newspapers, or in magazines for pictures relating to the weather.

Assessment Plan

Check students' weather books for understanding of each weather concept.
Have students verbally explain to you about each weather concept.
As students are participating in each experiment, question them for understanding.

Bibliography

Research Basis

Bredekamp, S. & Copple, C., (eds.) (1997) Developmentally Appropriate Practices in Early Childhood Programs (rev. ed). Washington DC: *National Association for the Education of Young Children*. 112, 114, 115

By kindergarten, young children have developed the ability to mentally and symbolically represent concrete objects, actions, and events. Students at this age have (or are developing) the ability to make a plan and then carry it out. Because of this ability, their activities can become more purposeful and goal-oriented. This can be applied to their understanding of science experiments. Kindergarteners can take a guess and then (sometimes with guided direction) figure out what is happening. Kindergarteners are more likely to comprehend and remember those new ideas when given the opportunity to experience new concepts, strategies, and relationships between objects, in a hands-on setting. We need to remember that although young children may have age-appropriate limits to their cognitive capabilities, they do have a vast ability to learn, think, reason, remember, and problem solve.

Church, E.B. (2003). Scientific Thinking: Step by Step. *Scholastic Early Childhood Today*. 4/2003. 35-37

There are several different skills that early childhood students should learn in order to understand scientific thinking. These include the abilities to observe, compare, sort and organize, predict, experiment, evaluate, and apply. When we give our students the opportunity to practice building these skills, we are helping them to learn process skills for understanding science as well as other subjects.

Observation is the process of looking closely without much actual doing. Kindergarteners often want to start the experiment right away. We should remind students that using observation is an important step in experiments. When students are encouraged to compare, they can begin to move beyond talking about what they noticed about an item and instead talk about relationships between items. Sorting and organizing is the processes of putting items together by recognizable traits. Students' should be encouraged to match, group, and organize items in many different ways. In this way, they begin to understand that some objects can belong to more than one group. When students are encouraged to predict, they practice building questioning and speculating skills. Students learn to use prior knowledge and information gained from observation, comparing, and sorting to make the best guess that they can as to what may or may not happen in a science experiment. Student's prediction skills will get better and better with experience. During an experiment, students can test their predictions and try out their ideas. Students need to be given ample time and provided with plenty of materials to experiment. One way for students to evaluate is by letting them take their concrete experience and communicate their findings to others. They can do this verbally or be given the opportunity to write it down in journals. They can also abstractly represent their finds through graphs, drawings, and charts. The last skill is for students to learn how to apply what they learned to other experiments. Students can be given new materials and new questions to answer. This is also a good time for open-ended questions.

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