3.5 CLOUDS

OBJECTIVES

- Identify stratus and cumulus clouds.
- Estimate and record the daily amount of cloud cover.
- Hypothesize about temperature in a cloud's shadow and in sunlight.
- Measure temperatures under cloud cover and in sunlight.
- Make hypotheses and generalizations about temperature and cloud cover.

CLIMATE EDUCATION FRAMEWORK

- 3-5Weather.A.1 By measuring weather conditions (temperature, amount and kind of precipitation, amount and kinds of clouds, wind direction and wind speed), scientists learn how the weather changes from day to day, month to month, and during the year.
- 3-5Energy.A.1 Whenever anything happens or changes, energy is involved. For example, whenever there is a change in an object's motion or temperature, energy is involved in those changes.
- 3-5Energy.A.2 Light is a form of energy that moves from one place to another place.
- 3-5Energy.B.1 Energy from the Sun travels to the Earth as light. When this sunlight is absorbed, it warms Earth's land, air, and water.

BACKGROUND

This activity introduces students to the role that clouds play in weather. Students observe that there are two general kinds of clouds, layered or *stratus* and heaped or *cumulus*. Within these two major categories there are several more kinds of clouds that are primarily dependent on altitude as well as combinations of different cloud types. These will be studied more in depth next year.

The second goal of the activity is for students to begin to estimate the amount of daily cloud cover. They begin with just three descriptions, clear (no clouds), partly cloudy (some clouds), and mostly cloud covered. They then begin to estimate the amount of cloud cover. It is suggested that percentages or fractions be used if students have been introduced to this concept in math. If not, use such terms as few clouds (up to ¼ or 25%), partly cloudy (around ½ or 50%), mostly cloudy (¾ or 75%), and totally cloud covered or overcast (100%).

The third focus of this activity is to help students become aware that there is a difference in temperature in sunlight and under cloud cover. They observe the capacity of clouds to block the sunlight. They hypothesize about the temperature difference between sunlit and shadowed areas and test their hypotheses.

STUDENT ROLE

Meteorologist

MATERIALS
Thermometers
Working Dictionary
Student Page 3.5 Daily Cloud Cover

PRODUCTS
Completed Student Pages

PROCEDURES

1. **Help the students to make a class concept map about clouds to find out what they already know.**

2. **On a day when small clouds are passing overhead. Go outside with the students and have them observe the clouds.**
   Ask such questions as
   - Are all the clouds the same?
   - How are they different?
   - Can you point to some clouds that are puffy and rounded?
     ✔Introduce the term, **cumulus**, for these heaped clouds.
   - Can you point to some clouds that seem to have a flat, stretched shape?
     ✔Introduce the name, **stratus**, for these layered clouds.
   - What other kinds of clouds do you see?
     ✔Help them to see that most clouds seem to be cumulus, stratus, or a combination of these two.
   - Are all clouds the same color? How are they different?

3. **Introduce the students to estimating the amount of cloud cover in the sky.**
   Ask such questions as
   - Are there always clouds in the sky?
   - Can you describe how much of the sky is covered with clouds today?
   - Is the amount of cloud cover always the same? How is it different on other days?
     ✔Introduce the ideas of *clear* (no clouds), *partly cloudy* (some clouds), and *totally or mostly cloud covered* (overcast).
   - How can you add this to the daily weather data collection.
     ✔Help the students plan to do this. Add to the Responsibility Chart.
     Use SP 3.5 Daily Cloud Cover.

4. **Go outside on a partly cloudy day and introduce the students to mathematically estimating the amount of cloud cover.**
   Ask such questions as
   - Can you describe how much of the sky is covered with clouds today?
   - Is the amount of cloud cover always the same? How is it different on other days?
     Introduce such terms as *clear* (no clouds or 0%), *few clouds* (25% or about ¼), *partly cloudy* (around 50% or about ½), *mostly cloudy* (75% or about ¾), and *totally cloud covered or overcast* (100%). Use percentages, fractions, or just the words as is appropriate to student understanding and math experience.

5. **Add this information to the monthly weather summary. See activity 3.6A Monthly Weather Summary.**

6. **On a day with a few small clouds have the students observe the shadows clouds make on the ocean or in an open area and what happens as clouds cover the sun.**

   CAUTION:

   NEVER LOOK DIRECTLY AT THE SUN!

   Ask such questions as
   - What did you notice as a cloud moved overhead?
     ✔Work toward the idea of it getting darker because there is less light
   - What happened to the light on the ground when the sun was blocked by the cloud?
     ✔Work toward the idea of the ground getting darker.
   - Which is closer to you, the cloud or the sun? Why do you think so?
   - How do you make a shadow with your body?
     ✔Work toward the idea that you make a shadow by blocking light.
   - Can you see your shadow in the dark? Why?
     ✔Work toward the idea that there is no light to block so bodies are not outlined in light.
   - Can you see your own shadow when the sun is blocked by clouds? Why?
     ✔When the clouds block the light there is no light to be blocked or light to make a shadow.
   - Can you see the shadow of trees, buildings, and other objects when the sun is blocked by clouds? Why?
     ✔Work to the idea that shadows are produced by the blocking of the sun's light. When the sun's light is blocked by clouds there is no light for the trees and buildings to block.
   - Can you feel any difference when the sun is blocked and when there is sunlight?
     ✔Work toward a difference in temperature.
   - How could you measure that difference?

7. Continue the discussion about the cloud passing and the sun coming back.

Ask such questions as these:

- What happens to the light on the ground when the sun reappeared?
- When the sun reappeared did you see your own shadow? Why?
  ✔Work toward the idea that the sunlight is no longer blocked and that bodies could again block the sunlight.
- Can you see the shadow of trees, buildings, and other objects when the sun is out? Why?
- Can you feel any difference when there is sunlight and when the sun is blocked by clouds or other things like trees or buildings?
- Can you feel a difference on the back and front of your hand when you hold it in front of your face to block the sun?
- What do you think could cause these differences?
  ✔Work toward the hypothesis that there seems to be a difference in temperature.
- How could you measure that difference?
  ✔Work toward the idea of measuring the temperature.
- What questions do you have about clouds and sunlight?
  ✔Have the students explore their questions while they are outside or record them in the Wonder and Discover Book to explore later.

8. Have the students continue their inquiry about clouds and sunlight.

Have them

- State or restate their hypotheses about temperature and shadows or other ideas.
- Design experiments to test their hypotheses.
  ✔Work for experiments that measure the temperature in shadow and sunlight at the same time.
- Test their hypotheses.
- Interpret results and make generalizations.
- Share their results.

EXTENSION

- Have students research other kinds of clouds and try to identify them.

DAILY CLOUD COVER SP 3.5

Name:_____

Date:_____

DATE	Amount of Cloud Cover	Kind of Clouds	TEMP

DATE	Amount of Cloud Cover	Kind of Clouds	TEMP