

How Does a Cloud Form?



Target Grade Levels

Sixth - Ninth

Time

Aspects of this lesson plan can stand alone, in one class session, or extend for a number of days and follow up.

Materials

- jar
- warm water
- a plastic bag of ice that fits over jar top
- a sheet of black paper
- flashlight
- matches
- notepad

Knowledge and Skills (TEKS)

- Language Arts:
 - Demonstrates effective communication skills during interviewing, reporting, providing information, role playing, or answering questions;
 - Clarifies spoken ideas with evidence and elaboration; and
 - Uses writing as a tool for research, for example, learning logs, posters, timelines, outlines, and summaries.
- Science:
 - Plan investigative procedures; and
 - Collect data through observation, measuring, and communication of valid conclusions.

Overview

Cloud formation and its effect on weather are important to scientific understanding of both weather forecasting and air quality concerns. This activity aids in the understanding of cloud formation, assisting in student education in the subjects of science, environmental studies and mathematics.

Background Information

Air warmed by the earth rises into the sky. As the air cools, the water in the air condenses to form clouds.

Clouds are part of weather. A cloud is a mass of fine drops of water or tiny crystals floating in the air above the earth, formed by water vapor in cool air. The three main types of clouds are cirrus, cumulus, and stratus. Cirrus clouds are located high in the sky, where temperatures are well below freezing; they are white, thin and look like feathers because they are made up of tiny crystals. Cumulus clouds are white clouds that form closer to the earth and are thin, with a cotton-like appearance. Due to their closeness to the earth, these clouds primarily consist of water droplets. They can produce showers and thunderstorms when they get bigger and thicker. Stratus clouds are grey, flat clouds that spread out over the sky. They are located low in the sky and are usually associated with widespread rain. These clouds do not grow bigger and thicker but usually spread wider.

When air quality meteorologists forecast Air Quality Health Alert days, one of the things they consider is cloud cover and cloud type. Air Quality Health Alert days are days that experience a lot of sun and ultraviolet radiation, considering cloud cover is crucial. Clouds can block the sun, create rain, or allow the sun to shine through and create conditions favorable for ground-level ozone formation.

Typically, due to their thickness and low position, cumulus clouds are capable of blocking the sun and stopping formation of high amounts of ground-level ozone. However, cirrus clouds in the sky, thin and high, can allow enough sunlight in to engage the photochemical process that turns pollutants in the air into ozone.

Knowing how, why and when certain clouds form help meteorologists determine whether or not tomorrow is an Air Quality Health Alert day.

More information on studying clouds can be found at the following websites:

- asd-www.larc.nasa.gov/SCOOL/
- www.globe.gov

Procedure

1) Vocabulary

- | | |
|-----------------------------|------------------|
| a) clouds | i) nimbostratus |
| b) cirrus | j) altostratus |
| c) cumulus | k) stratocumulus |
| d) stratus | l) altocumulus |
| e) Air Quality Health Alert | m) cirrocumulus |
| f) ultraviolet radiation | n) cumulonimbus |
| g) ground-level ozone | o) meteorologist |
| h) cirrostratus | |

2) Activities

- Do this activity on a dry day when the sky includes a variety of clouds. Take the students outside and have them lie on the grass and look up at the sky. Have them observe the sky for one minute, then ask them about the clouds they see. Are they the same or different? What characteristics do they notice about the clouds? Are they high or low, thick or thin, fat or skinny, etc.? What do they know about how clouds form? List answers on the notepad.
- Review when class comes inside.
- Write observations from notepad on blackboard. Tell the students that the activity they will participate in today will show them a little bit more about how clouds form.
- Cut out or draw pictures of five different types of clouds and then give each student a picture of a cloud. Have the student walk around the room and try to find other pictures that look like their own. The groups that the students end up in will be their group for the lesson.

Note: There are three main cloud types – cirrus (light, feathery/curly and high in the sky, they are common in fair weather), cumulus (puffy, flat and low, they are seen in fair

weather and in foul), and stratus (flat like blankets and usually grey, they are associated with fog, drizzle and snow, depending on their temperature, size and thickness) – and alterations of each: cirrostratus, nimbostratus, altostratus, stratocumulus, altocumulus, cirrocumulus and cumulonimbus (“alto” means “high”; “nimbo” means precipitation (rain or snow); “cirro” means it is layered, made up of many parts).

- e) Once they are in their groups, have the students count off: one through five (if necessary). Pass out role labels according to numbers: all of the ones are “technician”, twos are “principal scientist”, threes are “timekeepers”, fours are “recorders”, and fives are “reviewers”.
- f) Explain the instruction and discuss safety precautions (i.e. the importance of being careful with glass, what to do if glass breaks, etc.). Only teachers and other adult assistants will handle broken glass and matches. Student Instructions: The “technicians” will go to the front of the room and gather the materials necessary for the investigation. “Principal scientists” will place the jar on the sheet of black paper or tape the paper on the back of the jar so they cannot see through it. With the bag of ice nearby, they will fill about one third of the jar with warm water. The teacher or assistant will light the match and hold it over the jar opening. After a few seconds, the match is dropped into the jar and the “Taskmaster” will cover the top of the jar with the ice bag. While the “Encourager” shines the flashlight into the jar, “Timekeepers” record the length of time that it takes to create a cloud inside the jar. What is happening? “Recorders” will write observations on a separate piece of paper.
- g) Ask if anything needs to be repeated. When there are no more questions, ask the “technicians” to come up and gather the materials.
- h) Perform the experiment. Discuss observations.
- i) Invite the different groups to gather as much information as possible about their type of cloud, using sources in the library.
- j) Have each group make a large poster of their cloud type.
- k) Have each “Cloud Club” present their cloud to the class by displaying the poster and sharing the information they have learned.

3) Review

- a) After their research, ask the students about other types of clouds (cirrocumulus, cirrostratus, altostratus, altocumulus, nimbostratus, and cumulonimbus). What types of weather do the other clouds bring? Rain, snow, steady rain or snow, thunderstorms and fog. How does each of these weather systems affect ground-level ozone?
- b) Have each cloud club quiz the class on the material they presented. The cloud clubs can compete for points by writing down the group’s answer to each question, then, all answers are held up at once and the groups with the correct answers receive points. The winning group can be named Cloud Champions. (Note: this game makes it advantageous for all students to take notes on the cloud presentations and for groups to come up with difficult questions.)

4) Evaluation

a) Questions

- i) What did you see in the jar?
- ii) Thinking about your observations, how might a cloud form?
- iii) Why was the smoke from the match important to cloud formation?
- iv) From our investigation could we say that “a cloud is visible body of very fine droplets of water which hang in the atmosphere above the earth’s surface”?
- v) What makes up weather?

b) Possible Answers to Questions

- i) A cloud, smoke, dust, fog.
- ii) The warm air is cooled (by the ice cubes) and little drops of water come out of the air (water condenses). The drops of water are so little that they stay in the air. We see them as clouds.
- iii) So you could see the cloud better. It provided particles for vapor to “grab on to”.
- iv) Yes.
- v) Clouds, wind, rain, temperature.

c) The “reviewers” will ask their group the following questions:

- i) Why might the weather forecast be important?
- ii) What do the students know about how clouds affect sunlight?
- iii) How do clouds influence ground-level ozone and air quality?

d) Possible answers to the “reviewers” questions

- i) It helps us plan our daily activities, which helps us determine what to wear, whether or not it is going to be an Air Quality Health Alert day.
- ii) Blocks the sun or filters the sun.
- iii) When they block the sun, clouds can stop the formation of pollution. They can cause rain, clearing the air of ozone. Meteorologists have to see what kind of clouds are in the sky before calling an Air Quality Health Alert day.

5) Extension

- a) Every morning have each student go outside and look at the clouds. Have them draw the clouds on the page and identify the cloud. Have students try to predict the weather by looking at the clouds. Do this for two weeks. At the end of that time, have the students look at their journals and see how accurate their weather predications were.
- b) Have the students draw a picture showing the processes that lead to cloud formation.
- c) Have the students draw and/or label three main types of clouds.

- d) Have the students write a story about a cloud which includes where in the sky it is found and what type of weather it might bring.
- e) Have students observe and record cloud types daily for a month on a graph, by making a space next to the appropriate cloud name. Make a graph analyzing the amount of each type of cloud cover per day, week, month, etc. This activity provides essential skills in mathematics.
- f) Example: Our Cloud Chart for May

Type of Cloud	1	2	3	4	5	6	7	8	9	10
Cirrus	X			X	X					
Cumulus	X	X	X	X			X			
Stratus	X									

In the first week of May, 57 percent of the days experienced cirrus clouds, 71 percent experienced cumulus clouds and 14 percent experienced stratus clouds.

- g) Have students write a story about the cloud, including its location in the sky and what type of weather it might bring; have students write poems and rhymes about clouds.
- h) Display the weather pages from the newspaper and read them aloud daily. Discuss with students the elements of a weather report. Have students write weather reports to broadcast at the beginning or end of the school day. They may want to draw a picture to include with their forecast.
- i) Have students write poems or rhymes about clouds.
- j) On a day the sky has cumulus clouds, take the students outside to observe the clouds and the changing shapes. Have the students then write stories about what figures they see in the clouds.