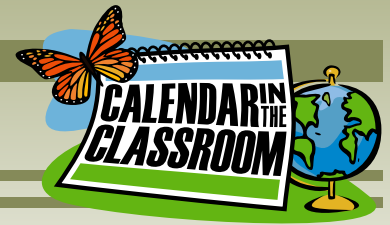




Curiosity About Clouds



Overview

Students will be able to identify the three major cloud types and tell what significant weather event may be linked to each type. Students will be able to draw and explain the water cycle.

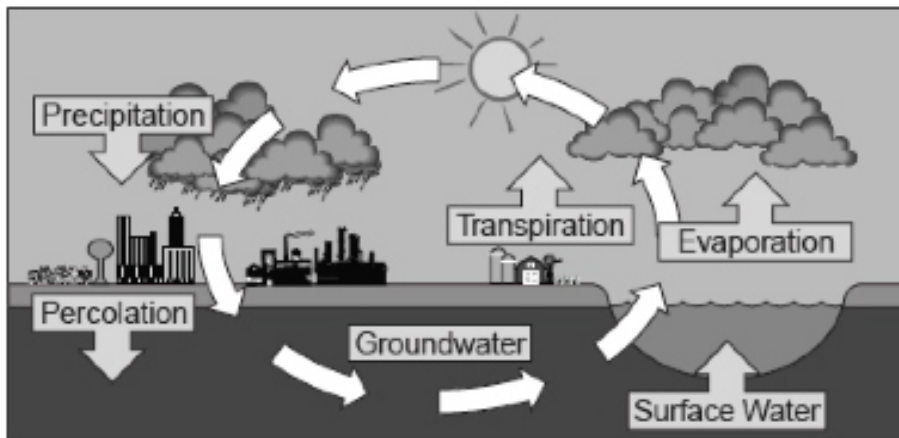
Standards/Benchmarks *

- Describe how the states of matter change as a result of heating and cooling. Science (4.2.1.2.2)
- Describe the transfer of heat energy when a warm and a cool object are touching or placed near each other. Science (4.2.3.1.1)
- Identify where water collects on Earth, including atmosphere, ground and surface water, and describe how water moves through the Earth system using the processes of evaporation, condensation and precipitation. Science (4.3.2.3.1)

Background

Using the Water Cycle graphic below as a guide, and this web address (<http://ga.water.usgs.gov/edu/watercycle.html>) as additional information, show how water moves from surface water to land and back through a continuous cycle. Explain how water is transferred to the air from oceans and surface water by evaporating, from animals and humans respiring, and from plants transpiring. Water is condensed in the air as clouds, returned to the earth through precipitation, and returned to the oceans as runoff from rivers and streams. Explain that this is a continuous cycle worldwide, with only a portion of any given cycle taking place in Minnesota. In addition, places not directly near an ocean participate in the cycle.

The Water Cycle



Warm Up

We are all part of the water cycle. Ask students to hold the flat palm of their hands about 4 inches from their mouths and exhale. What do they

Time:

Day 1 – 30 to 40 min.
Days 2 to 5 10 min. each

Skills:

Observing
Drawing
Forecasting
Drawing conclusions

Vocabulary:

cirrus clouds
cumulus clouds
cumulonimbus clouds
stratus clouds
evaporation
fog
precipitation
condensation
transpiration
water cycle

Materials Needed:

- Whiteboard
- Drawing paper/drawing utensils
- *Minnesota Weatherguide Environment™ Calendar*

feel on their palms? They have just added water to the great water cycle! Where will this water go? How will it become part of the cycle?

The Activity

1. Discuss and define clouds and review the features of the three main cloud types: cumulus, stratus, and cirrus. Refer to the cloud pictures in the *Minnesota Weatherguide Environment™ Calendar*. Take students outdoors and ask them to identify the types of clouds (see Questions for Discussion). Ask students what kind of weather is usually linked to these three cloud types. Include in the discussion the relationships among weather, cloud type, and wind direction. For example, if cirrus clouds are visible and the wind is from the west, the weather, most likely will remain good. If cirrus clouds are visible and the winds are from the east, there may be some precipitation within a 24-hour period.
2. Ask several students to tell how various types of clouds fit into the water cycle. (See Questions for Discussion.) All cloud types fit; they just have different roles. Have students reflect on what their lives would be like without clouds.
3. Discuss the effect of the water cycle on a community. For example, what is the impact, both constructive and destructive, of a thunderstorm, a tornado, a flood, a heavy snowfall, a drought, a sunny day, a heat wave, fog, thunder, lightning, and a hurricane? Point out to students that what one person may view as constructive another may view as destructive or inconvenient. For example a farmer may rely on a good thunderstorm to deliver water to crops, but a parade official may have to make alternate plans. As an aid, you may want to list columns on the whiteboard as indicated by this example and fill in the answers as a class activity. Be sure students realize that even the most severe and large-scale storms are merely nature's way of transferring energy in the earth's atmosphere and of spreading water over the earth.

	Constructive effects	Destructive effects
Thunderstorm		
Drought		
Sunny day		
Snowfall		
Flood		

Wrap Up & Assessment

1. Following this activity, have students observe the sky each day. Appoint one student to draw or name the observed cloud type on the weather calendar on the Weather News Board each day.
2. Have students forecast the daily weather based on their cloud and wind information.

Questions for Discussion

- Where do clouds fit into the water cycle? Clouds provide the vehicle for returning water to the earth through condensation and precipitation. Some clouds, such as cumulus, provide relief on a sunny day and reduce transpiration and evaporation. Other clouds, such as cumulonimbus and some stratus, provide direct precipitation.
- Do some cloud types bring us rain and snow? Which ones? Cumulonimbus clouds bring showers, lightning, and occasionally high winds and tornadoes. Stratus clouds bring dull overcasts and may evolve into nimbostratus, which bring rain, drizzle, or snow.
- How can we identify clouds?

Cumulus clouds are flat on the bottom and bumpy on the top. Cumulus clouds grow vertically due to heat from the ground. If they grow, their tops may spread to form altostratus or altocumulus or, if their vertical growth exceeds six kilometers, they may spread on top and become cumulonimbus.

Stratus clouds have flat tops as well as flat bottoms because they spread under a stable layer of air. Stable air prevents clouds from rising. Stratocumulus clouds form when cumulus-type clouds cannot grow because of a stable air layer.

Cirrus clouds are different from other clouds in that they are composed of tiny ice crystals. In Minnesota you may see these ice crystals sparkling in the sun at ground level when the temperature drops well below zero. A joke is that we then have “cirrus near us.”

Castellanus, which means castle, is a cumulus-type cloud that forms independent of surface heating. They look like little turrets on castles. Rarely seen alone, they are not uncommon when there are numerous cumulonimbus in the sky.

An **altostratus cloud** is a stratus cloud more than two kilometers (about 6,500 feet) above the ground. An altocumulus cloud is a stratocumulus cloud more than two kilometers above the ground.

Cirrostratus is a stratus-type cloud more than six kilometers above the ground.

Extensions

- Plan a class trip to the Science Museum of Minnesota's hands-on Experiment Gallery, which includes weather-related exhibits on clouds, tornadoes, and more.
- Invite a meteorologist to your class to talk about the weather and weather forecasting.
- Take time to explain how water becomes a gas and a solid. Discuss the symbol for water, H₂O, two hydrogen atoms plus one oxygen atom.

Resources

Minnesota Weatherguide Environment™ Calendar. Freshwater Society, Excelsior, MN. 2012.

Project WET, *The Incredible Journey*. This activity engages students in the complexity of the water cycle.

EcoTime Good Morning Cirrus. This brief activity can be done during a morning meeting and reinforces the concept of cloud types, while offering a fun way to evaluate student comprehension.

EcoTime contains 150 standards-based activities. Available from Jeffers Foundation.

*Minnesota Academic Standards

Standards Met

Subject	Code	Standard	Benchmark
Science	4.2.1.2.2	Solids, liquids and gases are states of matter that have unique properties.	Describe how the states of matter change as a result of heating and cooling.
	4.2.3.1.1	Energy appears in different forms, including heat and electromagnetism.	Describe the transfer of heat energy when a warm and a cool object are touching or placed near each other.
	4.3.2.3.1	Water circulates through the Earth's crust, oceans and atmosphere in what is known as the water cycle.	Identify where water collects on Earth, including atmosphere, ground and surface water, and describe how water moves through the Earth system using the processes of evaporation, condensation and precipitation.