

Agriculture is a Cycle

Objective

Students will make bracelets to model life cycles.

Background

AGRICULTURE IS A CYCLE. Farmers plant crops in spring, nurture them during winter and harvest them in the fall. In winter, the land rests to prepare for springtime, when the cycle starts again. Without this cycle of agriculture, people could not survive. There would be no food to eat, no sheets to sleep on, no shelter, no medicines, no balls or playing fields for playing games.

The cycles of agriculture are powered by abundant natural resources— soil, water, and energy from the sun. People are a resource, too. Because people have learned to use their resources wisely, America’s farmers and ranchers produce 16 percent of the world’s food on just 7 percent of the world’s land.

PEOPLE MOVE IN CYCLES. We get up in the morning, work, play and go to bed at night. Then we get up in the morning and start it all again. We start to school in the fall, stop in the summer, then start in the fall again. We eat breakfast, lunch and dinner, then wake up the next day and have to eat again.

WATER MOVES IN CYCLES. All of the Earth’s water can be found in one of the three states of matter—solid, liquid or gas. Water goes through all three states of matter in the water cycle. The water cycle is the continuous movement of the water from the Earth to atmosphere and back again. Next to air, water is the most abundant substance on the planet.

The heat from the sun causes water to rise into the sky. This is evaporation.

The water collects in the clouds, and the clouds become heavy with water. As the gaseous water moves upward, it runs into cooler air. In the cooler air the gaseous water condenses and becomes rain droplets or ice crystals. This is condensation.

The rain and snow that is formed this way falls to the ground. This is called precipitation.

As the water falls to the ground it collects in oceans, rivers, lakes and streams. This is called accumulation.

Most of the precipitation falls in the oceans and seas. Some of it evaporates and goes back into the air. The rest reaches the ground and soaks into the earth to become part of the groundwater supply, which accumulates underground in aquifers and above ground in lakes and streams.

Without water, we could not survive. Farmers could not grow the crops that feed and clothe us. Most of the water used by crops comes from precipitation, but sometimes farmers must use precious groundwater for watering crops so we will all have enough food to eat. This is called irrigation. Good farmers are very careful to make the most efficient use of

Oklahoma Academic Standards

KINDERGARTEN

Speaking and Listening: R.1,2,3,4; W.1,2. Reading and Writing Process: R.1,3; W.1. Critical Reading and Writing: R.3,4; W. Vocabulary: R.1; W.1. Research: R.1,2; W.1,2. Physical Science: 3-1. Earth Science: 2-1; 3-2. Economics Literacy: 3. Geography Literacy: 4

GRADE 1

Speaking and Listening: R.1,2,3,4; W.1,2. Phonics and Word Study: 2,3. Reading and Writing Process: R.1,3; W.1. Critical Reading and Writing: R.3,4,5; W.2. Vocabulary: R.1,2; W.1. Research: R.1,2,3; W.1,2,3. Earth Science: 1-1,2

GRADE 2

Speaking and Listening: R.1,2,3,4; W.1,2. Phonics and Word Study: 2,3. Reading and Writing Process: R.1,3; W.1. Critical Reading and Writing: R.3,7; W.2. Vocabulary: R.1,2; W.1. Research: R.1,2,3; W.1,2,3. Physical Science: 1-1. Life Science: 2-1. Geography Literacy: 2

GRADE 3

Speaking and Listening: R.1,2,3; W.1,2. Phonics and Word Study: 2,3. Reading and Writing Process: R.1,3; W.1. Critical Reading and Writing: R.3,7; W.2. Vocabulary: R.1,2; W.1. Research: R.1,2,3,4; W.1,2,3. Earth Science: 2-1,2. Economics Literacy: 2-3. Geography Literacy: 1AD, 2A. History Literacy: 1,9

Materials

(for each bracelet)

12- to 14-inch thin brown
leather cording

small pony bead (one each in
the following colors):

clear (people)

blue (water)

green (plants)

brown (soil)

orange or red (day)

black (night)

white (air)

yellow (sun)

zip-closing bags

small paper drinking cups

tape

Construction paper cut into
2- by 4-inch cards, as follows:

30 white

30 yellow

60 orange

60 brown

60 blue

150 green

30 envelopes

water used on crops.

PLANTS AND SOIL MOVE IN CYCLES. Plants grow in soil. They provide food for animals. Animals provide food for other animals. Plants and animals die and decompose, contributing to new soil. New plants grow.

Decomposition is nature's way of taking life and energy from dead plants and animals and changing it so new plants can use it. Bacteria and fungus eat the dead tissue from plants and excrete it in a form that helps live plants grow. These decomposers are so small you can't see them except when they are all massed together. That's the green, white or blue and furry stuff you've probably seen growing on food you keep in the refrigerator too long. Earthworms, land snails, slugs and even fly larva (maggots) are also important decomposers.

In nature dead plants and animals decompose and become humus for the soil. Humus acts as a sponge to help the soil hold water. It also traps air in the soil. Plants need air and water in the soil to grow. When the farmer plants crops in the soil, the growing crops take out nutrients. The farmer can replace those nutrients by tilling dead plants back into the soil and letting the decomposers go to work.

EARTH MOVES IN CYCLES. Earth rotates on its axis. It takes 365 days for the Earth to revolve around the Sun. As it revolves, moving nearer and farther from the sun, it gives us the cycle of seasons—spring, summer, fall and winter. With every 24-hour revolution, the Earth gives us the cycle of day and night.

Summer Solstice, around June 21, is the longest day of the year. Winter Solstice, around December 21, is the shortest. In the spring and fall are equinox, days when the hours of light and dark are the same. Spring Equinox is usually around March 21, and Autumn Equinox is around September 21.

All over the world people mark the seasons with festivals associated with agriculture. In spring we celebrate new life. On the farm the fields start to turn green, and there are baby animals everywhere. Farmers plant most of their crops in spring.

The summer sun makes everything grow and is the busiest time on the farm. Even the school year is based on a time when most everyone was involved in agriculture. Summer break was time off from school, so children could help on the farm. Fields had to be hoed to keep the weeds out. Crops had to be fertilized and protected from insects and other pests. Mid-summer celebrations provided rest from summer chores and relief from the heat.

Fall celebrations began as harvest festivals. After working from dawn to dusk for weeks at a time to get the crops in, it was time to celebrate the fruits of all that labor.

In winter work on the farm slows down. It is time for planning for the following growing season. Winter celebrations remind us that the dark, cold days will not last forever, and that the cycle will soon bring spring.

AIR MOVES IN CYCLES. Carbon dioxide gas is a colorless, odorless gas that is part of our atmosphere. It is formed by respiration (breathing), combustion (burning), chemical reaction and decomposition (rotting). Carbon dioxide is present in all organic matter.

Animals breathe in oxygen and exhale carbon dioxide. Plants take in

carbon dioxide through photosynthesis, use it to make food, and give off oxygen. Animals breathe it in again. This is known as the carbon cycle.

Agriculture keeps land covered with crops and trees. Scientists have found that keeping crops and trees growing helps take up extra carbon dioxide through photosynthesis. In Oklahoma we have about 34 million acres planted in crops and about 10 million acres in forest.

THE SUN MOVES IN CYCLES. The sun provides energy for all of the Earth's cycles. Without the sun, plants and animals would not survive. All sources of fuel are a result of the sun's power.

Only one two-billionth of the heat from the sun enters the Earth's atmosphere. The rest is lost in space. Of the energy (heat) that enters the atmosphere, about 30 percent is reflected back to space because of the clouds. About 30 percent of the energy is absorbed by the atmosphere and warms the air. Then about 40 percent of the energy in the atmosphere reaches the Earth's surface to warm the ground and the seas. Heat from the ground and the seas will then warm the atmosphere.

Plants must have sun to grow. Plants convert the energy from the sun into energy we can use. The plants we can grow in Oklahoma depend on the length of our growing seasons—the number of days from the time of the last frost in the spring to the first frost in the fall. Some plants, like garden peas and lettuce, can survive light frost and cooler temperature but don't do well in the extreme heat of Oklahoma summers. Others, like okra and eggplant, love the heat. Certain plants also need more hours of sunlight than others. The world is divided into growing zones, dependent upon the number of days between the first and last frost.

English Language Arts

1. Discuss the meaning of the word "cycle."
 - Ask students what they think of when they hear the word "cycle" (motorcycle, bicycle, tricycle).
 - Write the word "cycle" on the chalkboard, followed by the words "motorcycle," "bicycle" and "tricycle."
 - What do all these words have in common?
 - Brainstorm answers to the question: "What is a life cycle?"
 - Students will write short papers or draw pictures to explain the meaning of the term "life cycle."
2. Print copies of Student Worksheets A and B front to back and cut them into instruction cards. Provide each student with one leather strip and a set of beads along with an instruction card. Students will make bracelets as follows

Vocabulary

- accumulation**—gathering, especially little by little
- axis**—a straight line about which a body or a geometric figure rotates or may be supposed to rotate
- carbon dioxide**—a heavy colorless gas that does not support burning, dissolves in water to form carbonic acid, is formed especially by the burning and breaking down of organic substances (as in animal respiration), is absorbed from the air by plants in photosynthesis, and has many industrial uses
- condensation**—changing from a less dense to a denser form (e.g. steam condenses into water)
- cycle**—a series of events or operations that happen again and again regularly and usually lead back to the starting point
- decompose**— to break down through chemical change; rot
- energy**—usable power (as heat or electricity)
- evaporate**—to pass off or cause to pass off into vapor
- fungus**—any of a kingdom of living things (as molds, rusts, mildews, smuts, and mushrooms) that lack chlorophyll, are parasitic or live on dead or decaying organic matter, and were formerly considered plants
- groundwater**—water within the earth that supplies wells and springs
- irrigation**—supplying with water by artificial means
- nurture**—to further the development of
- photosynthesis**—the process by which plants that contain chlorophyll make carbohydrates from water and from carbon dioxide in the air in the presence of light
- precipitation**—water or the amount of water that falls to the earth as hail, mist, rain, sleet, or snow
- resource**— a usable stock or supply
- revolve**—to move in an orbit season—one of the four quarters into which the year is commonly divided
- survive**—to remain alive : continue to exist



Ag Career: Atmospheric Scientist

Atmospheric scientists study the weather and climate and how it affects human activity and the earth in general. Most atmospheric scientists work indoors in weather stations, offices or laboratories.

Occasionally they do field work, which means working outdoors to examine the weather. Some atmospheric scientists may have to work long hours during weather emergencies.

Atmospheric scientists need a bachelor's degree in atmospheric science or a closely related field for most positions. Those who work in research usually need a master's degree or PhD.

Source: US Department of Labor: <http://www.bls.gov/ooh/life-physical-and-social-science/atmospheric-scientists-including-meteorologists.htm>

to help them remember the different cycles of life. Read and discuss background information for each cycle as students string their bracelets.

—Tie a knot at one end of a leather cord.

—Beginning with the clear “people” bead, string the colored beads in order as you listen to the information your teacher is reading.

3. Students will work in groups to create posters to illustrate the different life cycles, using the color designated to represent each cycle as the predominant color.
4. Introduce students to the *Farmer's Almanac* (www.farmer's.almanac.com).
 - Students will devise their own research questions based on information available in the Farmer's Almanac.
 - Discuss the origins of folk lore. Students will research folklore related to the weather and planting.
 - Students will interview some older farmers and gardeners to collect local folklore about planting and the weather.

Science

1. Provide each student with an envelope containing trading cards cut from construction paper: 1 white, 1 yellow, 2 brown, 2 orange, 2 blue and 5 green.
 - Tell students the orange cards represent gold, and the green cards represent money. Do NOT tell them what the other cards represent.
 - Students will trade cards freely among themselves.
 - Students will sit down and sort their cards by color.
 - Students will all stand. Proceed as follows:
 - Ask if they all have a WHITE card. Those who do not must sit down. The white card represents AIR. Air is necessary for survival. Students must have at least one card to survive.
 - Ask if they all have a YELLOW card. Those who do not must sit down. The yellow card represents SUNLIGHT. Sunlight is necessary for survival. Students must have at least one card to survive.
 - Ask if they all have a BLUE card. Those who do not must sit down. The blue card represents WATER. Water is necessary for survival. Students must have at least one card to survive.
 - Ask if they all have a BROWN card. Those who do not must sit down. The brown card represents SOIL. Soil is necessary for survival. Students must have at least one card to survive.
 - Those still standing have survived. Discuss the importance of those things necessary for survival compared with wealth.
2. Monitor several spots in the school yard to find out how many hours of sunlight they get in a day.
 - On a sunny day, check the locations once an hour, and place a marker for every hour the sun is shining in that spot.
 - Use plant books or seed catalogs to research which plants can grow in which spot, based on the hours of sunlight.
3. Students will research the first and last frost in your area and calculate the length of the growing season.
4. Conduct this experiment to demonstrate the water cycle:
 - Give each student a paper drinking cup and a seal-locking bag.

- Students will hold the bag by one corner so it is in a diamond shape.
 - Tape the cup inside the bag to avoid slippage.
 - Put two ounces of water in each cup.
 - Seal the bags, and tape them to a sunny window.
 - Students will record what they observe after 10 minutes, 30 minutes, two days and four days. (The water should evaporate from the cup, condense on the sides of the bag and collect in the bottom of the bag.)
5. Students keep track of the weather for several days and compare with predictions found on weather websites (www.farmer'salmanac.com, [mezonet](http://mezonet.com), etc).
 6. Students will research the phases of the moon by looking in the encyclopedia, searching the library card catalog or using an online search engine.

Social Studies

1. Oklahoma has many festivals in the summer to celebrate and promote the crops that grow well in a particular area.
 - Students will research ag-related festivals in your part of the state and locate other ag-related festivals statewide. (Oklahoma Department of Tourism website would be a good place to start: <http://www.travelok.com>)
 - Students will map the festivals on a large map of Oklahoma and calculate the mileage from your town to each of the festivals.
 - Students will each select one of the festivals to research and write reports on the festival's history.
2. Students will research to find examples of ag-related celebrations around the world and write reports.
3. Students will create a circular timeline showing the school year and holidays associated with agriculture (planting and harvest).

Extra Reading

- Ditchfield, Christin, *Water (True Books; Natural Resources)*, Children's, 2003.
- Ernst, Lisa Campbell, *Round Like a Ball*, Blue Apple, 2008.
- Kirkland, Jane, *Take a City Nature Walk*, Stillwater, 2005.
- Lindbo, David, *SOIL! Get the Inside Scoop*, American Society of Agronomy, 2008.
- McKneally, Ranida, and Grace Lin, *Our Seasons*, Charlesbridge, 2007.
- Nardi, James B., *The World Beneath Our Feet: A Guide to Life in the Soil*, Oxford, 2003.
- Peterson, Cris, *Amazing Grazing*, Boyd Mills, 2002.
- Sidman, Joyce, and Beckie Prange, *Song of the Waterboatman and Other Pond Poems*, Houghton-Mifflin, 2005.
- Toupin, Laurie, *Freshwater Habitats: Life in Freshwater Ecosystems*, Children's, (Watts Library) 2005.

Water Cycle Song

(to the tune of "oh, my darlin'")

EVAPORATION

(Push both palms up, palms parallel to floor.)

CONDENSATION

(Push with arms straight out to the side.)

PRECIPITATION on my head.

(Pretend to "rain" on head.)

ACCUMULATION

(Make arms sweep back and forth in front.)

WATER CYCLE

(Arms rotate in circle in front.)

And we start all over again
(Turn around in place in a circle.)

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AIR IS A CYCLE. Animals breathe in oxygen and exhale carbon dioxide. Plants take in carbon dioxide, use it to make food, and give off oxygen. Animals breathe it in again.

THE SUN IS A CYCLE. The sun provides warmth and light for all of the Earth's circles. Without the sun, plants and animals would not survive. The sun binds us together.

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Make a bracelet to help you remember the cycles of life. Tie a knot at one end of the leather cord. String the beads in the following order.

clear = people
blue = water
green = plants
brown = soil
orange or red = day
black = night
white = air
yellow = sun

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