

Agriculture is a Cycle

Grade Level: 1-3

Approximate Length of Activity: One-two class periods

Objective

Teacher

1. Describe to students the ways in which agriculture is a cycle.
2. Describe the cycles of water, air, earth, plants, soils and people.

Students

1. Learn about many different cycles.
2. Make bracelets representing the cycles of life.

Michigan Content Standards: (Science) P.PM.E.2; E.ES.E.1; E.SE.01.12; L.OL.E.1; L.OL.E.2; E.FE.E.1; E.ES.03.41; E.ES.03.51

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.
- **Circle**- a line segment that is curved so that its ends meet and every point on the line is equally far away from a single point inside.
- **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 separate a thing into its parts or into similar compounds.
- **Energy**- Usable power (as heat or electricity).
- **Evaporate**- to pass off or cause to pass off into vapor from a liquid state.
- **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 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; to continue to exist.

Background

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 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.

AGRICULTURE IS A CYCLE. Farmers plant crops in spring, nurture them during summer and harvest them in the fall. In the 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 approximately 16 percent of the world's food on approximately seven percent of the world's land.

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 to the air. The rest reaches the ground and soaks into the earth to become part of the groundwater supply which accumulates 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 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 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 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 till the crops were 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 Michigan we have about ten million acres planted in crops and about 19 million acres of 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 grow in Michigan depend on the length of 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 heat

of Michigan summers. Others, like the snap beans and sweet corn, love the heat. Certain plants also need more hours of sunlight than others. The world is divided into growing zones and dependent upon the number of days between the first and last frost.

Materials Needed: (for each bracelet)

- 12 to 14-inch thin brown leather cording
- Small pony beads (one each in the following colors):
 - clear (people)
 - blue (water)
 - green (plants)
 - brown (soil)
 - orange or red (day)
 - black (night)
 - white (air)
 - yellow (sun)
- Red cabbage leaves
- Zip-closing bag
- Three clear, short, fat cups
- Two balloons
- One bottle of club soda
- Small paper drinking cups
- Tape
- Copies of "Agriculture is a Cycle" worksheets A and B

Activity Outline

1. Tell students why they will be making bracelets to help them remember the different cycles of life.
 - Print copies of Student Worksheets A and B front to back.
 - Cut them into instruction cards.
 - Hand out one leather strip and a set of beads for each student along with an instruction card.
 - Have each student tie a knot at one end of a leather cord.
 - Beginning with the clear "people" bead, have students string the colored beads in the order shown on the card.
 - Read and discuss background information for each cycle as students string their bracelets.
2. Have students work in groups to create posters to illustrate the different life cycles, using the color designated to represent each cycle as the predominant color.
3. Use this experiment to demonstrate the carbon dioxide (air) cycle:
 - Tear up several leaves of red cabbage and put them in a zip-closing bag.
 - Pour hot water over the cabbage, and zip the bag shut.
 - Let the cabbage seep in the water until the water is blue and cold.
 - Pour the liquid into a cup.



- Discard the bag and cabbage.
 - Explain that cabbage juice is an indicator (a substance which indicates the presence, absence or concentration of a substance) because it contains a natural chemical that changes colors, based on whether a substance is an acid or a base, and that carbon dioxide makes carbonic acid when dissolved in water.
 - Label three cups as follows: control, club soda, breath.
 - Divide the cabbage juice equally among the three cups.
 - Blow up a balloon, and let the air out of it.
 - Open the club soda, and quickly put the balloon on the bottle mouth.
 - Let the balloon stay on the bottle until it inflates.
 - Twist the balloon closed and take it off the bottle.
 - Hold the end of the balloon in the cup labeled “club soda” and slowly release the gas from the balloon into the cabbage juice.
 - Blow up another balloon, and twist it to hold your breath in.
 - Hold the end of that balloon over the cup labeled “breath,” and slowly release its contents into the cabbage juice.
 - Leave one cup of cabbage juice alone to serve as the control cup.
 - Compare the three cups.
 - Have students record their observations.
 - 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.
4. Use plant books or seed catalogs to research which plant can grow in which spot, based on the hours of sunlight.
 5. Have students research the first and last frost in your area and calculate the length of the growing season.
 6. Conduct this experiment to demonstrate the water cycle:
 - Give each student a paper drinking cup and a seal-locking bag.
 - Instruct students to 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.
 - Have students 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.)

Discussion Questions

1. What is a life cycle?
2. How does the earth move in cycles?
3. Describe the water cycle.
4. Do all of the cycles help farmers?

Related Activities

1. Activities related to language arts
 - Discuss the words “cycle” and “circle.”
 - Ask students what they think of when they hear the word “cycle” (motorcycle, bicycle, tricycle).
 - What do all these words have in common?
 - Brainstorm answers to the question: “What is a life cycle?”
 - Have students write a short paper or draw pictures to explain the meaning of the term “life cycle.”
 - Introduce students to the Farmer’s Almanac (www.farmer’salmanac.com).
 - Students will devise their own research questions based on information available in the Farmer’s Almanac.
 - Discuss the origins of folk lore, and have students research folklore about the weather and planting.
 - Have students interview some older farmers and gardeners to collect local folklore about planting and weather.
2. Activities related to social studies
 - Michigan has many festivals in the summer to celebrate and promote the crops that grow well in a particular area.
 - Have students research ag-related festivals in your part of the state and locate other ag-related festivals statewide. (Michigan’s Official Tourism site should be a good place to start: www.michigan.org)
 - Have students map the festivals on a large map of Michigan and chart the mileage from your town to each of the festivals.
 - Have students research to find examples of ag-related celebrations around the world.
 - Have students create a circular timeline showing the school year and holidays associated with agriculture (planting and harvest).
3. Activities related to Information Technology
 - Have students keep track of the weather for several days and compare with predictions found on weather Web sites (www.farmer’salmanac.com, Mezonet, Weatherbug, etc.).
 - Have students research the phases of the moon by looking in the encyclopedia, searching the library card catalog or using an online search engine.

Book Resources

1. “In For Winter, Out for Spring” by Arnold Adoff and Jerry Pinkney
2. “One Small Blue Bead” by Byrd Baylor
3. “Water Dance” by Thomas Locker
4. “Mud” by Mary Lyn Ray and Lauren Stringer
5. “A Drop of Water: A Book of Science and Wonder” by Walter Wick

Acknowledgement: Adapted from “Agriculture is a Cycle,” Oklahoma Agriculture in the Classroom.

A Cycle is a Circle

Worksheet A

A Cycle is a Circle

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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Worksheet B

PEOPLE move in circles. The Earth provides us with what we need to survive. We must take care of our valuable resources.

WATER IS A CIRCLE. Water rains on the land. It collects in oceans, rivers, lakes and streams. It then evaporates, rises into the sky and collects in clouds. The clouds become heavy with water, and rain falls down to land again.

PLANTS AND SOIL ARE CIRCLES. 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.

EARTH IS A CIRCLE. Earth rotates on its axis, revolving around the Sun. The Earth and Sun give us the circle of seasons and the circle of day and night.

AIR IS A CIRCLE. 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 CIRCLE. 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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