W 1203

4-H PHENOLOGY WHEELS

OBSERVING THE NATURAL WORLD AROUND US

Andrea Ludwig, Associate Professor and Extension Specialist, Department of Biosystems Engineering and Soil Science, University of Tennessee

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Skill Level

Beginner (4th and 5th grade) or Intermediate (6th – 8th)

Learner Outcomes
The learner will be able to:
- Define the term phenology
- Observe changes in the natural world around them related to season, climate, or other natural cycles
- Create a phenology wheel as a class and on their own

Educational Standard(s) Supported

BIO2.LS4 14
EVSC.LS2 6

Success Indicator
Learners will be successful if they can:
- Define phenology and provide examples of phenological observations.

Life Skill(s)

Observing, Identifying and Building Relationships, Communication

Tags

4-H Science

Time Needed

30-45 minutes

Materials List

Poster board, foam board, or white board

Sharpie or white board markers

4-inch by 4-inch white sticky notes or white notecards (unlined) with tape or push pins

Coloring pencils or markers

Introduction to Content

From the leaves changing colors in autumn to the emergence of the 17-year cicadas, the natural world around us is always changing. Life cycles of plants and animals are in tune with nature's cycles, especially related to climate and seasonal changes. Whether it's over the course of the day as the sun rises and sets, throughout the year with the changing of the seasons, or over longer periods of time, these cycles are like pulses of the heartbeat of Earth.

What would happen if you picked a spot in your yard or in your favorite park and observed changes over a day? What would you see? What would change around you? What about over a week? Or over the year? You would see how plant and animal life are responding to events like the sun rising and setting, temperature changes, weather patterns, and interactions that result from these triggers among lifeforms.

Figure 1. The change in season affects the vegetation and water in this pond at Seven Islands State Birding Park in Knox County, Tennessee.

Terms and Concepts

The study of cyclic phenomena in nature relating to climate and plant and animal life is called ***phenology***. Some examples of phenology observations include seeing flowers and leaves emerge from winter buds, hearing the first mating calls of frogs and toads, the arrival of migratory birds, seeing the first groundhog outside its den after winter hibernation, and observing leaf color changes on deciduous trees during fall, and much more. There are signs of every season!

Setting the Stage

This activity is meant to spark interest in the outdoors, develop skills in making observations of the natural world, and create connections for students between living things and the environment.

1. What changes in nature have you observed over the last day?
2. What changes in nature have you observed over the last month?
3. What would happen if you sat in your backyard or at your favorite park and made observations over the course of the day? How about the week, month, or year? What triggers the observations you might see?
4. What if you built a birdhouse and were able to watch every day, what would happen? What triggers the observations you might see?

Phenology can be related to set time periods (e.g. day, week, season, year) or can be discussed in terms of life cycles of plants and animals. Use examples from the most recent change in season or local wildlife of interest to show examples of phenology.

Strategies to Increase Student Engagement

- Tip – Bring in posters of seasons or life cycles of plants and animals
- Tip – Choose a spot in the schoolyard and take a photo each season to show the changes over time
- Tip – Check out the National Phenology Network for more on phenology
    - https://www.usanpn.org/

Experience – Build a Class Birthday Phenology Wheel

Preparation: Create a class Phenology Wheel. This can be done using foam boards or poster boards (best option for multiple uses), large wall paper, or on a chalkboard or white board.

Figure 2. Phenology Wheel example that includes months and seasons.

Notes

Modify the activity to take out the drawing component by simply asking students to describe their observations to the class. The observation can then simply be written in bullets/words on the sticky note or straight onto the wheel poster.

Local phenologies will differ! A new student from a different area may have different observations than classmates making observations all in the same place. This can lead to a discussion about why phenologies would vary from place to place.

Display the Class Birthday Phenology Wheels somewhere in the school such as the hallway or at the library. Create an open-ended opportunity for others to add to a phenology wheel set up somewhere in the school.

Each student will need a 4-inch by 4-inch white sticky note (or notecard), and each table a set of coloring pencils or markers.

Activity:

Ask students to think about what is happening in nature during their birthday/birth month. What observations do they see in nature around their birthday? This could be related to the weather, to their favorite animal sightings, or to plants in their yard. Be sure to emphasize the interest is in the natural world, so stay away from human-centered activities or pets. Ask that they keep their birthday a secret for now (that is part of the game). If needed, bring in posters of the seasons to provide examples.

Ask students to write their names on their sticky/notecard and then draw their birthday nature observations. They can use words instead of drawing objects if necessary.

The instructor should be the first player so the students can see how to participate. The instructor should say: "My birthday happens when ___" and then describe what is drawn on the sticky/notecard. Then the class gets to guess the birthday month. For example, "the fall leaf colors peak on my birthday." The answer is October. If needed, start with season to narrow it down. Once someone guesses right, place the sticky/notecard on the wheel in the corresponding month wedge. Then go around the room and ask the students to share. Alternatively for more student guidance, instructors may have their drawing already completed to share at the beginning.

Add sticky/notecards to the wheel as students share their nature observations and the class guesses the month. As the collection grows on the board, students will start to see similarities and differences based on season. The game is complete when all students' sticky/notecard have been added to the Phenology Wheel.

Figure 3. A completed class Birthday Phenology Wheel.

Share

After the game is complete, ask students to look at the Birthday Phenology Wheel that was created out of all the birthdays in the class and look for patterns or trends. Ask students to share their observations on the following:

- How are colors spread across the wheel/between seasons? Are there certain colors seen in some months and not in others?
- Where do you see the most animal observations on the wheel? Are there similarities between the animals represented?
- What kind of weather observations were made in the different seasons?

Another approach may be to invite students with shared birthday months or season to the front to describe as a group the similarities they see.

Process

After students have had a chance to evaluate the Birthday Phenology Wheel and share their observations, ask them:

- What other patterns do you see?
- What natural triggers or natural cycles occur that result in the observations made?
- What kind of relationships can you extract from all this information based on seasonality?

Give the students a specific animal and ask that they think about the life cycle of that animal. Ask them what that animal is doing during their birth month? For example, what is a raccoon (our official state wild animal) doing during the coldest part of winter? They enter a hibernation-like state called torpor to conserve energy. They sleep a lot during this time! During late winter and early spring, they go in search of a mate and become more and more active as spring progresses. Raccoons are nocturnal animals, which means they are most active at night. During the summer months, female raccoons are busy raising their young, which are called kits. Raccoons are opportunistic omnivores, which means they eat both plants and animals (omnivorous) and will not shy away from a free meal. Raccoons are often found near water, so look for their almost perfect tracks in the mud. They have long, skinny toes! During the fall months, raccoons stay busy eating to fatten up and search for winter dens.

For more student guidance, have a poster of the life cycle of a plant or animal that the students would be very familiar with (e.g. bear, deer, turkey, blackberry). Then talk through how the life cycle or behaviors align with changes in the season.

Generalize

Discuss how phenology will change from place to place. Use the example of fall foliage color changes or the hummingbird migration. Depending on where you are, the first leaf color change or the first hummingbird sight will take place on different days.

Fall Foliage Prediction Map – https://smokymountains.com/fall-foliage-map/

Hummingbird Central - https://www.hummingbirdcentral.com/

Apply – Make Your Own Phenology Wheel

Challenge each student to create their own Phenology Wheel. Phenology Wheels can be location-based or organism specific. For location-based wheels, students can select a place in their yard, at their favorite park, or in the schoolyard. For organism-specific wheels, students can research their plant or animal of interest and create a life cycle wheel or a seasonal wheel.

Phenology Wheels can be hand drawn or created using photographs or other digital media. These options can integrate with art, digital design, photography, or technology classes.

Figure 4. An example location-based phenology wheel using photographs.

References

Montana Natural History Center - https://www.montananaturalist.org/blog-post/make-your-own-phenology-wheel/

University of Wisconsin, Madison Arboretum - https://arboretum.wisc.edu/content/uploads/2014/02/10-4-Birthday-Phenology-Game.pdf

National Phenology Network - https://www.usanpn.org/

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Supplemental Information

Educational Standards Met

BIO2.LS4 14) Obtain information and ask questions about the advantages and disadvantages of the basic plant life cycle (alternation of generations). Compare variations in this life cycle among major groups of plants.

EVSC.LS2 6) 6) Evaluate the interdependence among major biogeochemical cycles in an ecosystem and recognize the importance each cycle has in maintaining ecosystem stability.

TIPPS
Life Skills

Head – Thinking, Managing

Heart – Caring

Hands – Working

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