



Patterns in the Decline of Monarch Butterflies

Subject: Science **Grade Level:** / 6th- 8th grade

Materials:

- Technology with access to the Internet
- dnr.mo.gov/education/monarchs
- Migration activity script (page 8)

Vocabulary:

Cause: something that gives rise to an action, phenomenon, or condition

Causation: refers to the factor that is producing the effect

Correlation: is the mutual relationship between two or more things

Ecosystem: a biological community of interacting organisms and their physical environment

Effect: a change that is a result or consequence of an action or other cause

Environmental factors: an identifiable element in the physical world that affects the growth of an organism

Migrate: to change location periodically, especially by moving seasonally from one region to another

Milkweed: a native plant that Monarch butterfly caterpillars need to grow

Pattern: repeated outcome or result of a certain event or effect

Population: all the individuals of one species in a given area

Essential Learning Outcomes:

Students will be able to:

- Recognize patterns in data and make warranted inference about changes in population from scientific articles.
- Explain the difference between correlation and causation.

Lesson Objective(s):

Students will know:

- The pattern of Monarch butterflies' migration and the difficulties that they face throughout their travel
- The characteristics of ecosystems can vary over time
- Patterns can be used to identify cause and effect relationships
- Difference between correlation and causation

Students will understand:

- Patterns in data about ecosystems can be recognized and used to make warranted inferences about changes in populations
- Cause and effect relationships can be used to predict phenomenon in natural or designed systems
- Growth of organisms and population increases are limited by access to resources

ENGAGE: Access prior learning / Stimulate interest / Generate Questions

Pose the situation to students that they are going to go on a trip to Mexico! To plan for the trip they need to figure out what they will need. Brainstorm a list with the students (clothes, food, water, place to stay, etc.). Animals take trips and move throughout the year. What does migration mean (or what does it mean to migrate)? Do humans migrate like this? Have the students tell you some of their thoughts on these questions. Create a list of animals that migrate with student input. Then create a list with the students of the top three reasons why butterflies might move (migrate): weather, food source, and mating. Do not introduce the formal vocabulary of "migration" during this



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stage. Allow the students to explore the word and assess whether they have the background knowledge needed for the rest of the lesson. Also show them this map of their migration patterns:

<http://dnr.mo.gov/education/monarchs.htm>

EXPLORE: Concrete experiences / Describe hand-on, minds-on activities / Describe appropriate background

If the students were on their way to Mexico there are a lot of dangers that they could face. Road conditions safety could hinder them from returning home safely. As for the butterflies, many factors affect their ability to complete their migration. From the previous portion of the lesson, start to pose questions to see if the students know what it is called when animals or humans move to change location. Get students in the mindset of migration before starting the migration activity because they will be able to understand more fully what they are being asked to do. Complete this activity to give them a better understanding of some of the dangers Monarch butterflies face.

Take the students outside or in a space large enough for the activity. Tell the students that they are each Monarch butterflies who have summered in the US, and they are going to start moving (migrating) south to Mexico for the winter. But they better be careful because danger lies ahead; they may not make it there!

Place a boundary line labeled as United States (this is where the students will start), and place another boundary line approximately 10 yards away labeled as Mexico.

Have the students number off 1-25 (alter activity for different sized group). Have the students listen to you as you call out the directions on the attached Migration Activity Sheet.

Once the activity is complete, discuss with students what they learned from the experience.

EXPLAIN: Focus student understanding on concepts / Brief and direct explanation of concepts, skills, or abilities

Over the years there has been a major decline in Monarch butterfly populations. Researchers have discovered there are many factors that play a role in this decline. There are three factors that researchers hypothesize have made the biggest impact on the decline. The primary cause for decline is likely the loss of breeding habitat caused by use of herbicides in agriculture and private lawns. These herbicides kill wild milkweed, the food source for the larval stage of the Monarch Butterfly. The other factors are extreme weather and deforestation in Mexico.

There are some correlations and causation factors that contribute to the decline in Monarch butterfly population. First, it is important for students to know the difference between these two concepts. A correlation is the mutual relationship between two or more things. Factors can exhibit a positive correlation, if they are all going in the same direction. If one factor rises while another falls they have a negative correlation. But correlation does not necessarily indicate causation. Causation refers to the factor that is producing the effect. To establish causation we need to know how one would cause the other. (Start a discussion with an example like this one: sugar consumption is up in American and so are global temperatures. Is one causing the other? What is the correlation between the two? What could be a cause of the increase in sugar consumption?). Also, have the students come up with their own example to share out to the class. As a class, students can evaluate the different examples that their peers come up with. Also, the teacher will be able to assess whether the students understand what correlation and causation are before they are being asked to do it with the Monarch butterfly.



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ELABORATE: Confronted with a related, but new activity / Requires transfer of concepts, skills, or abilities / Student develops a deeper and broader understanding / Apply to daily life / Introduce vocabulary

Divide students into jigsaw groups (Place children into groups and provide them with different materials to research. After researching material, the students will share or “teach” the rest of the students on what they found and give them different information regarding the Monarch butterfly and their decline. One group is going to have the task of finding data about Monarch butterfly populations, one about climate, another about milkweed population, and the last about deforestation in Mexico. Have them research and find data about their topic that covers the past two decades. Have the students look for, find, and record patterns in the data. Next, the class will compare patterns in their data from over the years. They will then find connections and comparisons between all of the groups’ data. Lead discussions with the students to determine possible cause and effect relationships between the factors. Students should know how to develop their own cause and effect relationships from crafting their own in the previous section.

EVALUATE: Throughout / Used to reveal the adequacy of their understanding / New, but related activity that requires knowledge and abilities developed in the instructional sequence

After researching the designated information and discussing it as a class, have the students create a graph that represents the data over the years that they have studied. Creating this visual will help students see the connections between the increases and decreases of each variable over the years, and it will also allow them to practice their graphing skills. Allow for these to be hung up in the classroom or hallway for viewing. As students find out more information regarding the Monarch butterfly, they can add the information to the data they have already researched. After graphing the data, students will answer the prompt, “what are some of the causes for the decrease in the Monarch butterfly population? What leads you to think this?” In the prompt, students should use causation and correlation to help answer the question. The prompt should be used as an exit ticket (A writing assessment that teachers use to see what was learned during the lesson). Therefore, the teacher will be able to assess what the students learned throughout the entirety of the lesson about migration, correlation, and causation.

Differentiated Instruction / Modifications:

- Provide prepared links and materials for students who may have difficulty accessing the information given in the lesson.
- Acquire materials that require different levels of reading skills so each student will be able to contribute to the jigsaw activity during the elaborate stage of the lesson.
- Provide an outline for what should be included for the exit ticket at the end of the lesson. Students might have difficulty organizing their thoughts. If this is the case, have a graphic organizer like a Venn diagram or flowchart on hand that can be utilized.
- Allow students to work with a partner if needed during the evaluation stage of the lesson; the rest of the lesson allows for groups or whole-class work.

Higher Order Thinking Questions:

- What are some other threats the Monarch butterflies might face?
- Can you explain how this might affect their flight pattern?
- Do you think there is a solution to help this situation?
- How might something you do impact the Monarch butterflies?



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Resources:

<http://dnr.mo.gov/education/monarchs.htm> : A lot of useful information on monarchs and their life cycle and conservation.

<http://norrislab.ca/wp-content/uploads/Flockhart-et-al.-In-press.pdf>: graph for milkweed abundance

Misconceptions:

- All the animals that migrate make it safely to their destination. (There are many threats posed to animals on their migration route that could result in death, injury, and their inability to make it to their destination.)
- Every animal migrates. (There are many animal species that do take part in the migration process, but there are also animals that stay in the same general location their whole life.)

Extensions:

Discuss which of the threats the Monarch butterflies face are environmental factors and which ones are from the impact of humans. Using a t-chart, with environmental factors on one side and human factors on the other side. This will give the students a visual to look at in the classroom or hallway for the remainder of the year.

Notes:

Missouri Learning Standards: Grades 6-8 [K-5 Correlations]

Science Grade Level Expectations:

Life Sciences

LS2 – Ecosystems: Interactions, Energy, and Dynamics

Concept A: Interdependent Relationships in Ecosystems

- 6-8-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on individual organisms and populations of organisms in an ecosystem. [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]

Concept C: Ecosystem 6-8 Dynamics, Functioning and Resilience

- M-LS2-4: Constructed by and argument supported by empirical evidence that explains how changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making inferences about changes in populations, defining the boundaries of the system, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]

Social Studies Grade Level Expectations:

3. Geographic Study

Theme 1: Tools for Social Science Inquiry

6-8 Geography

- A. Create and use maps, graphs, statistics, and geo-spatial technology in order to explain relationships and reveal spatial patterns or trends

English Language Arts Standards:

Reading Informational Text

3. Synthesize Ideas from Multiple Texts (Approaching Texts as a Researcher)

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D. Comprehension [K-5 Correlation R1A, R1D]

- Read and comprehend informational text independently and proficiently

Speaking and Listening

1. Collaborating

A. Conversations[K-5 correlation SL1A, SL3A]

- Follow rules for collegial discussions and decision-making, track progress towards specific goals and deadlines, and define individual roles as needed

NGSS:

MS.Matter and Energy in Organisms and Ecosystems

MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]

Disciplinary Core Ideas:

LS2.A: Interdependent Relationships in Ecosystems

- Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1)
- Growth of organisms and population increases are limited by access to resources. (MS-LS2-1)

For more information call or write:

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Migration Activity Sheet

1. You have just come out of your chrysalis and your wings have dried! It's time to test them out. Everyone move forward 4 steps.
2. There's some nice milkweed ahead at a local garden. Move forward 2 steps and smack your lips 5 times.
3. You find some water in a parking lot, but it has been polluted! So you get sick. Everyone sit down and hold your stomach like it hurts. Now everyone besides number ___ and ___ (sorry you don't survive!) get back up, you live so move forward 2 steps.
4. Watch out! There's a bird ahead. Freeze. Oh no! Number ___ and ___ died, so sit down. Everyone else move forward 3 steps.
5. The weather has been crazy! Strong winds ahead, everyone take one step back.
6. Everyone move forward 6 steps it has been a long day of traveling! Now you are tired and hungry, but milkweed is hard to find! Numbers ____, ____, ____, and ___ can't find any food. Sit down.
7. Whoa you just barely escaped capture from an inquiring child! Your wing is harmed, flap your arm and move forward 3 steps. Wait, numbers ___ and ___ don't survive.
8. You are almost to Mexico to winter! It's time to find a place in the forest, but there are fewer trees than there were before. Everyone besides numbers ___ and ___ finds a tree. You are safe for now.