Bio/Diversity Project
Lesson Title: Specific Pollinators: Bees, Butterflies and Moth

Teacher: Gricelda Meraz
Grade Level: *6th*
Time: *80 minutes*

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| **AZ State Science Standard:** | *6.L2U1.13*<br>• *Develop and use models to demonstrate the interdependence of organisms and their environment including biotic and abiotic factors* |
| **Content Objective:** Math, Reading, Science, Writing, Other: | • *Students will learn the defining characteristics of different pollinating insects*<br>• *Students will be able to explain how an insect's form impacts their pollinating function.*<br>• *Students will use teamwork and analyze the problems that Monarch reserves in Mexico face and propose solutions* |
| **Language Objective:** (Optional) | N/A |
| **Scientist of the Week:** | ***Catalina Trails***<br>• *Michoacan, Mexico*<br>• *Discovered the Cero Pelon summit where Monarch overwintering site in 1975*<br>• *First Westerner researching Monarch migration to discover this migration*<br>• *pattern and trace it to Mexico*<br>• *Helped to find other overwintering sites and put them under the Mexican*<br>• *government's protection* |

| **Vocabulary** | **Materials** |
|---|---|
| • Proboscis<br>• Diurnal<br>• Nocturnal<br>• Function | • https://kids.britannica.com/students/assembly/view/53025<br>• Paper<br>• Colored Pencils<br>• Scissors<br>• Tape<br>• Monarch Debate Article<br>• Journal |

**Seasonality:** No specific seasonality required

| *Monsoons* | *Autumn* | *Winter* | *Spring* | *Dry Summer* |
|---|---|---|---|---|
| July-Sept. | Oct.-Nov. | Dec.- Feb. | Mar.-Apr. | May-June |

**Guiding Questions:**
- What are the key structural features that distinguish butterflies from moths, and how does this affect their methods of pollination?
- How can the cultural significance of the butterfly to pre-Hispanic cultures help to protect the butterfly population?

- Why are butterflies a key species?

**Engagement/Introductory Activity:**
This is what you will do to get the students engaged in and excited about the topic of the lesson! It should also provide an opportunity for you to get an idea of what they do (and do not) already know, and the assumptions that they have going into the lesson.

- Ask students how many species of butterflies they think there are in the world
    - Answer: over 20,000 different species of butterflies
    - In the Sonoran Desert: 250 species
- List a few common species that are specific to the Sonoran Desert and the plants they pollinate
    - American Snout -- Aster
    - Mormon Metalmark -- Rabbit brush
    - Pipevine Swallowtail -- Pipevine
- Show students a video of how butterflies collect nectar and pollinate
    - https://www.youtube.com/watch?v=Zb-x9Nvg4jg
- Butterfly Adaptations
    - have long thin legs, and don't have a place to store pollen
    - They are not as efficient as bees in pollinating flowers
- Butterflies are migratory pollinators that we see in the Sonoran Desert in late summer, fall, and early spring
    - Monarchs can travel 50-100 miles a day
    - The Monarch butterfly is unique among the butterflies because of their long distance, round trip migrations.
    - They use a combination of air currents and thermals to travel long distances.
    - Some fly as far as 3,000 miles
    - The eastern population of North America's Monarchs overwinters in the states of
- Mexico and Michoacán from October to late March
    - Here the temperatures range from 32 to 59 degrees Fahrenheit. If the temperature is lower the monarchs are forced to use their fat reserves. & the humidity assures the monarchs won't dry out allowing them to conserve energy while hibernating
- Talk about the cultural significance of butterflies in pre-Hispanic cultures with picture slides of archeological discoveries:
    - Butterflies represent heroes and important people that died
    - The Teotihuacan culture (200-900 A.D.) used butterflies in their ceremonial pottery
    - Toltec culture (900-1168 A.D.) butterflies were on the breastplates of colossal Tula warrior figures & carved in their temples that were the center of ceremonial Mayan culture
    - The Aztec goddess of happiness, flowers, and housework was represented with a human face and arms and body and wings of a butterfly
    - The name given to Monarch Butterflies was Quetzalpapalotl meaning daughter of the sun
- Explain to them the myth of how Monarchs came to be/ their migration to the Rocky Mountains in Mexico in the winter
- Next, move on to the topic of moths:
- Ask students how many species of moths they think are in the world
    - Answer: 160,000 species
    - In the Sonoran Desert = ~ 2,750 (not a precise number)
    - In North America = 12,000
- List a few common species that are specific to the Sonoran Desert and the plants they pollinate
    - Yucca moth -- yucca
    - Hornworm -- tobacco
    - Looper -- cabbage, broccoli
- Moth Adaptations:
    - White flowers that are visible at night
    - Flowers that are sweet smelling
    - Some can hear sounds that bats make

- Show students a diagram on how to differentiate butterflies and moths. Share with them the following Information
    - When a butterfly lands and rests on a plant, it holds its wings vertically, while moths tend to rest with their wings folded back almost horizontally
    - Moths have heavy, furred bodies, whereas the butterflies have more delicate, slender bodies with little hair
    - Butterfly antennae are thin and end with a knob at the tip. Moth antennae are often feathery and without a knob.
    - Not all moths are night fliers

**Exploratory Activity:**
Provide step-by-step instructions on what the students will do to in this activity to gain new skills and/or knowledge. Attach worksheets, PowerPoints, video links, or other material used to this section, or reference it here and then attach it to the lesson plan when you have completed it.

- Students will explore how moths and butterflies differ in anatomy by creating their own set
- Students will need the printed outlines of the butterflies and moths
- The students will color and design their moths and butterflies however they want, and will cut their insects into their basic parts; body, antenna, forewing, hind wing.
- The student will trade their parts with a classmate and figure out which parts belong to the moth and which belong to the butterfly
- Once completed, the parts will be returned and taped onto a paper. Using the diagram of butterfly vs moth anatomy, they will label the moth and butterfly anatomy on their sheet.
- The moth must have a stout, larger body and feathery antennae
- The butterfly must have a skinny body and antenna
- Some specific features must be noted on the paper, such as moths being nocturnal
    - At least 3 characteristics must be represented

**Explain:**
What questions or prompts will you use to get students to explain their observations or to explain what the outcomes of the activity that they participated in were? This should provide an opportunity for students to communicate their new understandings, as well as to articulate what they still do not understand.

- Ask students to reflect on the differences. How does each insect utilize their body for pollination?
- Which insect do you think is most effective at pollinating?
- How do their behavioral characteristics affect their pollinating?

**Extension Activity/Questions:**
This section provides an opportunity for students to connect the knowledge that they have gained to other contexts – can they take what they learned and logically expand upon it, or apply it to alternate situations? Provide one or two additional ideas for activities that students can use to expand upon the new knowledge that they have gained.

- Using articles with information on how conservation status impacts Monarchs and their habitat plant, how certain conservationists feel about captive bred monarchs, and how monarchs are currently assisted by monarch enthusiasts, the students will conduct a debate from 3 viewpoints; those who believe monarchs should be listed as threatened, those who believe monarch breeding should be regulated, and those who disagree with government intervention for monarchs.
- Begin with a video on butterfly conservation (https://www.youtube.com/watch?v=pJQbuX_UGQw)
- Each student will write into their journal:
    - the stance they are taking regarding the conservation status of Monarchs
    - 2 claims that support their argument
    - 2 facts of supporting evidence from the articles
- The debate will go until each group has discussed their positions, claims, and facts
- Students may switch sides after arguments have been read
- After every group has spoken at least 2 times concerning their position (through one or several

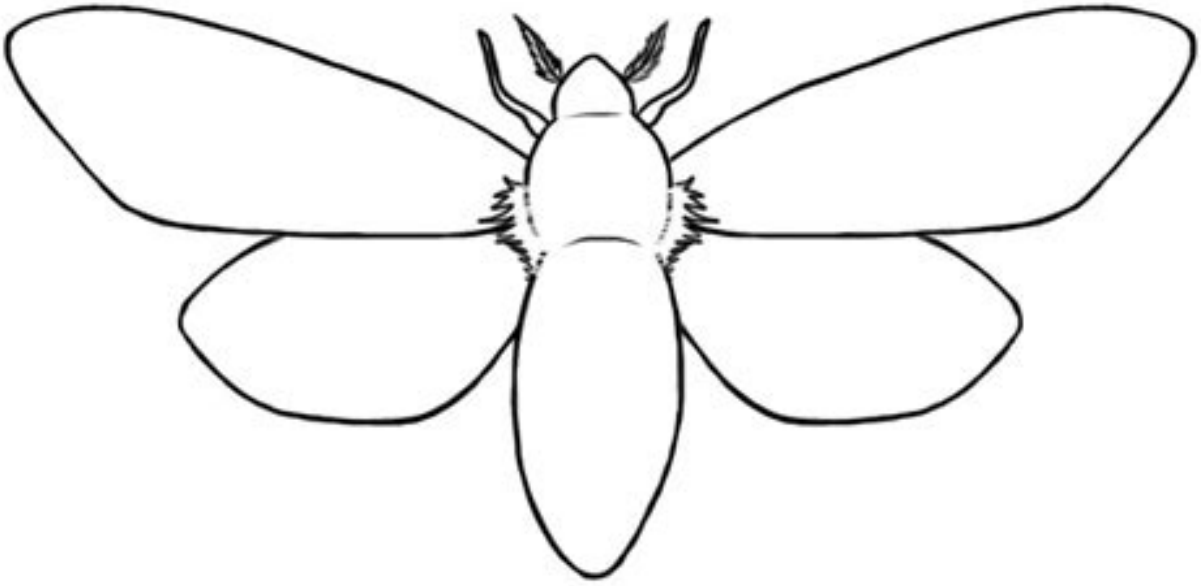
spokespersons), the students can reflect on their choice.

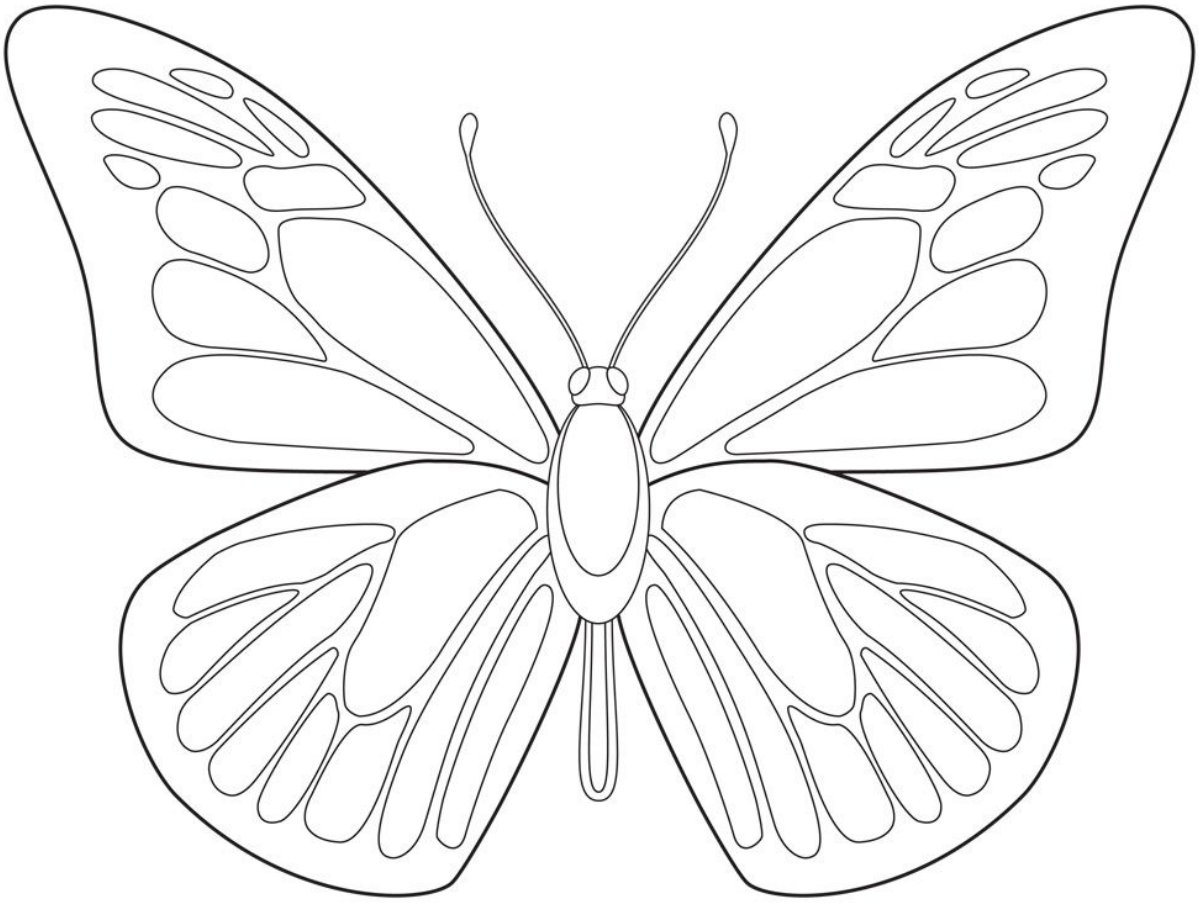
- Ask the students after the debate if they wish to change sides because the facts persuaded them?
- Ask the students what side they fall on in this debate?
- Emphasize to the students that each group had valid arguments and reasoning for their position regardless of who won the debate. Finding one solution that satisfies everyone is almost impossible. It is not easy to solve problems related to conservation. It is necessary that each interested party compromise or yield to some of the demands made by opposing groups, even when their interests are affected.

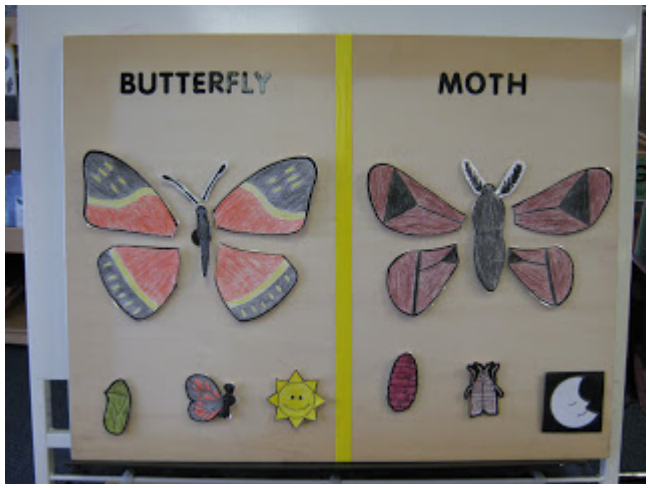
**Evaluation Activity:**

How will you evaluate whether or not the students have achieved the learning objective?

- Show students some ideas for the "action project"
    - Plant pollinator gardens and milkweed organically
    - Help by becoming a citizen scientist, monitoring habitats and migration of Monarchs
    - Visit Monarchjointventure.org to find out more ways to help out with the research and dispersal of the monarch population







Example (without labels)

# Debate Sobre la Conservación de la Monarca

Las monarcas son la mariposa más icónica. No solo son importantes para el medio ambiente, sino también para las personas. Las monarcas se utilizan para enseñar metamorfosis en las escuelas, y muchas personas disfrutan criándolas. Plantar su hábitat de elección, algodoncillo, ayuda la monarca, entonces, se encuentra en muchos jardines. Pero los monarcas son una especie tan importante, que los conservacionistas quieren protegerlos aún más.

Ellos han presentado una petición para clasificar a las monarcas como especies en estado amenazado. En los Estados Unidos, esto establecería algunas reglas sobre monarcas y algodoncillos. Actividades tales como criar monarcas sin supervisión de grupos de conservación serían ilegales. Como el algodoncillo es parte del hábitat crítico, la destrucción del algodoncillo sería ilegal y se castigaría con multas. Muchos simplemente no plantarán algodoncillo o lo

eliminarán solo para evitar problemas. El Servicio de Pesca y Vida Silvestre de los Estados Unidos es citado como el agente de cumplimiento de estas reglas, pero generalmente no tiene los recursos para buscar infractores de reglas.

Otros conservacionistas creen que estas reglas son demasiado estrictas, pero quieren regulaciones sobre la cría de monarcas. Discuten con la industria de cría de mariposas para escuelas, exhibiciones de la naturaleza, actividades de conservación y eventos. Creen que los criadores comerciales liberan mariposas enfermas o débiles en la población salvaje, lo que podría dañarla. Solo aquellos que puedan obtener monarcas salvajes podrán apreciar su belleza.

Lo que ha hecho que la mariposa Monarca sea tan icónica y ampliamente aceptada es el crowdsourcing de comprender su migración y el interés por conservarla. El estado amenazado podría motivar a las corporaciones y al gobierno a ser más considerados con los monarcas, pero para las personas normales, este estado podría ser contraproducente.