LESSON #4:
WHAT STRUCTURES DO WE NEED TO GROW AND SURVIVE?

SCIENCE

K- 5TH GRADE

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INTRODUCTION

The *Genomic Logic for Underlying Morphological Divergence (EPSCoR)* project aims to bring science-related learning experiences to schools. This lesson is the last of six, designed to facilitate learning the concepts of biodiversity (lesson 1), adaptation (lesson 2), evolution (lesson 3), plant and animal structures (lesson 4), heredity (lesson 5), and the care of butterflies (lesson 6). These lessons will serve as a tool for the trainer or professional in charge of teaching (teacher, professor, among others). For participants, they can be teachers (as part of their professional development) or students.[1]

In this fourth lesson, the instructors or teachers of the elementary level, and their students, will actively participate in some activities where they will understand the principles of the structure of plants and animals. The life cycles of the *Asclepias curassavica* plant will be discussed and in the case of an animal the monarch butterfly will be studied.

This lesson includes:

- ✓ Scientific background of the concepts
- ✓ Glossary
- ✓ Alignment of the content to the standards, expectations, and specificities of the Department of Education of Puerto Rico (DEPR)
- ✓ Educational Process
- ✓ Detailed activities to carry out in the classroom.

[1] Unless otherwise stated, the neutral term will be used with nouns such as teacher/s, participant/s, professor/s, instructor/s, and/or student/s.

GUÍA DEL MAESTRO

MATERIA: Ciencia **NIVEL:** Elemental (K-5)

CONCEPTOS: estructuras de plantas y animales, ciclo de vida, biodiversidad, especie, adaptación

CONOCIMIENTO PREVIO: semejanzas y diferencias, características de los seres vivos

OBJETIVOS ESPECÍFICOS DE APRENDIZAJE

Objetivos conceptuales:

- Identificar semejanzas y diferencias entre algunas especies dadas.
- Interpretar información relacionada con los conceptos especie y biodiversidad.
- Reconocer similitudes estructurales y diferencias entre las plantas y los animales.
- Reconocer características particulares que ayudan a una especie a sobrevivir en un ambiente dado.
- Definir adaptación.
- Definir evolución.
- Mencionar mecanismos que ayudan a una especie a sobrevivir (ejemplo: camuflaje).
- Describir las estructuras de plantas (plantas hospederas) y animales (mariposas).
- Describir las fases del ciclo de vida de una planta y el ciclo de vida de una mariposa.
- Describir la morfología de las alas de las mariposas.
- Distinguir que progenie (crías) surge de dos progenitores (padres) dados.
- Identificar y mencionar las características que se transmiten y conservan de padres a crías.
- Discutir y entender el orden de eventos en el ciclo de vida de las mariposas.
- Escribir, dibujar y crear un plegado (*o libro tipo acordeón*) para capturar las observaciones de la mariposa monarca.
- Mencionar como la intervención humana puede contribuir o afectar la disponibilidad de una especie.

Objetivos procedimentales:

- Observar e identificar organismos que comparten características semejantes y diferentes, y que pertenecen a la misma especie.

- Utilizar dibujos o diagramas para explicar las similitudes estructurales entre las especies.
- Investigar cómo surgió la mariposa (su historia evolutiva).

Objetivos actitudinales:

- Valorar y mostrar aprecio por la naturaleza y la diversidad de la vida
- Reconocer la importancia de cuidar la biodiversidad.
- Reflexionar sobre la fragilidad de una especie para crecer y cómo podemos cuidarla.
- Aceptar, respetar y reconocer los trabajos e ideas de otros.

ESTÁNDARES, EXPECTATIVAS Y ESPECIFICIDADES:

Grado: 1-3ro (Indicadores según los estándares de contenido)

Estándar: Estructura y niveles de organización de la materia

- Reconocer las similitudes estructurales y las diferencias entre los humanos, las plantas y los animales (puede usar dibujos, esculturas o representaciones teatrales).
- Hacer observaciones con el propósito de describir las estructuras que necesitan las plantas y los animales para sobrevivir y crecer.
- Desarrollar argumentos lógicos sobre el hecho de que las plantas y las crías se parecen mucho a sus progenitores, pero no son exactamente iguales a ellos.

Estándar: Conservación y cambio

- Interpretar información relacionada con el concepto de biodiversidad haciendo énfasis en el aprecio por la naturaleza y la diversidad de la vida.
- Reconocer que la materia (seres vivientes y no vivientes) cambian a través del tiempo.
- Describir los patrones de cambio en la materia.
- Reconocer que la reproducción es una forma de conservación de los seres vivientes.
- Deducir que los seres vivos cambian a través del tiempo.
- Identificar las características que se transmiten y se conservan de generación en generación

Estándar: Interacciones y energía

- Construir un argumento a partir de evidencia para explicar que en un ambiente particular, algunos tipos de organismos sobreviven mejor, otros viven con más dificultad y otros no logran sobrevivir.

- Explicar cómo las variaciones en características entre individuos de la misma especie ofrecen ventajas para sobrevivir, encontrar pareja y reproducirse.
- Describir el ciclo de vida de los organismos (nacimiento, crecimiento, reproducción y muerte).
- Analizar e interpretar datos para proporcionar evidencia de que las plantas y los animales tienen características heredadas de sus progenitores, las cuales varían dentro de los organismos que pertenecen a un mismo grupo.
- Explicar cómo las variaciones en características entre individuos de la misma especie ofrecen ventajas para sobrevivir, encontrar pareja y reproducirse.
- Comparar datos de distintas áreas y establece conexiones entre la biodiversidad y las condiciones ambientales.
- Observar plantas y animales para comparar la diversidad de la vida en una variedad de hábitats.

Grado 4to y 5to (Indicadores según los estándares de contenido)
Estándar: Estructura y niveles de organización de la materia

- Mencionar y argumentar sobre las ventajas funcionales de las adaptaciones estructurales en los seres vivos.

Estándar: Conservación y cambio

- Definir, identificar y utilizar evidencia para elaborar argumentos sobre los mecanismos adaptativos en las plantas y animales que le permiten sobrevivir y reaccionar a cambios en el ambiente.
- Identificar formas para conservar la supervivencia de los organismos en su ambiente.
- Reconocer que la reproducción es necesaria para perpetuar la especie.
- Inferir en que la reproducción permite conservar o cambiar algunas características de las especies.
- Explicar los cambios relacionados con la forma, estructura y funciones vitales en los organismos.
- Reconocer que los organismos tienen ciclos de vida y cambian a través del tiempo.
- Reconocer que la forma, la estructura y las funciones vitales de los organismos pueden cambiar a través de sus etapas de desarrollo.

BACKGROUND

When we talk about **adaptation**, we refer to the characteristics that a species possesses that gives it the capability of survival in the environment it inhabits. A **species** is a group of organisms that share the same characteristics that can cross and produce a fertile descendance. However, individuals of one same species can show mild variations. These variations may be favorable or unfavorable. This lets the species survive in a particular environment. Depending on environmental factors, after many generations, a population can look very different. Adaptations can be **structural** or **physiological**. Butterflies are a particularly strong example of structural adaptations. These adaptations in butterflies include the way in which they use **mimicry**, **camouflage**, and even their capability to fly. Some examples of adaptations that butterflies possess are:

Camouflage = The principal structural adaptation of butterflies is in their wings and how they use them to hide. The wings of many species have evolved to imitate its surroundings, with the common green as a particularly good example. These butterflies have wings that have a color and shape that match exactly to the leaves in which they are found, which makes it more difficult for predators to find them.

Disguise and subterfuge = Many butterflies have developed “eye spots” on their wings. When their wings are open, these spots give the butterfly the appearance of a much larger creature, terrifying possible predators. In that same way, viceroy butterflies deliberately imitate the appearance of a monarch butterfly, which has evolved to be toxic upon consumption. As a result, predators avoid hunting both species. Another example that we can mention are the colors of *Heliconius*, who have red because animals associate it with a bitter taste.

Delight = Butterflies are cold-blooded creatures, which means that they need to heat their wings before taking off. That is where they are more vulnerable to predators, but it is a vital part in the progress of the butterfly. Butterflies may simply fold their wings if they overheat.

Sensibility to light = Every fourth generation of monarch butterflies migrates 2,000 miles (3,220 kilometers), traveling from as North as Canada to places to hibernate in Mexico. Monarch butterflies use their antennae to detect the basic level of light around them. This lets them know the time of the day depending on the amount of light that they can see, which also lets them stay alert.

Examples of adaptation in living beings

Species	Adaptation	How can adaptation help it survive in the environment?
Crocodiles	Digestive apparatus	Adapted to ingest a large variety of preys
Fish	Travel	It is favored by the wavelike movements of its body
Horse	Growth in size	To face prairie predators
Wolves	Development of muscles for chewing	It makes it easier to chew their prey
Anteater	Tail	It works as a coat
Mollusks	Large muscular foot	It allows them to set themselves on the sand to travel
Primates	Fingers	To collect tree branches
Butterflies	Camouflage	It allows them to imitate its surroundings with makes it harder for predators to find them

GLOSSARY

1. **Similarity** – relation among people, animals or things that have common traits.
2. **Difference** – quality that lets something distinguish itself from another thing.
3. **Species** – a group of organisms that can interbreed to produce fertile descendants.
4. **Biodiversity** – variety of organisms in our Planet.
5. **Adaptation** – traits form an animal that helps it survive in a specific environment.
6. **Structural adaptations** – adaptations that include changes in structure of some parts of the species' body.
7. **Mimicry** – structural adaptation that provides protection to an individual, letting it copy the appearance of other species.
8. **Camouflage** – structural adaptation that lets the individual blend into its surroundings. It involves the individual's change in color.
9. **Physiological adaptations** – changes in metabolic processes of an organism.

Evolution – change in inheritable traits of a population through time.

EDUCATIONAL PROCESS

BEGINNING

This activity explores the knowledge that the participants have about what the structures of a plant and an animal are like (with an emphasis on the butterfly). The life cycles of the *Asclepias curassavica* plant and the monarch butterfly will be discussed.

1. Before beginning to discuss the structures that a plant and an animal (Monarch Butterfly) need to survive, the teacher will determine the student's knowledge of what a plant and the Monarch butterfly need to grow.
2. In the case of grades K-3 the teacher can ask the students what things a plant and an animal (Monarch butterfly) need to grow.
3. Once the students have mentioned it, the teacher proceeds to complete **Worksheet #1** with the students. See instructions in the worksheet.
4. For 4th to 5th grade students, the teacher asks students to cut out all the shapes that appear on **Worksheet #1.** The teacher tells the students that in the oval figures they will write the title “The plant needs…” and in the rest of the oval figures the things that a plant needs to grow. Students will form a flower (see key). Finally, the students' responses are discussed, and doubts are clarified.
5. Having discussed **Worksheet # 1** with students at both levels, the teacher you indicated “you already know the things that a plant and an animal like the butterfly need to grow, but what structures do plants and animals have that allow them to survive?” This question will start the development activity.

DEVELOPMENT

1. The teacher listens to the students' responses when mentioning the structures that plants and animals need to survive.
2. The teacher will use the PowerPoint presentation to elaborate on the answers given by the students and clarify doubts.
3. The teacher will talk about the main parts of a plant (flower, stem, leaves, roots, and the fruit) and the function that each one of them carry out for the maintenance and reproduction of the plant.
    a. We must remember that not all plants have fruits or flowers, or this same structure that has just been discussed.
4. The teacher will explain to students that some plants can reproduce by sexual or asexual reproduction. The teacher will utilize the life cycle of the *Asclepias curassavica* plant to explain this information.

5. The teacher uses the information in the PowerPoint to explain the importance of the flower in the sexual reproduction of the plant and how an *Asclepias curassavica* plant can reproduce asexually by cuttings.
6. To determine if K-3 students recognize the parts or structures that allow a plant to survive, **Worksheet # 2 The parts of a plant** will be completed. Students will cut out the pieces of a plant, color them, glue them correctly in the mold, and identify the different parts of the plant. The activity is discussed and the functions of the different parts of the plant are reviewed. The teacher will utilize the PowerPoint Presentation.
7. For 4th and 5th grade students, their corresponding **Worksheet #2** will be completed. Finally, the doubts are discussed and clarified.
8. To explain the structures that an animal like the butterfly needs to survive, 4th and 5th grade students will complete **Worksheet #3**.
    a. In the case of K-3 students, the teacher will show **Worksheet #3** and will ask the students for the name and role of each part or structure indicated (if the student cannot identify the name and the role of the structure, the teacher will indicate this through socialized discussion).
9. Then, K-3 students will complete **Worksheet #4a**. They will color and trim the sheets. They will glue the pictures in the corresponding number together with the word that represents each phase of the butterfly's life cycle.
10. In the case of 4th and 5th grade students, they will complete **Worksheet #4b**. Students will create the Butterfly Life Cycle fold (see instructions for creating the fold).

CLOSURE

1. In cooperative groups, prepare a skit to explain the phases in the life cycle of butterflies. Each student must act out a phase of the cycle (there may be a narrator).
2. Each group will present their skits to explain the life cycles of plants and animals.

Additional Worksheet :

- The teacher can also use sheets of the **Additional Worksheet. In the case of K-3,** the teacher can cut out the five pictures and hand them out to five students. If the students cannot read, the teacher could read the information so that they place the events of the life cycle of plants in the correct order in front of the group. For **4th and 5th grade students**, the teacher could form groups of 5 students. The teacher will hand out an envelope to each group with the five pictures for them to order the events

correctly and explain the process amongst them. The teacher could work on the activity individually; that is, that each student could do the activity by themselves. See **Additional Worksheet.**

K-3

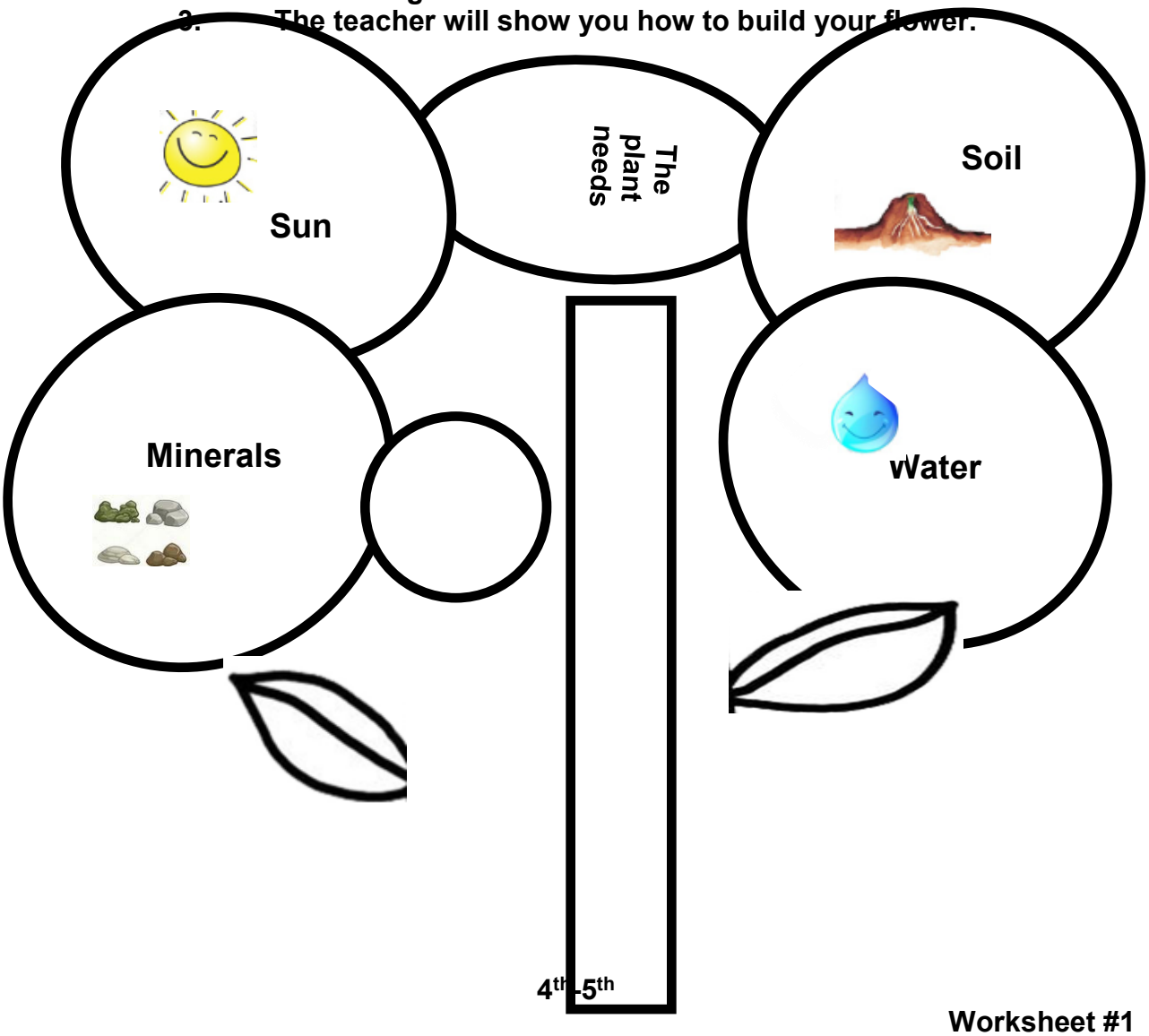
Worksheet # 1

Lesson #4: What structures do we need to grow and survive?

Materials:
Wooden palette (those used for ice cream popsicles)
Crayons
Scissors
Glue

Process:

1. Use the materials and pictures to form a flower in which you will show the things that a plant needs to grow.
2. Use the scissors to cut out the different shapes. The teacher can cut out the figures beforehand.
3. The teacher will show you how to build your flower.



4th-5th

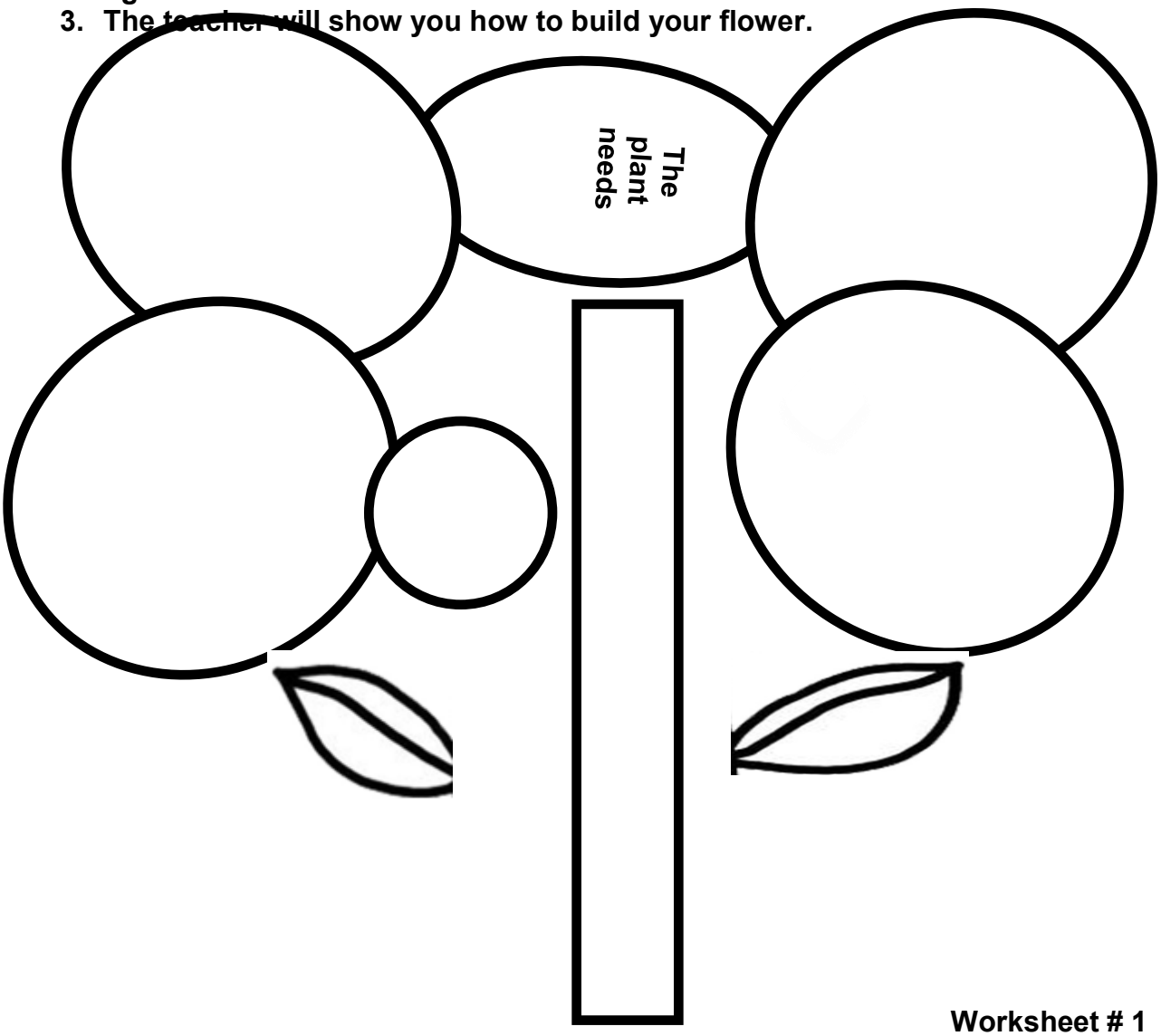
Worksheet #1

Lesson #4: What structures do we need to grow and survive?

Materials:
Wooden palette (those used for ice cream popsicles)
Crayons
Scissors
Glue

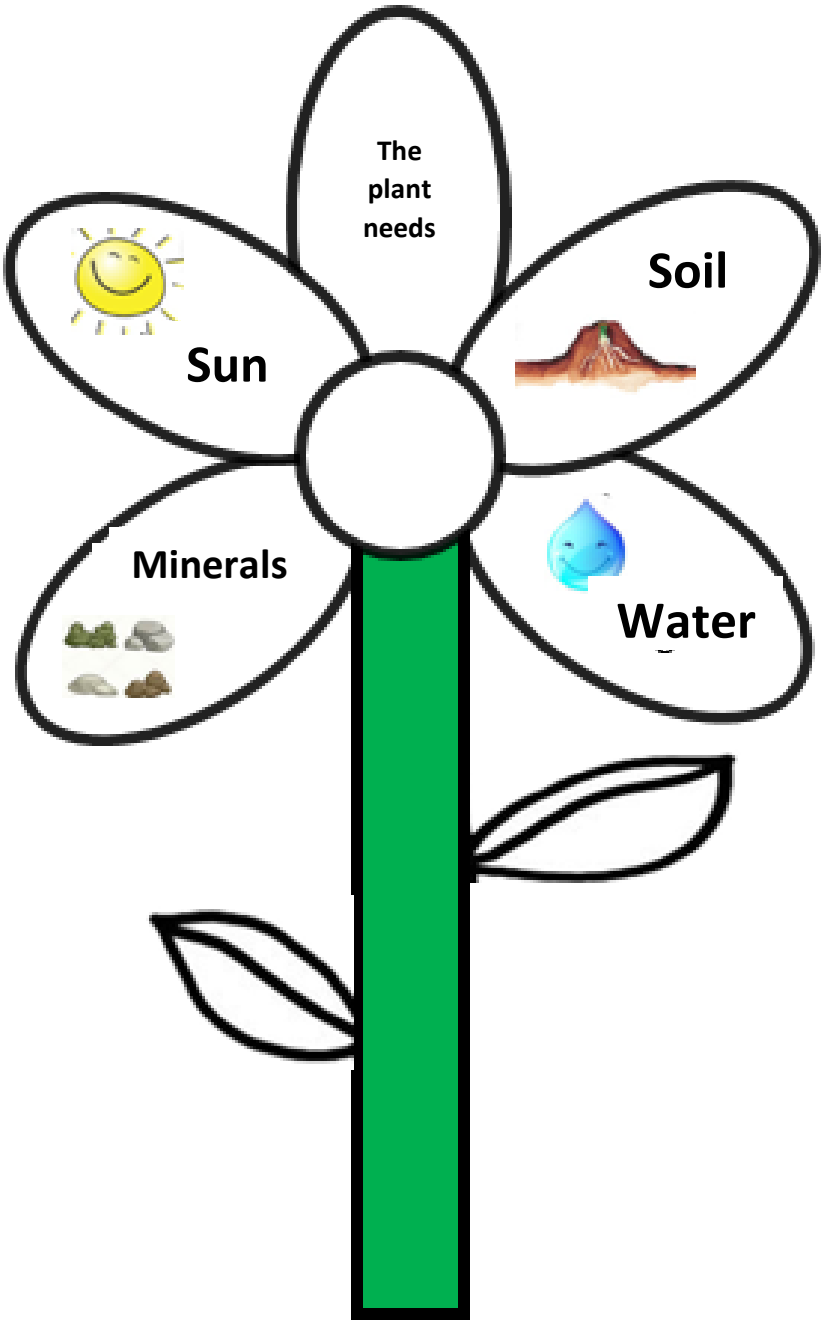
Process:

1. **Use the materials and pictures to form a flower in which you will show the things that a plant needs to grow.**
2. **Use the scissors to cut out the different shapes. The teacher can cut out the figures beforehand.**
3. **The teacher will show you how to build your flower.**



Worksheet # 1

Lesson #4: What structures do we need to grow and survive?



K-3

Worksheet #2

Lesson #4: What structures do we need to grow and survive?

Use the pieces to make a plant. Cut out, color, and paste in figure 1. Then identify the parts of the plant.

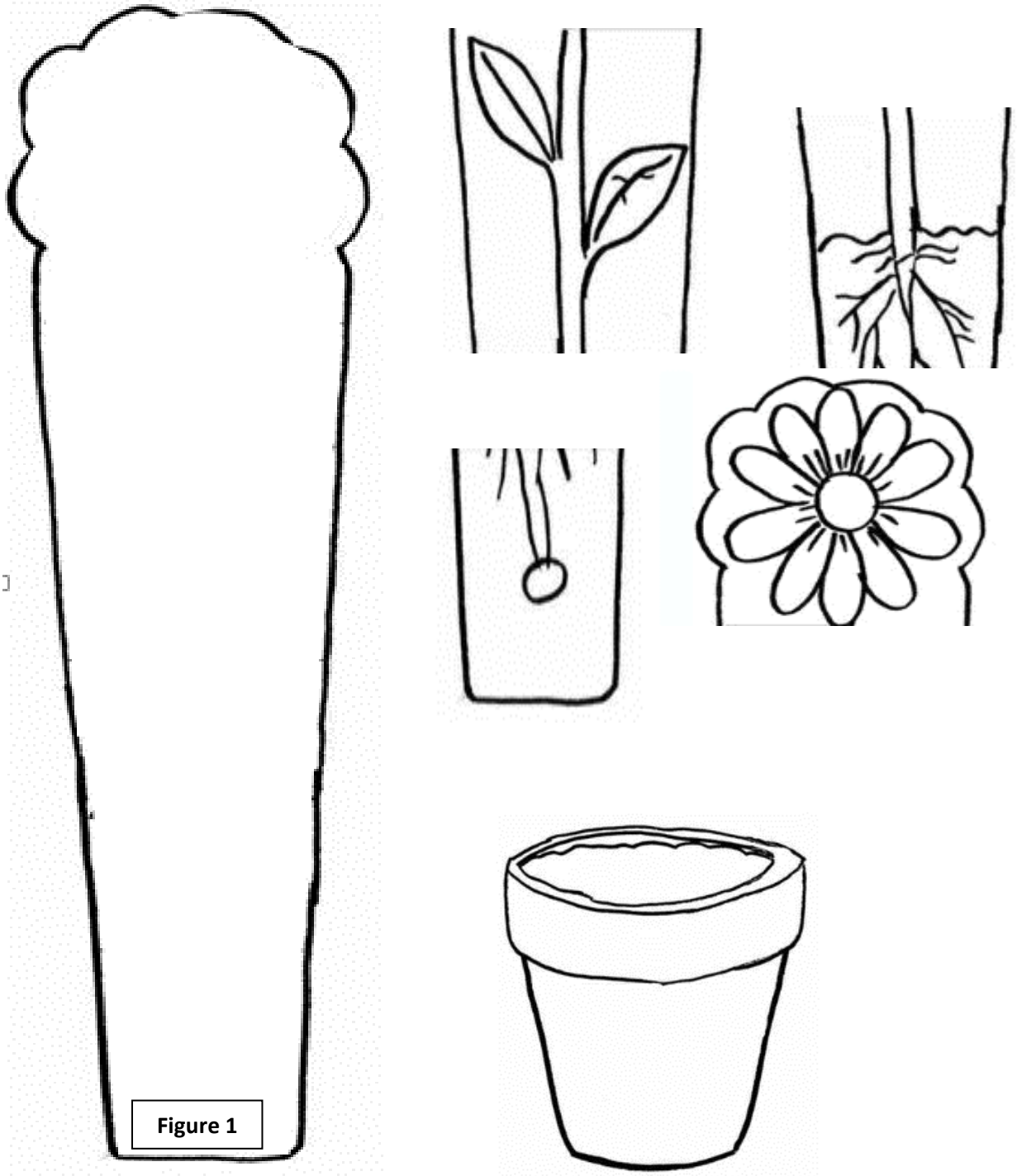


Figure 1

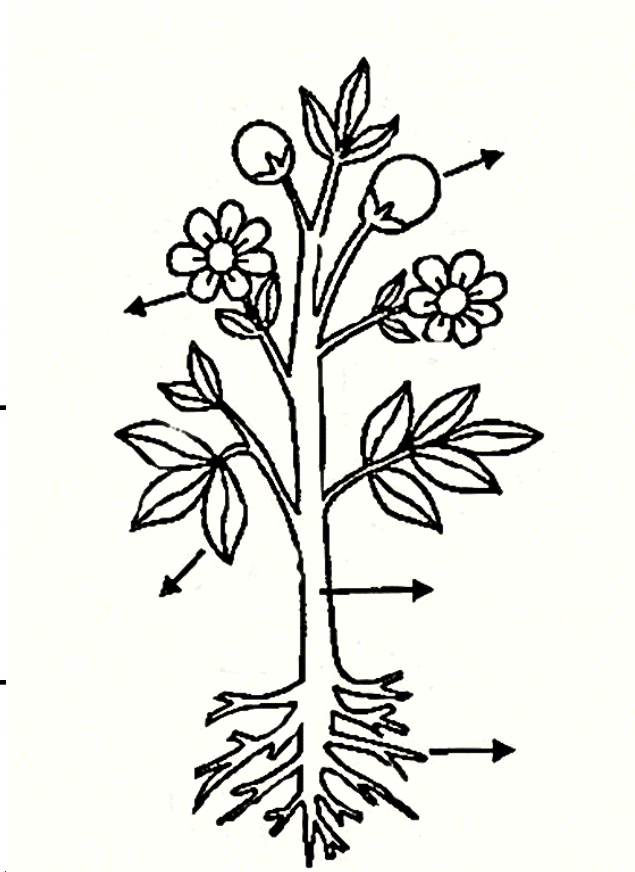
4th - 5th

Worksheet # 2

Lesson #4: What structures do we need to grow and survive?

Unscramble the words that appear in the box. Then label the parts of the plant.

evelas
efsorlw
sotro
tursif
emst



Match each part of the plant with its role. Write the number down in the corresponding space. You may repeat numbers in some cases.

1. Leaves
2. Roots
3. Stems
4. Fruits
5. Flowers

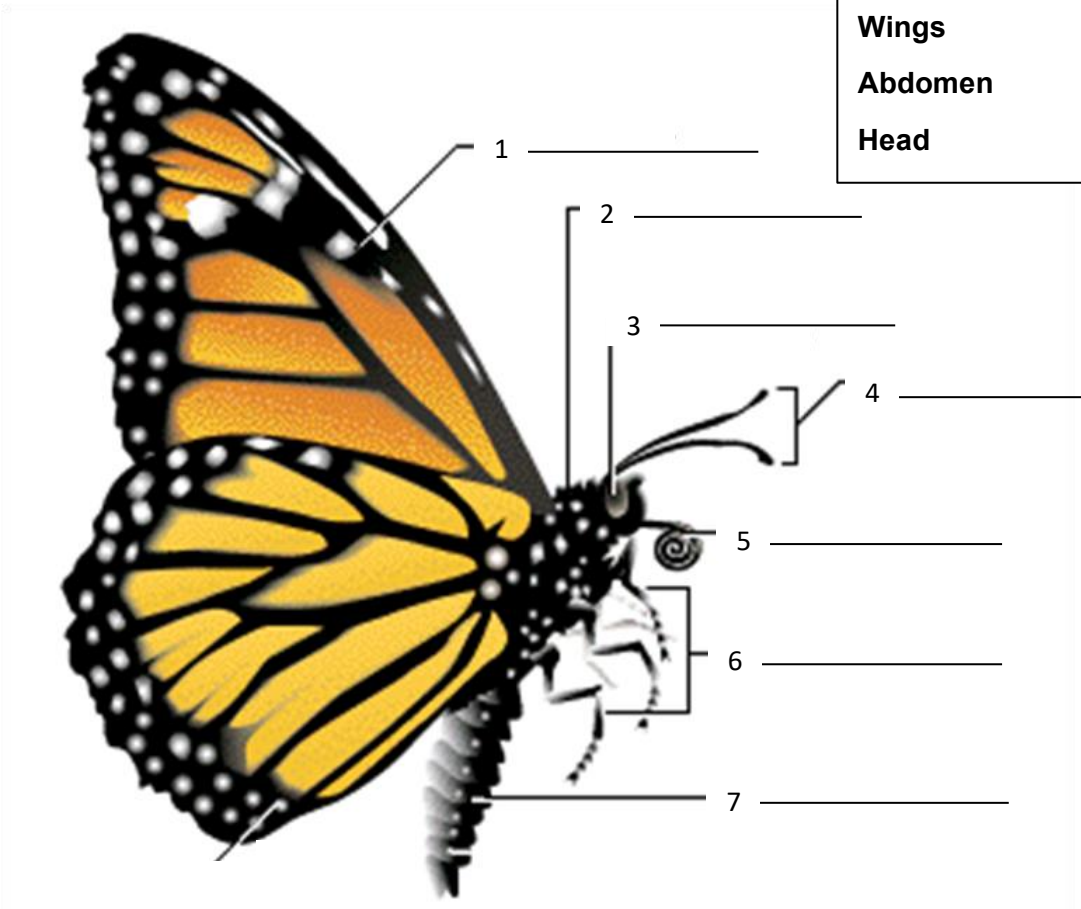
___ allow the plant to reproduce
___ elaborates the plant's food
___ include the seeds
___ fixates the plant to the soil
___ take water and nutrients from the soil
___ carries food to all parts of the plant

Worksheet #3

Lesson #4: What structures do we need to grow and survive?

Label the parts of the butterfly. Use the words that appear in the box.

Antennae	**Proboscis**
Wings	**Compound eye**
Abdomen	**Legs**
Head	



Match each part of the butterfly with its role. Write the number down in the corresponding space. You may repeat numbers in some cases.

1. Compound eye
2. antennae
3. wings
4. proboscis
5. abdomen

___ sucks nectar from flowers

___ its colors protect them from predators

___ allows the butterfly to feel slight movements.

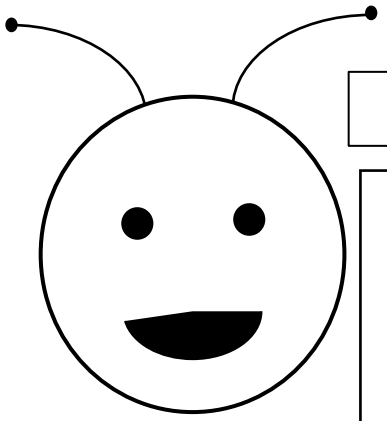
___ important for reproduction

___ responsible to allow flight

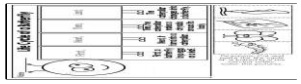
___ allows the butterfly to locate smell sources

Worksheet #4a

Lesson #4: What structures do we need to grow and survive?

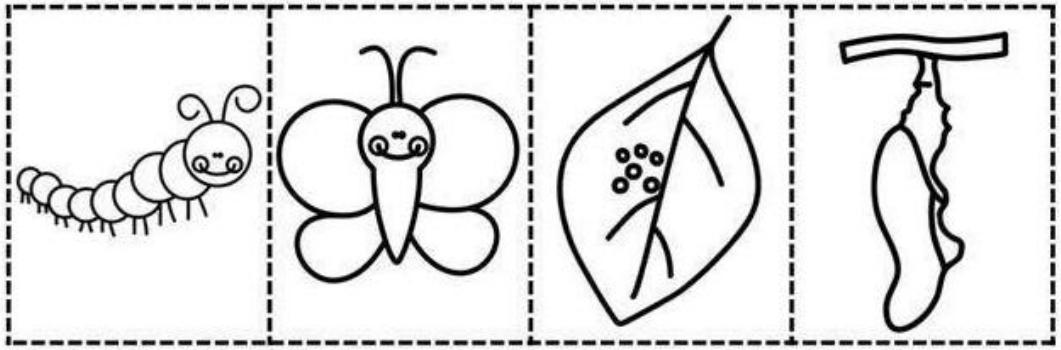


The butterfly's life cycle



1	2	3	4

Color and cut out the pictures. Glue the pictures to the corresponding number along with the word that represents each phase of the butterfly's cycle.



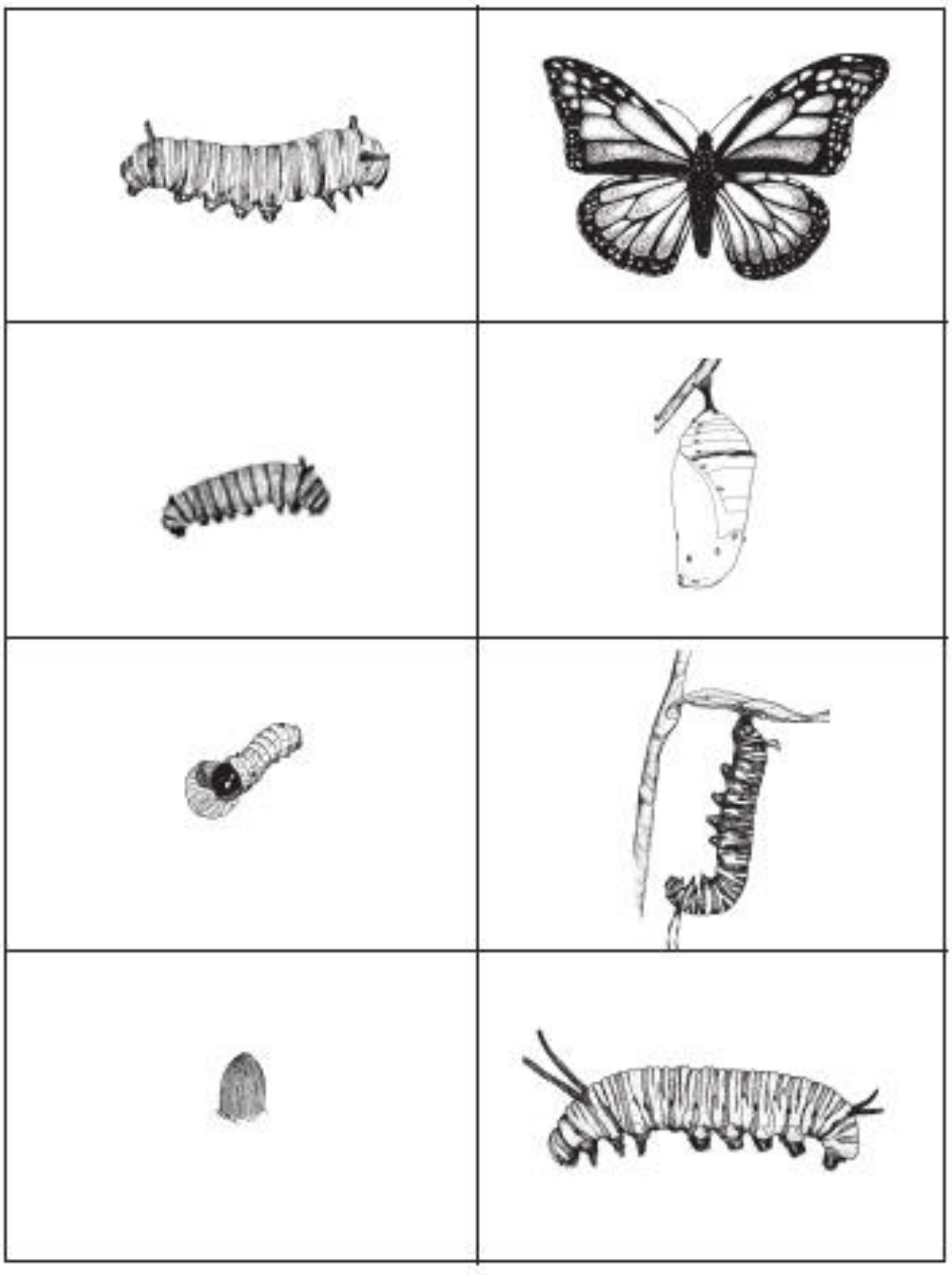
eggs	butterfly
caterpillar	chrysalis

4th - 5th

Worksheet # 4b

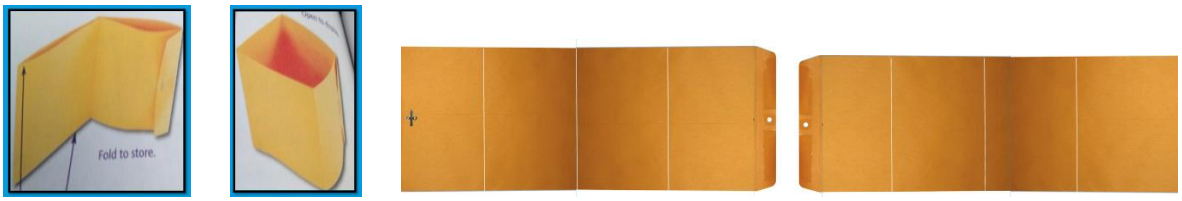
Lesson # 4: What structures do we need to grow and survive?

Cut out the illustrations and glue them to the manila envelope to create the fold. Follow your teacher's instructions.



How to prepare the foldable to illustrate the life cycle of the monarch butterfly?

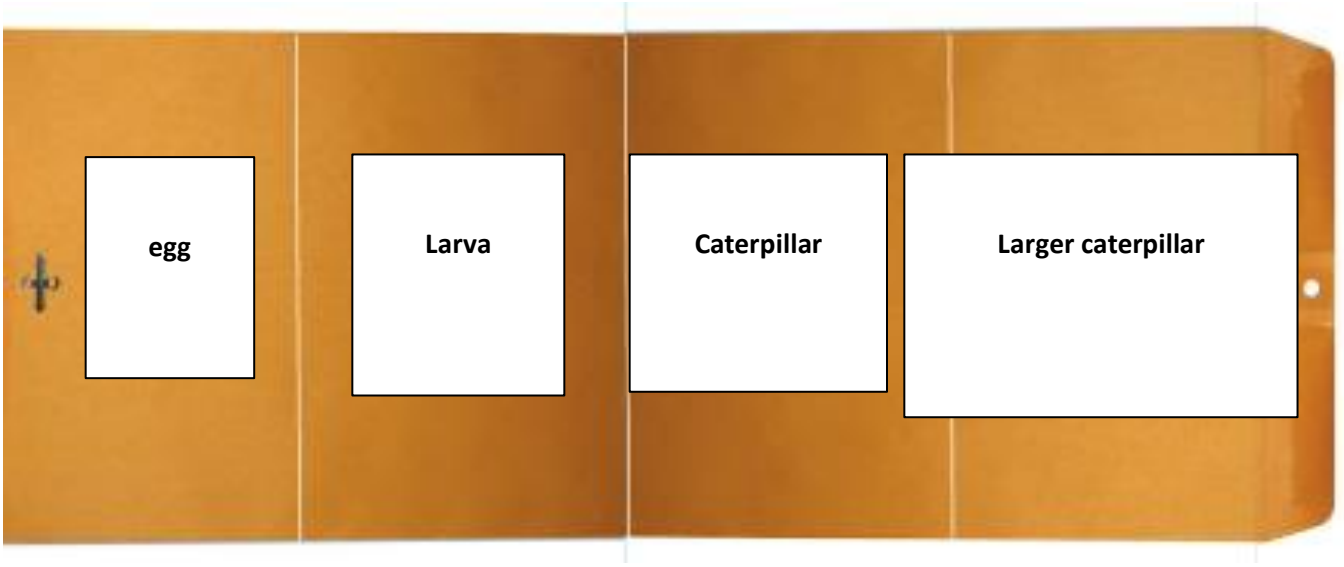
Illustrations

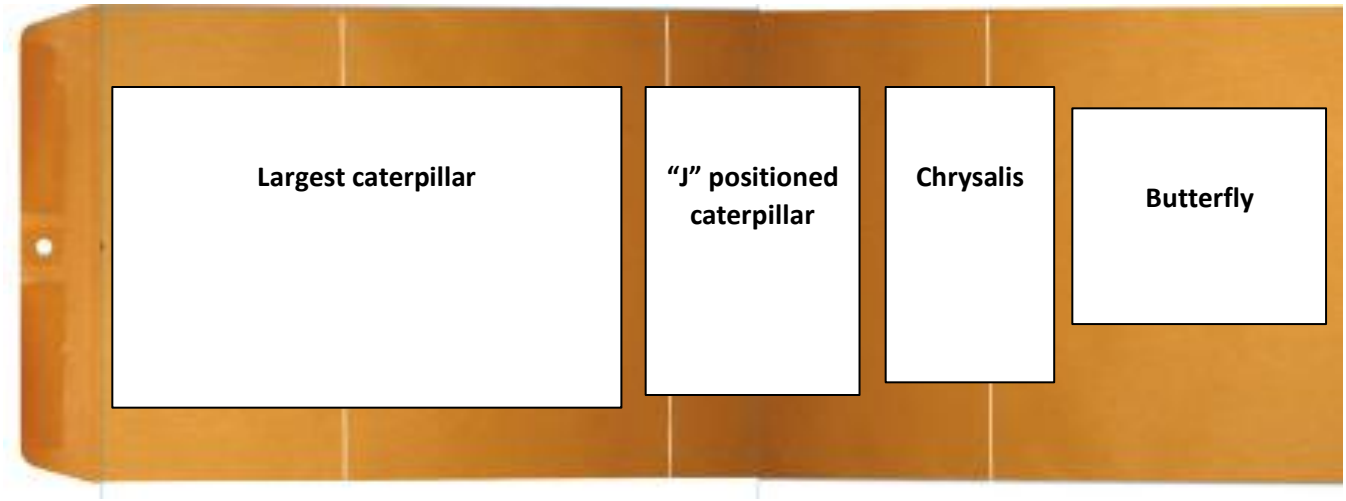


#1 #2 #3 #4

1. First, cut both ends of the envelope as shown in **Illustration # 1**.
2. Then fold the manila envelope in half.
3. Open the envelope so that a rectangular prism is formed, as shown in **Illustration #2**.
4. At the end, open the envelope. **Illustrations #3** and **#4** show the two sides of the envelope when it is open.
5. Once the foldable is formed, complete the parts according to the corresponding information or figures for each side (faces) of your rectangular prism (as explained in *Figure #1*).

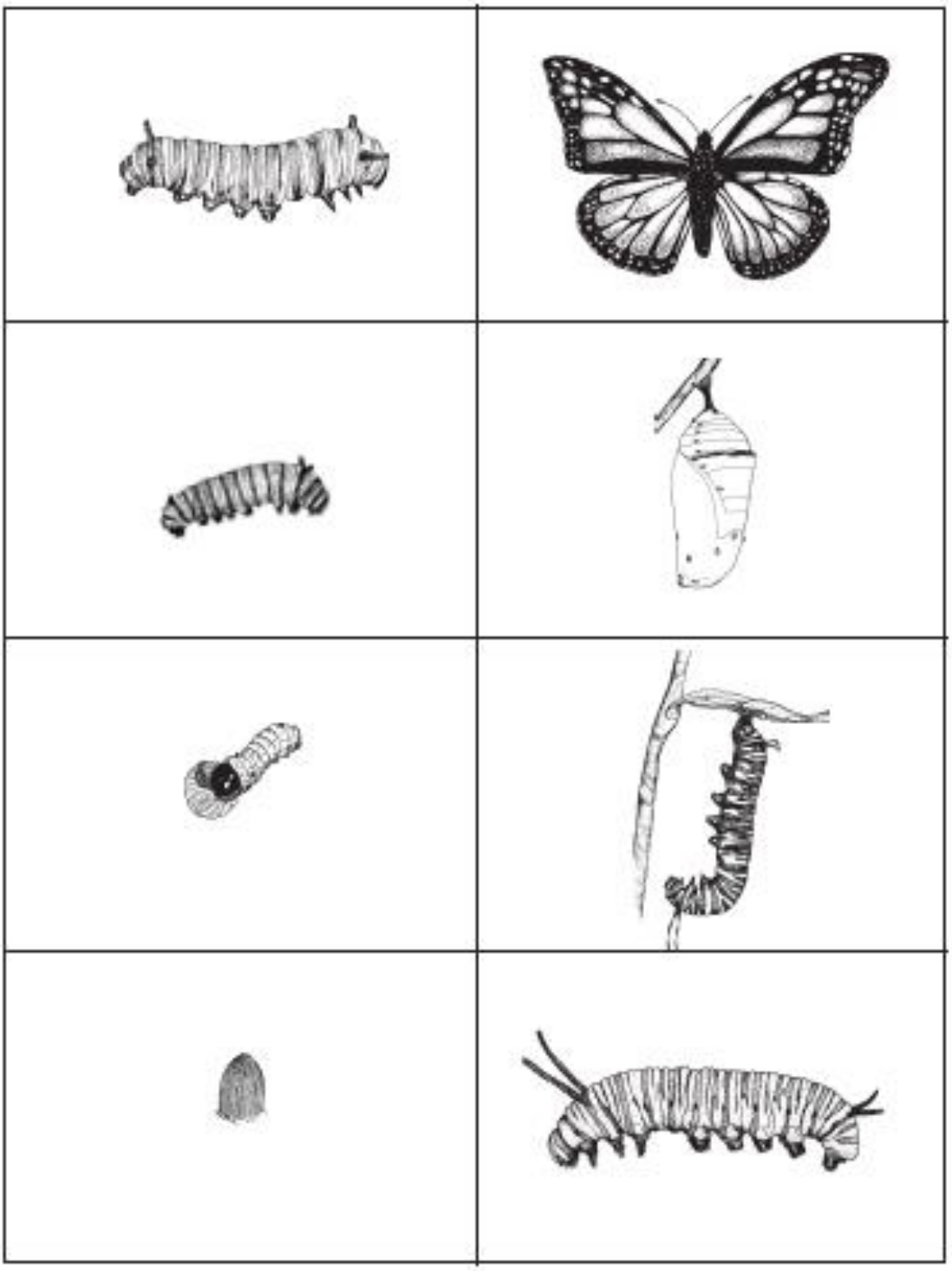
Figure #1: Instructions to place the information on the foldable





✓ It is important that students can distinguish the size between caterpillars.

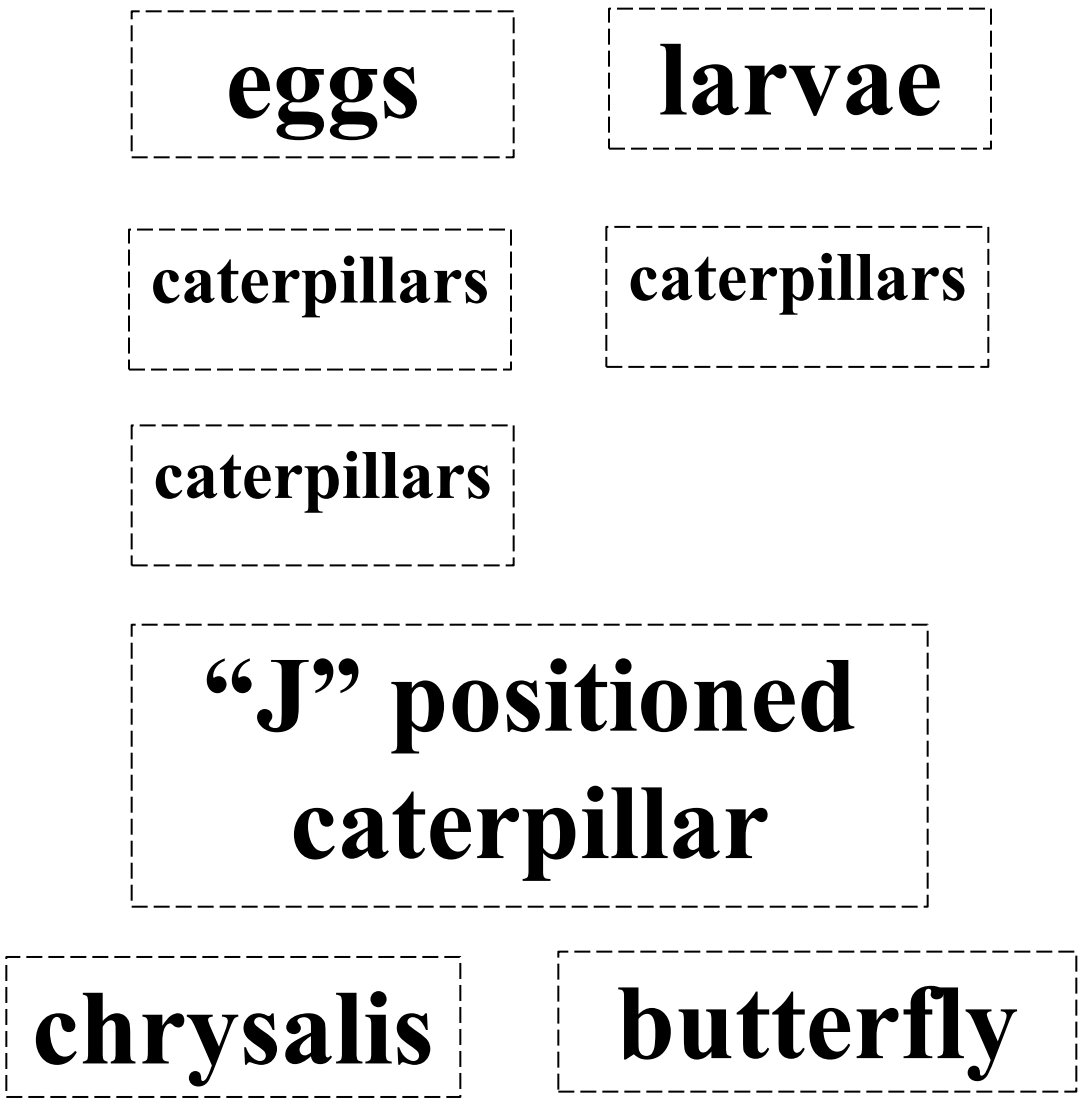
Figure #2: Illustrations for the foldable



Modified from: ***3-6 Life Cycle Curriculum Guide - MONARCHS IN THE CLASSROOM, p.33,*** **Curriculum Folder on the NSTA Thumb Drive (2015)**

Words to cut out and utilize on the foldable

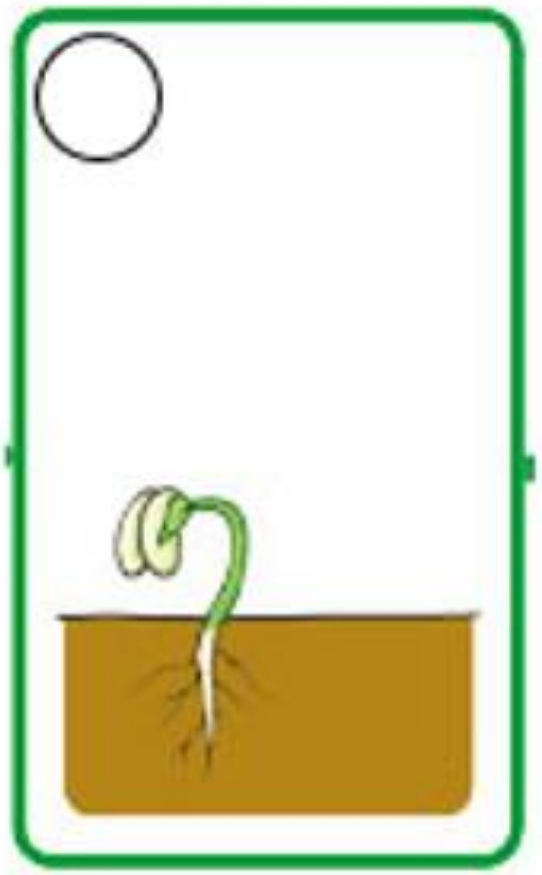
(Students may write the words instead)



✓ The size and the information may vary according to the observations or illustrations that the students have.

Additional Worksheet

Lesson # 4: What structures do we need to grow and survive?

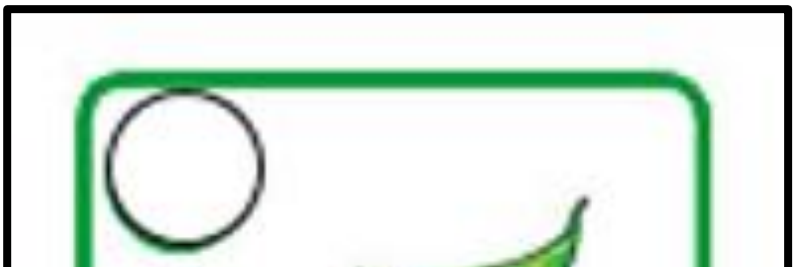


From a seed grows a plant.

In its fruits, seeds are formed.

The seed falls on the wet soil.

The plant grows and becomes an adult plant, which grows flowers.



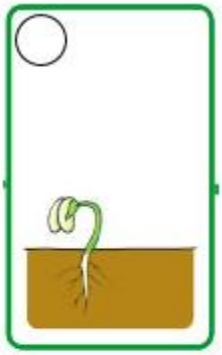
These flowers then turn into fruits.

Additional Worksheet

Lesson # 4: What structures do we need to grow and survive?

Watch and read carefully. Arrange the shapes to represent the life cycle of a plant. Write the numbers from 1 to 5 in the circle that appears in each figure to indicate the correct order. Then cut out the shapes and use arrows to form your plant life cycle.

In its fruits, seeds are formed.



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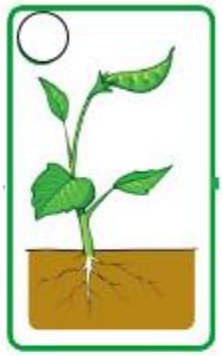

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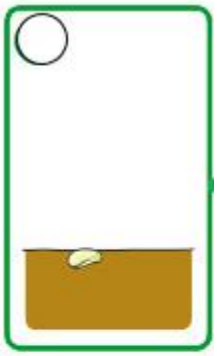
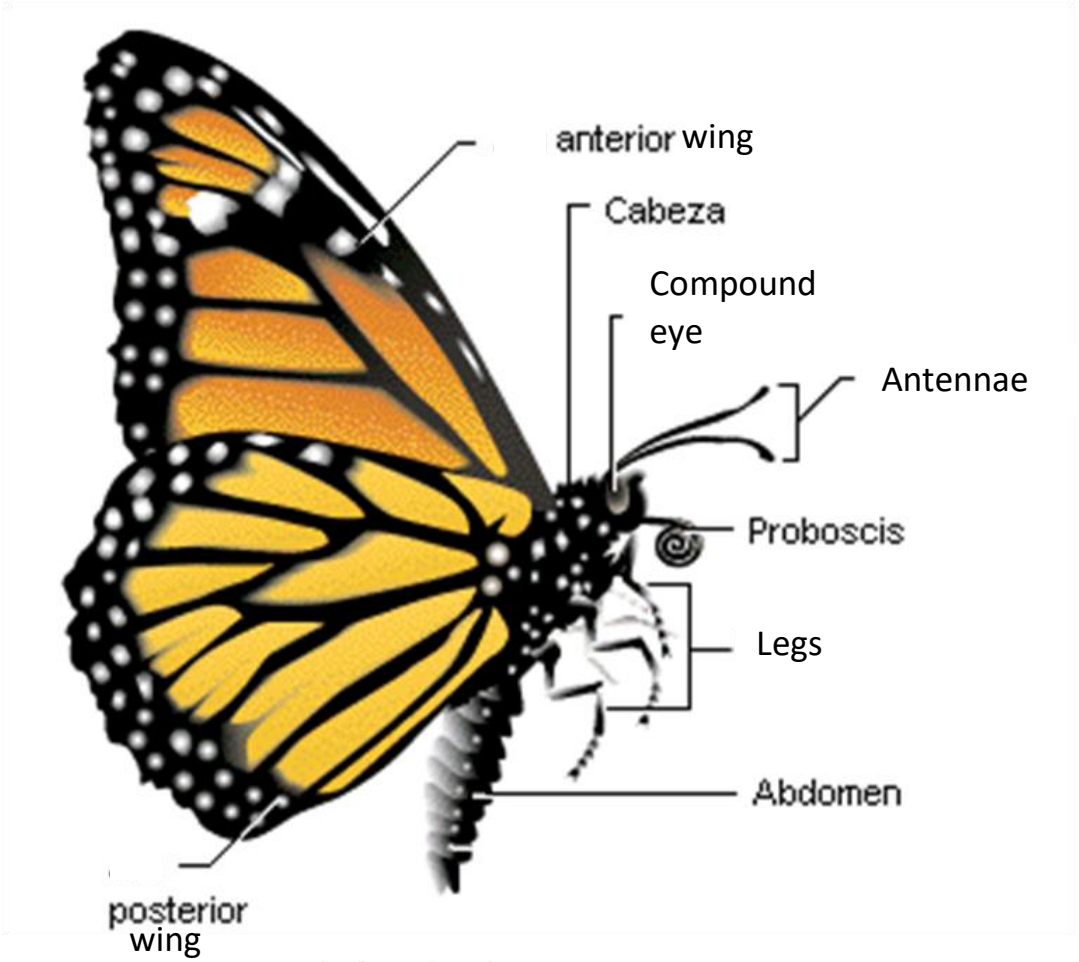


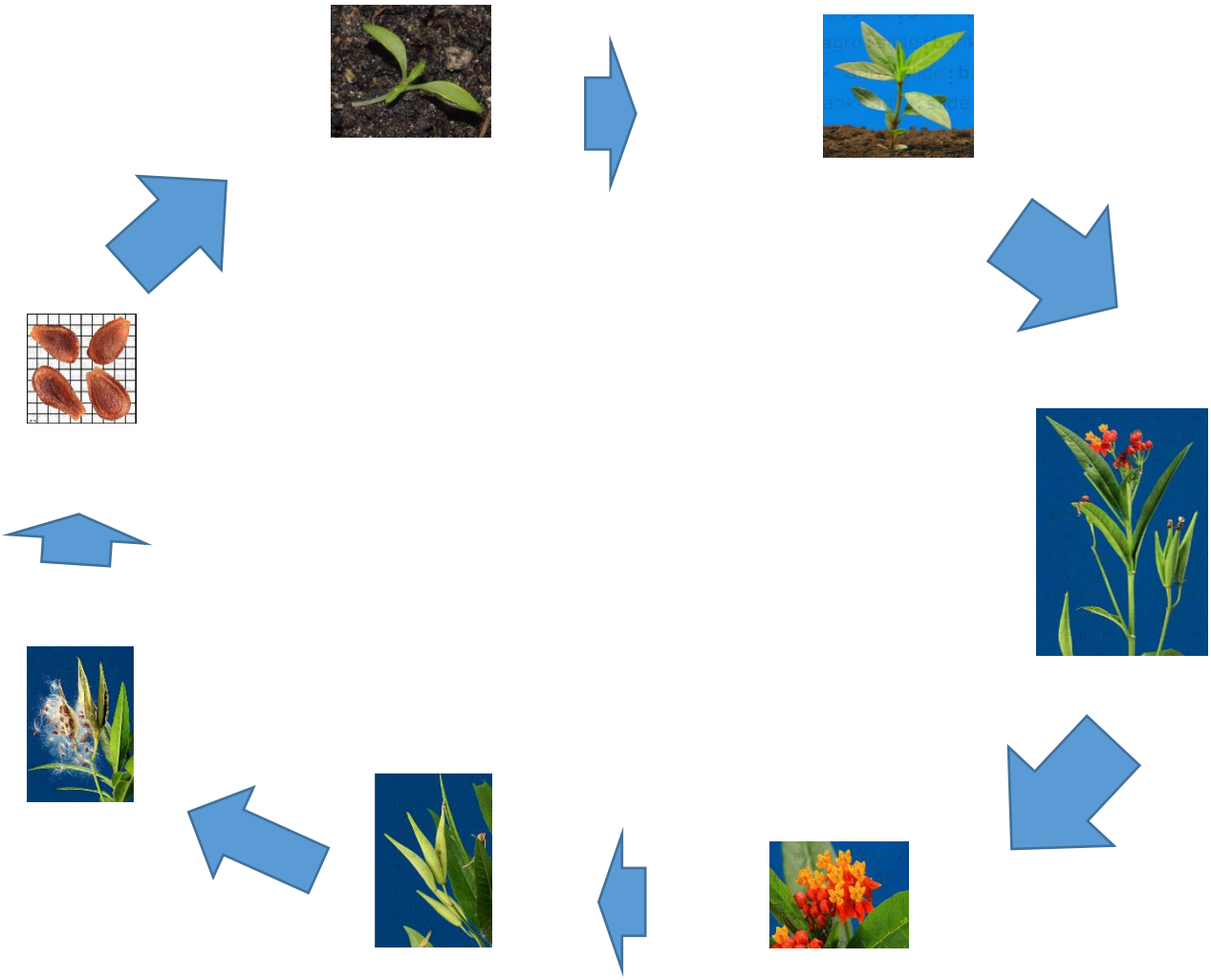
The seed falls on the wet soil.

Butterfly Morphology



Morfología de una mariposa

Reproduction cycle of the *Asclepias curassavica* plant, host of the Monarch Butterfly.



Parts of a flower