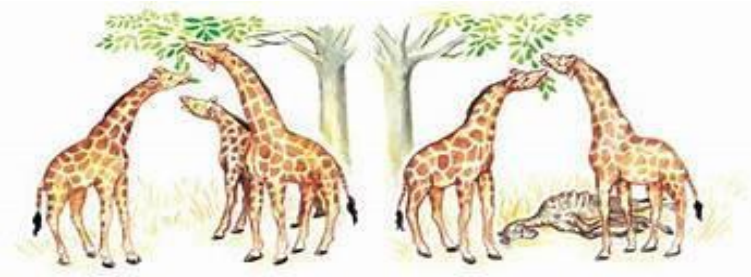
LESSON 2:

AND I MANAGE TO 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 second 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 adaptation. Emphasis will also be placed on diversity, competition, habitat, evolution, and extinction, among others.

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.

TEACHER'S GUIDE

SUBJECT: Science **LEVEL:** Elementary (K-5)

PRIMARY CONCEPT: adaptations

SECONDARY CONCEPTS: diversity, competition, habitat, evolution, extinction

PRIOR KNOWLEDGE: similarities and differences, characteristics of living beings

SPECIFIC LEARNING OBJECTIVES

Conceptual objectives:

- Identify similarities and differences between certain species.
- Interpret information related to the concepts of species and biodiversity.
- Recognize structural similarities and differences between plants and animals.
- Recognize particular characteristics that help a species survive in a given environment.
- Define adaptation.
- Define evolution.
- Mention mechanisms that help a species survive (e.g., camouflage).
- Describe the structures of plants (host plants) and animals (butterflies).
- Mention how human intervention can contribute to or affect the availability of a species.

Procedural objectives:

- Observe and identify organisms that share similar and different characteristics and belong to the same species.
- Use drawings or diagrams to explain the structural similarities between species.

Attitudinal objectives:

- Value and show appreciation for nature and the diversity of life.
- Recognize the importance of caring for biodiversity.
- Reflect on the fragility of a species in order to grow and how we can care for it.
- Accept, respect, and recognize the work and ideas of others.

STANDARDS, EXPECTATIONS, AND SPECIFICATIONS:

Grade: 1st-3rd (Indicators according to content standards)

Standard: Structure and Levels of Organization of Matter

- Recognize structural similarities and differences between humans, plants, and animals (you may use drawings, sculptures, or dramatic representations).
- Make observations for the purpose of describing the structures that plants and animals need to survive and grow.

Standard: Conservation and Change

- Interpret information related to the concept of biodiversity, emphasizing appreciation for nature and the diversity of life.
- Recognize that matter (living and nonliving) changes over time.
- Describe patterns of change in matter.
- Recognize that reproduction is a form of conservation of living things.
- Identify characteristics that are passed on and conserved from generation to generation.

Standard: Interactions and Energy

- Build an argument based on evidence to explain that, in a particular environment, some types of organisms survive better, others live with more difficulty, and others do not survive.
- Explain how variations in characteristics among individuals of the same species offer advantages for survival, finding a mate, and reproduction.
- Describe the life cycle of organisms (birth, growth, reproduction, and death).
- Analyze and interpret data to provide evidence that plants and animals have characteristics inherited from their parents, which vary within organisms belonging to the same group.
- Explain how variations in characteristics among individuals of the same species offer advantages for survival, finding a mate, and reproduction.
- Compare data from different areas and establish connections between biodiversity and environmental conditions.
- Observe plants and animals to compare the diversity of life in a variety of habitats.

Grade 4th and 5th (Indicators according to content standards)

Standard: Structure and levels of organization of matter

- Mention and discuss the functional advantages of structural adaptations in living beings.

Standard: Conservation and Chang

- Define, identify, and use evidence to develop arguments about the adaptive mechanisms in plants and animals that allow them to survive and react to changes in the environment.
- Identify ways to preserve the survival of organisms in their environment.
- Recognize that reproduction is necessary to perpetuate the species.
- Infer that reproduction allows some characteristics of species to be preserved or changed.
- Explain changes related to the form, structure, and vital functions of organisms.
- Recognize that organisms have life cycles and change over time.
- Recognize that the form, structure, and vital functions of organisms can change throughout their stages of development.

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.

Lesson # 2: And I manage to survive!

Concepts: Adaptations

Related vocabulary: competition, habitat, adaptation, evolution, extinction

Materials:

1) Worksheets
2) Pictures to cut.
3) Informative sheets
4) Blank sheets of paper (legal sized)
5) Scissors
6) Crayons or coloring pencils
7) Glue

EDUCATIONAL PROCESS

BEGINNING

In this activity, the knowledge that participants have about living beings and the traits that allow them to survive in an environment is explored.

1. In socialized discussion, show four (4) pictures of living beings and make the following questions (they can be modified according to the level of knowledge):
    a) Describe the organisms in the pictures:

 A	 B	 C	 D

- These pictures will be shown in the *PowerPoint* presentation.
  Possible answers:
  A. The butterfly has big eyes.
  B. They have a lot of hair, there is a big bear and a small bear (offspring)
  C. They have many thorns.
  D. It has a hump.

b) What can we see in their surroundings (the habitat)?
  A. Trees
  B. A cold place
  C and D: Hot and dry place

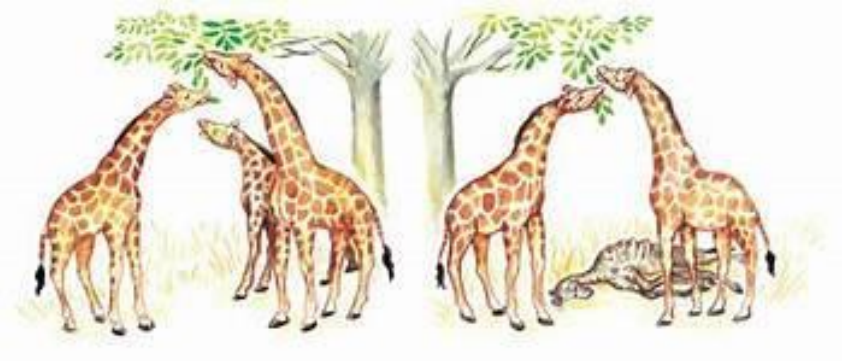
c) If organisms present different traits, do you think they could live in that place?
   Expected answer: No. For example, bears would be cold with less hair.
d) If their environment changes, do you think they could survive with their appearance?
   Expected answer: No. For example, the bear's environment would be too hot, and the butterfly could not survive in an extremely cold environment.
e) What name would you give to the capacity that living beings have of changing or modifying throughout time?
   - It is expected that students should identify the concept: adaptation. If students do not know the concept, it will be indicated that they will learn it later. It is important to remember that we are exploring the knowledge that students have about the concept.

DEVELOPMENT

1. Using a *PowerPoint* presentation, students will observe various illustrations and identify some traits that help them survive in their environment.
2. In cooperative groups, students will complete **Worksheet #1: And I manage to survive!** (It varies depending on the grade)
3. In **Worksheet #1 (K-3)**, students will cut and paste in a folded blank sheet some traits that four selected species possess, to survive in their environment.
   - The student will identify and cut the trait that belongs to each species.
4. In **Worksheet #1 (4-5)**, students will use the informative sheet that the teacher handed out to make a poster.
   - See instructions on the format to create the foldable.

CLOSURE

1. Once **Worksheet #1** is discussed, the following image of a giraffe with a short neck and giraffes with long necks is presented.



   - The teacher will ask the students: What do you think happened to the giraffe?
   - This image is included in the *PowerPoint* presentation.

2. When finalized, the same question from the beginning will be asked:
   - What name do you give to the capacity that species must change or modify throughout time?

Lesson #2: And I manage to survive! **Worksheet # 1**

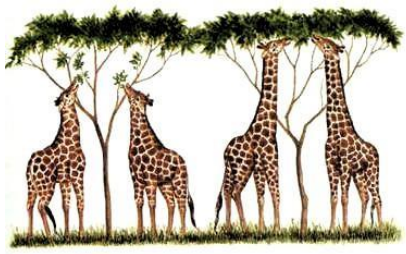
Elementary Level (K-3)

Materials:

1. Scissors
2. Glue

Procedure:

1. Look up the traits of each species.
2. Then, cut them and paste them to create your foldable.



giraffes

flat fish

butterfly

color that looks like the leaf of a plant

changes color, remains still, and looks like it's dead

long neck that helps them eat leaves in trees

legs to impulse itself in the water and swim

polar bear

Lesson #2: And I manage to survive! **Worksheet # 1**

Elementary Level (4-5)

Materials:

1. Informative sheet: Adaptation to the environment
2. Blank sheet of paper
3. Pencils or crayons
4. Scissors
5. Glue

Procedure:

1. Follow the instructions to make your foldable.
2. Cut and paste the pictures of species.
3. Complete the information in your foldable with the informative sheet.
3. Use the example that is shown in the table to know how to complete the foldable.

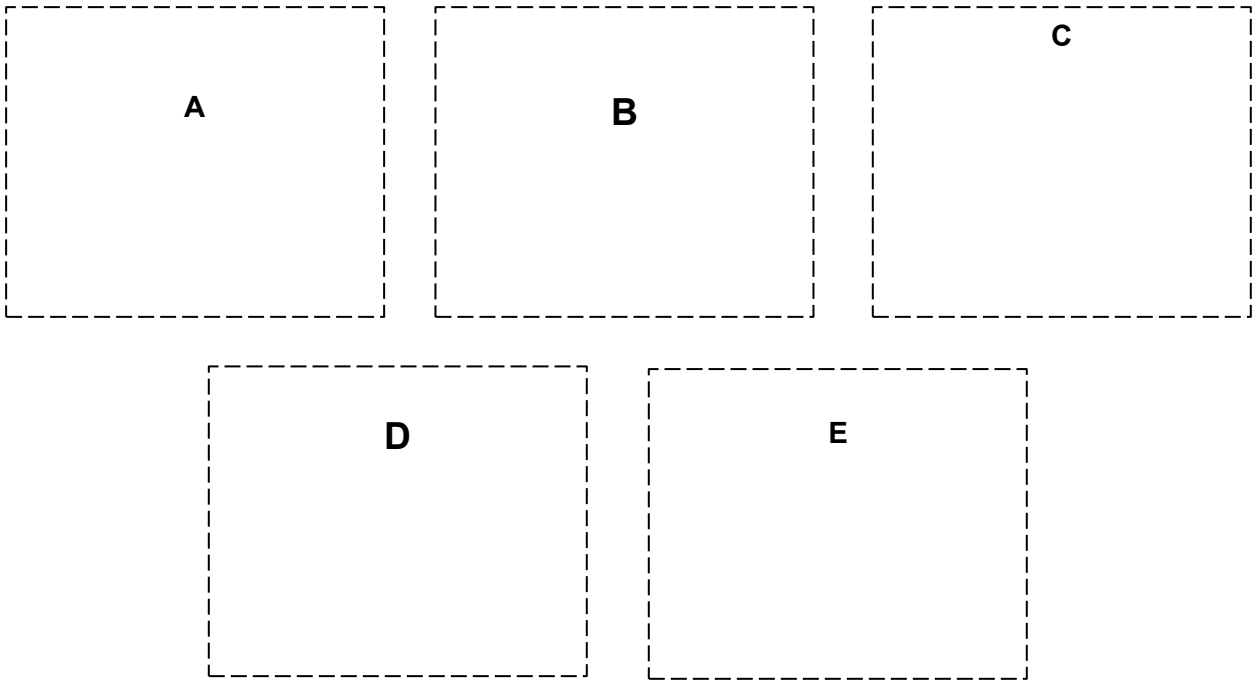
Example:

Common name of the animal	Typical environment where the animal lives (habitat)	Adaptation that the animal has	How does this adaptation help the animal to survive in the environment?
Camel	desert	camel's hump	It provides water

Worksheet #1

INFORMATIVE SHEET: ***Adaptation to the environment***

A. Observe the 5 examples of species. Look up for their traits and adaptations to survive in their environment. Use this information to complete your foldable.

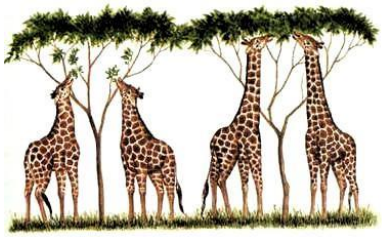


Look up for the adaptations of each species and write them down in your foldable
● They use their front legs to impulse themselves in the water and paddle like dogs. ● They live in cold environments, such as the North Pole.
● This color allows them to be confused with the green leaves of plants. ● This trait is called camouflage. ● Some can live in tropical zones. Some others live in colder places but migrate to warmer places to reproduce.
● They have big, red, and very distinctive eyes, but once they close them and remain still in the foliage, they are barely noticeable. ● This is another example of camouflage. ● These species may inhabit Central America.
● It uses its capacity to change color to hide from its predators. ● Besides changing color, it remains still and appears to be dead. ● They are found in deep waters (oceans).
● Their long necks help them feed from leaves on trees. ● This trait occurred during time. ● It was not a quick adaptation. ● They can live in the tropical savanna.

Worksheet #1

INFORMATIVE SHEET: *Adaptations to the environment (KEY)*

A. The following table shows 5 examples of species and their adaptations to survive in their environment. Use this information to complete your foldable.

Species	Adaptations
 **polar bear**	● Polar bears use their front legs to impulse themselves in the water and paddle like dogs. ● Front legs and hind legs are placed horizontally, and they are used like rudders. ● They live in cold environments, such as the North Pole.
 **butterfly**	● The butterfly's color allows it to be confused with the green leaves of plants. ● This is an example of a main structural adaptation of butterflies. ● This trait is called camouflage. ● Some can live in tropical zones. Some others live in colder places but migrate to warmer places to reproduce.
 **tree frog**	● Tree frogs have big, red, and very distinctive eyes, but once they close them and remain still in the foliage, they are barely noticeable. ● This is another example of camouflage. ● These species may inhabit Central America.
 **flat fish**	● The flat fish uses its capacity to change color to hide from its predators. ● Besides changing color, it remains still and appears to be dead. ● They are found in deep waters (oceans).
 **giraffe**	● A giraffe's long neck helps it feed from leaves on trees. ● This trait occurred during time. ● It was not a quick adaptation. ● They can live in the tropical savanna.

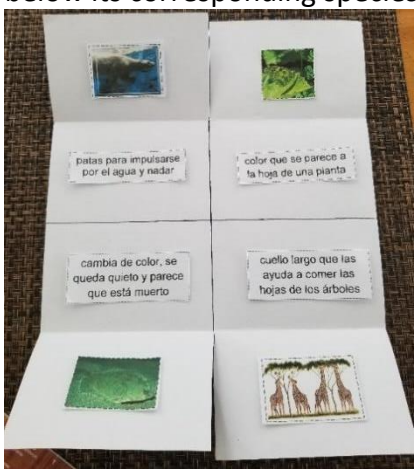
How to create a foldable
(Elementary Level K-3)

Step #1: Fold both sides of a blank sheet of paper, forming 2 doors.

Step #2: Cut both doors in half, forming 4 pieces (similar to windows).

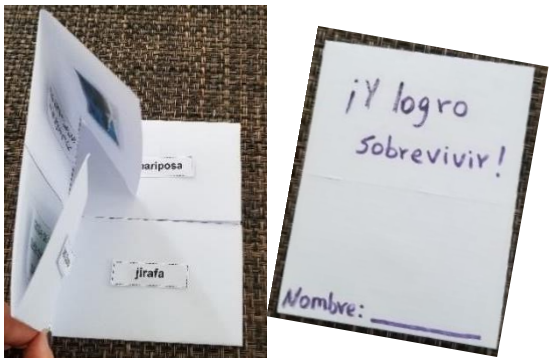
Step #3: Cut the pictures from Worksheet #1: And I manage to survive! Paste each picture in one of the "windows."

Step #4: Cut the information from each species and paste it in the space available below its corresponding species.



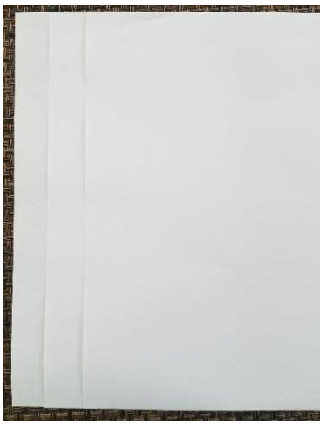
Step #5: Close the "windows" and paste the name of each species.

Step #6: To finish, fold in half, forming a booklet.

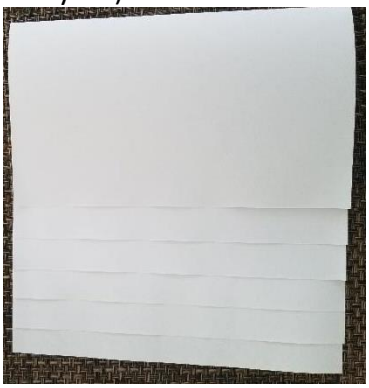


How to create a foldable
(Elementary Level 4-5)

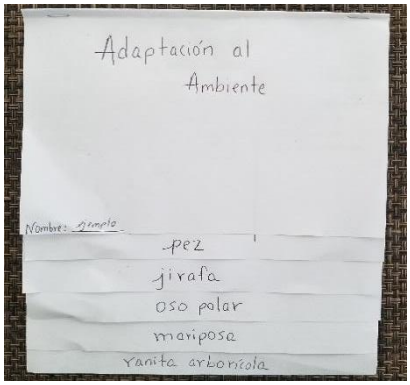
Step #1: Use 3 blank sheets of paper and place them leaving a space of ½" between each one.



Step #2: Fold papers so that 6 tabs are formed (approximately ½").



Step #3: Write a title and the name of the species in each tab.



Step #4: Use Worksheet #1: And I manage to survive!, to complete the information for each species.