



Teacher:	Subject and Grade Level: Carla the Caterpillar Undergoes Metamorphosis Biology, Ecology, Physiology, Math Grades K – 4	Date
<p>L.K.2 Reproduction and Heredity Conceptual Understanding: Plants and animals change in form as they go through stages in the life cycle. Young plants and animals are very much like their parents and other plants and animals of the same kind, but they can also vary in many ways. L.K.2 Students will demonstrate an understanding of how living things change in form as they go through the general stages of a life cycle.</p> <p>L.K.3 Ecology and Interdependence Conceptual Understanding: The environment consists of many types of living things including plants and animals. Living things depend on the land, water, and air to live and grow. L.K.3A Students will demonstrate an understanding of what animals and plants need to live and grow. Conceptual Understanding: Interdependence exists between plants and animals within an environment. Living things can only survive in areas where their needs for air, water, food, and shelter are met. L.K.3B Students will demonstrate an understanding of the interdependence of living things and the environment in which they live. L.K.3B.1 Observe and communicate that animals get food from plants or other animals.</p> <p style="text-align: right;">118 College Drive 5087 Hattiesburg, MS 39406 Phone: 601-266-4739 https://stem-ondemand.org STEMonDemand@usm.edu</p>		





L.1.2 Reproduction and Heredity

Conceptual Understanding: Plants and animals change with each stage of life. Plants have predictable and observable characteristics at each developmental stage (germination, growth, reproduction, and seed dispersal). Most plants are stationary so they depend upon animals or the wind for seed dispersal. Plants and animals are similar to their parents and resemble other plants and animals of the same kind.

L.1.2 Students will demonstrate an understanding of how living things change in form as they go through the general stages of a life cycle.

L.1.2.2 Obtain, evaluate, and communicate information through labeled drawings, the life cycle (egg, larva, pupa, adult) of pollinating insects (e.g., bees, butterflies).

L.1.3 Ecology and Interdependence

Conceptual Understanding: Animals, such as insects, depend on other living organisms for food. Many plants depend on insects or other animals for pollination or to move their seeds around so the plant can survive.

L.1.3B Students will demonstrate an understanding of the interdependence of flowering plants and pollinating insects.

L.2.1 Hierarchical Organization

Conceptual Understanding: Animals have unique physical and behavioral characteristics that enable them to survive in their environment. Animals can be classified based on physical characteristics.

L.2.1 Students will demonstrate an understanding of the classification of animals based on physical characteristics.

L.2.1.1 Compare and sort groups of animals with backbones (vertebrates) from groups of animals without backbones (invertebrates).

L.2.1.2 Classify vertebrates (mammals, fish, birds, amphibians, and reptiles) based on their physical characteristics.

L.2.1.3 Compare and contrast physical characteristics that distinguish classes of vertebrates (i.e., reptiles compared to amphibians).

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L.2.1.4 Construct a scientific argument for classifying vertebrates that have unusual characteristics, such as bats, penguins, snakes, salamanders, dolphins, and duck-billed platypuses (i.e., bats have wings yet they are mammals).

L.2.2 Reproduction and Heredity

Conceptual Understanding: Plants and animals experience different life cycles as they grow and develop. Plants and animals exhibit predictable characteristics at each developmental stage throughout the life cycle.

L.2.2 Students will demonstrate an understanding of how living things change in form as they go through the general stages of a life cycle.

L.2.3 Ecology and Interdependence

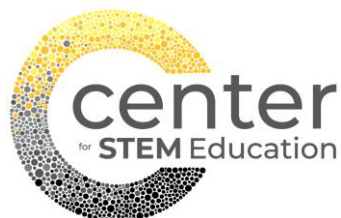
Conceptual Understanding: Animals thrive in environments where their needs are met. The environment where plants and animals live sometimes changes slowly and sometimes changes rapidly. If living things are unable to adapt to changes in the environment, they may not survive.

L.2.3A Students will demonstrate an understanding of the interdependence of living things and the environment in which they live.

Conceptual Understanding: All animals and plants need food to provide energy for activity and raw materials for growth. Animals and plants have physical features and behaviors that help them survive in their environment. All living things in an environment interact with each other in different ways and for different reasons.

L.2.3B Students will demonstrate an understanding of the interdependence of living things.

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L.3.1 Hierarchical Organization

Conceptual Understanding: Plants and animals have physical characteristics and features that allow them to receive information from the environment. Structural adaptations within groups of plants and animals allow them to better survive and reproduce in an environment.

L.3.1 Students will demonstrate an understanding of internal and external structures in plants and animals and how they relate to their growth, survival, behavior, and reproduction within an environment.

L.3.1.1 Examine evidence to communicate information that the internal and external structures of animals function to support survival, growth, and behavior.

L.4.1 Hierarchical Organization

Conceptual Understanding: All organisms need energy for growth and development. Animals have specialized structures and systems for obtaining and processing energy. These structures and systems cannot function properly without adequate nourishment. Living organisms can be adversely affected by environmental conditions or disease.

L.4.1 Students will demonstrate an understanding of the organization, functions, and interconnections of the major human body systems.

L.4.1.3 Construct models of organ systems (e.g. skeletal, nervous) to demonstrate both the unique function of the system and how multiple organs and organ systems work together to accomplish more complex functions.

L.4.2 Reproduction and Heredity

Conceptual Understanding: Scientists have identified and classified many types of plants and animals. Each plant or animal has a unique pattern of growth and development called a life cycle. All of Earth's cycles are driven by energy which can be traced back to the sun.

L.4.2 Students will demonstrate an understanding of life cycles, including familiar plants and animals (e.g., reptiles, amphibians, or birds).

L.4.2.1 Compare and contrast life cycles of familiar plants and animals.

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Materials (per student):

Students will work collaboratively in groups of 4 to do this task.

- 1 Exploration activity sheet
- 1 per student – Butterfly fact sheet
- 1 per student – Frog fact sheet
- 1 Extra-long pipe cleaner per student
- ~ 10 rigatoni noodles per student
- ~ 10 gummy life savers per student

ENGAGEMENT

I'm wondering if any of you have ever seen photos of yourselves as a baby. What were some differences about the way you looked then and the way you look now? What were some things that you can do now that you couldn't do when you were a baby? *Allow for response.*

Now I'd like to know who in here has ever gone camping or taken a walk down by a lake? *Allow for response.* I'm wondering if you've ever seen a bunch of butterflies or heard frogs croaking at night? *Allow for response.* What did the frogs sound like? *Allow for response.*

Today we are going to follow our little friend, Carla the Caterpillar, as she grows up – just like you did – and makes a really big change in her life. Can anyone guess that that change will be? *Allow for response of Carla turning into a butterfly.* Along the way, we are going to see if Carla is going to make friends with someone who looks a bit different than herself.

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ELABORATION

Ask: Well, we see that Carla was an invertebrate insect and Old Man Frog was a vertebrate amphibian. Now then... who can tell me if people are vertebrates or invertebrates? How can you tell? *Allow students to answer.* Do we have a backbone or no backbone? Does anyone know what the bones in our backbone or spine are called and how many we have? *(allow students to answer)* We have 33 vertebrae that make up our backbone or spine. The reason we have so many individual bones making up the spine is so that we can bend and twist. If our backbone was a single bone (like a leg bone), we wouldn't be able to do these things very well. If time allows, you can put a meter or yard stick down the back of your shirt and you can see how hard it is. *Allow student response.*

Engage: Now we will create a model of a human spine. You will notice that you have some hard rigatoni noodles, a long pipe cleaner, and some squishy gummy life savers. These represent different elements that we have in our backs that make us vertebrates.

- We start out with a spinal cord (pipe cleaner) that carries information from our brain to our body.
- Next, we protect the spinal cord with the vertebral bones (the hard rigatoni noodles).
- In addition to protecting the spinal cord, our backbone also helps us stand up straight – something that invertebrates like worms can't do.
- But why do we have these squishy life savers? *Allow student response.* We need cartilage disks in between the vertebrae to cushion our spine. Otherwise, they would rub together and the bones would get chipped. *Allow students to rub two noodles together to demonstrate wear and tear on the bone.*
- Now we will “build” our model of the moveable part of the human spine – the cervical, thoracic and lumbar portions. *Your teacher will pass out a diagram of the spine to help you.* We need to count out 24 “vertebrae” noodles and 24 “vertebral disk” gummy life savers. *You will be working in groups of 4 to make a whole spine.*
- The vertebrae are separated into categories (can be painted): 7 cervical vertebrae, 12 thoracic vertebrae, 5 lumbar vertebrae, 5 sacral vertebrae and 4 coccygeal vertebrae.
- **L.2.1, L.4.1**

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Teacher Note on Activity –

- Start with a pipe cleaner to represent the spinal cord.
- 24 layers of rigatoni pasta as vertebrae (to make it to scale).
- Place a gummy life saver in between each vertebra to represent the cartilage disks.

Allow time for students to work in groups of four to do this activity.

Pipe cleaners will have to be twisted together at the ends to join them.



FURTHER ELABORATION

- One way to remember the number of vertebrae in the main portions of the spine is: You eat breakfast at 7 (cervical), lunch at 12 (thoracic), and dinner at 5 (lumbar).
- Time permitting, extend the activity by having students paint the vertebral sections 5 different colors: 7 cervical, 12 thoracic, 5 lumbar (remember that there are also 5 sacral and 4 coccygeal vertebrae in a real spine).

EVALUATION

To summarize, we learned that all insects are invertebrates. Having a backbone is what separates vertebrates from invertebrates. Some vertebrates have lungs and live on land, while others breathe with gills and swim in the water. Amphibians are vertebrates that can live on land and in water, and typically undergo a metamorphosis.

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