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Unit Title: Life Cycle of Butterflies	**Content Area:** Life Science	**Grade Level:** 2

Unit Summary: The Life Cycle of Butterflies introduces students to the concepts of life cycles by inviting them to investigate one organism—the painted lady butterfly (Vanessa cardui) for eight weeks. As students care for the caterpillars and butterflies, they observe, record, and describe in words and drawings the metamorphosis from caterpillar to chrysalis and from chrysalis to butterfly. In many cases, students will get to see a butterfly lay eggs. Some butterflies will die natural deaths, completing students' observations of the life cycle. Through these investigations, students will understand that the term "cycle" implies continuity and that life cycles exist for all living organisms. This experience deepens their understanding of the diversity and complexity of life on earth. [NJCCCS 5.3 Life Science: All students will understand that life science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the use of mathematics.] The crosscutting concepts of patterns will be classification, which depends on careful observation of similarities and differences; objects can be classified into groups on the basis of similarities. Such classification is useful in codifying relationships and organizing a multitude of objects or processes into a limited number of groups. Students will recognize patterns in various life cycles and identify commonalities to the life cycle of the butterfly. Science & Engineering Practices: Constructing Explanations and Designing Solutions- Students will make use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. Obtaining, Evaluating, and Communicating Information-Students will use observations and texts to communicate new information.

Unit Essential Questions:

- How do the properties of materials determine their use?
- What do all living things have in common?
- How is matter transformed, and energy transferred/transformed in living systems?
- How do organisms change as they go through their life cycle?
- In what ways are organisms of the same kind different from each other?
- How does this help them reproduce and survive?

Unit Enduring Understandings:

- The structures of materials determine their properties.
- Living organisms have a variety of observable features that enable them to obtain food and reproduce.
- All organisms transfer matter and convert energy from one form to another.
- Organisms reproduce, develop, have predictable life cycles, and pass on some traits to their offspring.
- Sometimes differences between organisms of the same kind give advantages in surviving and reproducing in different environments.

Possible Student Misconceptions:

- Students tend to equate life cycles only with the examples they observe in school, such as certain types of plant, butterfly, frog, or mealworm life cycles. When students encounter organisms that are different from the ones they studied, they fail to recognize that all organisms have a life cycle.

NJCCS:

- 5.3.2.A.1 Group living and nonliving things according to the characteristics that they share.
- 5.3.2B.1 Describe the requirements for the care of plants and animals related to meeting their energy needs.
- 5.3.2D.1 Record the observable characteristics of plants and animals to determine the similarities and differences between parents and their offspring
- 5.3.2E.2 Describe how similar structures found in different organisms (e.g., eyes, ears, mouths) have similar functions and enable those organisms to survive in different environments.

NGSS Performance Expectations: Students who demonstrate understanding can…

- K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive.
- 1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.
- 2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats.
- 3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

Primary CCSS ELA/Literacy Connections:
RI.1.10 With prompting and support, read informational texts appropriately complex for grade. (1-LS1-2)
W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). (1-LS1-1)

Primary CCSS Mathematics Connections: MP. 2 Reasons abstractly and quantitatively; MP. 4 Model with mathematics

Lesson Pace & Sequence

Lesson Title/Number: Lesson 1 Pre Unit Assessment Getting Ready For Caterpillars	**Learning Objective(s):** Students wills draw a picture that represents their ideas of a caterpillar	**Lesson Duration:** 40-50 minutes

Learning Cycle	***Learning Activities***	***Resources/Materials***	***Science and Engineering Practices***	***Disciplinary Core Ideas***	***Crosscutting Concepts***

What lesson elements will support students' progress towards mastery of the learning objectives(s)? ****Elements do not have to be in conducted in sequence.***	***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	By conducting a brainstorming session to find out what they already know about caterpillars, using some of the following questions to help focus the discussion: What are caterpillars? What do they look like? Where have you seen caterpillars? What were they doing? What happens to caterpillars? What do caterpillars look like when they are grown? Record responses on the KWL chart	• TG - Section 4 - pg.5 • Chart paper • Markers	Ask questions based on observations to find more information about the natural and/or designed world(s).		
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Students will draw a picture of what they think a caterpillar looks like, showing how a caterpillar changes during its life.	• Paper • Pencils • Crayons			
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students will view a video clip of the metamorphosis of the butterfly and develop questions from their observations. Questions will be recorded on the KWL. Students will then have the opportunity to make changes to their pictures if needed.	• Chart paper • Markers • Video clip: http://education.nationalgeographic.com/education/activity/monarch-butterfly-life-cycle-and-migration/?ar_a=1	Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. Asking Questions and Defining Problems	All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow.	
Explain: How will you help students connect their exploration to the concept/topic under investigation?	By reading Monarch Butterfly by Gail Gibbons, the story of the complete life cycle of the monarch, including its annual migration students will be able to build upon what they know and what they have just learned about caterpillars and butterflies.	• Storybook *Monarch Butterfly* by Gail Gibbons			
Elaborate: How will students apply their learning and develop a more sophisticated	By writing/drawing in their science journals students will record what they have learned	• Journals • Pencils • Vocabulary words; butterfly	Obtaining, Evaluating, and Communicating Information	Animals have body parts that capture and convey different kinds of information needed for	

understanding of the concept/topic?	using the vocabulary words.	and caterpillar		growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs.	
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	By evaluating journals and attaching a Rubric score to the entry	• Teacher made rubric for assessing journals			
Extend: How will students deepen their conceptual understanding through use in new context?	Students will write about potential problems and solutions to those problems the caterpillars may have living in the classroom.		Use materials to design a device that solves a specific problem or a solution to a specific problem.		

Lesson Title/Number: Caring For Caterpillars/ Lesson 2	**Learning Objective(s):** Students will use their senses to observe their caterpillars in its new home in a cup.	**Lesson Duration:** 40-50 minutes

Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	By discussing the caterpillars' foods with the class. Talk about their natural food as well as the prepared food supplied in the cups. Create a Venn Diagram of foods that the caterpillar can eat and foods that we eat.	• Chart paper • Markers			
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	By showing students an actual caterpillar to observe, comparing their drawings from the previous lesson (predictions).	• Caterpillars • Hand lens	Compare predictions(based on prior experiences) to what occurred (observable events)		
Explore: What hands-on/minds-on common experience(s) will you provide for students?	By allowing students to touch, smell and see the food for the caterpillar. Distribute one cup with food and one lid to each child. With clean fingers, the children should now push the food firmly into the bottoms of the cups. Ask them to use their senses for how the food feels, smells and looks. Students will	• Caterpillar food • Cups • Hand lens		All animals need food in order to live and grow. They obtain their food from plants or from other animals.	

	then receive one caterpillar for their cup and place the lid on top of the cup. Using the hand lens students will observe the caterpillar and the food.				
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Students will record their observations onto Activity Sheet 1 provided in the TE	• Activity Sheet 1			
Extend: How will students deepen their conceptual understanding through use in new context?	Students will assist in setting up a class terrarium for the extra caterpillars. This will give them the opportunity to observe more closely how the caterpillars eat, move and grow.			All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow.	Things may change slowly or rapidly.
Lesson Title/Number: Learning More About Caterpillars/ Lesson 3		**Learning Objective(s):** Students discuss what caterpillars and other organisms need to stay alive.			**Lesson Duration:** 40-50 minutes
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Discuss the idea that every living creature needs certain things to stay alive. These basic needs include air, water, food, appropriate temperature, and shelter. Ask students if caterpillars and people have the same needs				
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Students will observe caterpillars. Tell students that you want them to use their hand lenses to look at the caterpillars closely for signs that they are alive and discuss any changes that have occurred.	• Caterpillars • Hand lenses			Things may change slowly or rapidly.

Explore: What hands-on/minds-on common experience(s) will you provide for students?	By measuring their caterpillars. Students will lay a piece of yarn along the outside of the cup and mark the length of the caterpillar. Students record the changes in size as the caterpillar grows	• Caterpillars • Hand lenses • Yarn	Make observations and/ or measurements to collect data that can be used to make comparisons.	All animals need food in order to live and grow.	
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Interactive reading in STC Literacy Series, The Life Cycle of Butterflies, “Animals Growing and Changing” pgs. 4–5.	• STC e-book *"The Life Cycle of Butterflies"*			
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Students will complete activity Sheet 2:Taking Care of My Caterpillar.(TG, Section 4, pg. 22)	• Science Journals (Activity Sheet 2)		All animals need food in order to live and grow. They obtain their food from plants or from other animals.	
Extend: How will students deepen their conceptual understanding through use in new context?	Contribution of Observation for Class Calendar monitoring caterpillar growth		Use observations to describe patterns and or relationships in the natural and designed worlds in order to answer scientific questions and solve problems.		Events have causes that generate observable patterns.
Lesson Title/Number: Caterpillars have basic structures that help it function/ Lesson 4		**Learning Objective(s):** Students discuss the caterpillar’s activities and study its basic body parts.			**Lesson Duration:** 40-50 minutes
Learning Cycle ***What lesson elements will support students’ progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students’ progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students’ application of practices and their understanding of core ideas?***
Elicit: How will you access students’ prior knowledge?	Revisit the class KWL chart reviewing and adding to what has been learned and adding any additional questions	• KWL chart			Things may change slowly or rapidly.

Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Read in STC Literacy Series, The Life Cycle of Butterflies, "Animals Growing and Changing" pgs. 8–9	• STC e-book "*Animals Growing and Changing*"	Read grade-appropriate texts and/ or use media to obtain scientific and/ or technical information to determine patterns in and/ or evidence about the natural and designed world(s).		
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Allow students time to observe the caterpillars closely with the hand lenses. Tell them that the discussion today will be about the caterpillar's body parts. You might ask, for example, 1) What color is the caterpillar? How big is it? How would you describe its shape? 2) Which end is the head? How can you tell? 3) How many legs can you count? 4) Describe how the caterpillar moves. Can it walk on the smooth sides of the plastic cup? On the lid? On the food? On the silk? 5) What kind of body covering does it have?	• Caterpillar • Hand lenses	Ask and/ or identify questions that can be answered by an investigation.		
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Hold a class discussion about what they have learned by observing their caterpillars. You may use the illustration on pg. 108 either on the bulletin board or as an overhead projection to help focus the discussion. Distribute Activity Sheet 3 and preview it with the class. Allow sufficient time for students to complete the sheet.	• Illustration of caterpillar		All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place and seek, find, and take in food water and air.	
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Ask students to dictate statements for you to record on the Class Calendar on their observations about the caterpillar's body during this lesson. Invite students to make predictions about how the caterpillars may be different by tomorrow.	• Class Calendar	Use observations to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems		Lesson Title/Number: Students can learn a great deal about caterpillar anatomy by constructing caterpillar models. Encourage them to create their own models based on what they have observe / Lesson 5

Extend: How will students deepen their conceptual understanding through use in new context?	Students can learn a great deal about caterpillar anatomy by constructing caterpillar models for an at home project. Encourage them to create their own models based on what they have observed using various materials they have at home.	• Enlarged image of a caterpillar with labels for body parts	Develop a simple model based on evidence to represent a proposed object or tool.		
Lesson Title/Number: Observing Change: Growth and Molting / Lesson 5		**Learning Objective(s):** Students can learn a great deal about caterpillar anatomy by constructing caterpillar models. Encourage them to create their own models based on what they have observed.			**Lesson Duration:** 40-50 minutes
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Ask students to think/pair/share with partners what they have learned about caterpillars.	• Class KWL chart			
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	To spark discussion about the concept of growth and change, ask students how they have changed since they were in kindergarten. Can they wear the same shoes or clothes that they wore in kindergarten? Discuss the relationship between food and growth. Do students understand that food is responsible for their growth? Can students relate this concept to other animals, including caterpillars?		Ask questions based on observations to find more information about the natural and/ or designed world(s).		Patterns in the natural and human designed world can be observed used to describe phenomena, and used as evidence

Explore: What hands-on/minds-on common experience(s) will you provide for students?	Give the children an opportunity to observe how caterpillars are growing and to share discoveries with one another. Listen to the questions they ask. Keep a careful eye on any of the caterpillars that may be ready to molt so that you can seize the right moment to observe.	• Caterpillars • Hand lenses		Animals have body parts that capture and convey different kinds of information needed for growth and survival.	
Explain: How will you help students connect their exploration to the concept/topic under investigation?	To help students focus their observations, ask some specific questions, such as: 1) What do you see in the cup that was not there the last time you looked? 2) Where do you think it came from? 3) What do you think it might be? 4) Does the caterpillar seem larger?		Ask questions based on observations to find more information about the natural and/ or designed world(s).		
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Students will complete Activity Sheet 4 and preview it with the class. Allow students time to complete the sheet	• Science Journal (Activity Sheet 4)		All animals need food in order to live and grow.	
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Completion of Activity Sheet 4	•	Use observations to describe patterns and/ or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.		
Extend: How will students deepen their conceptual understanding through use in new context?	Read in STC Literacy Series, The Life Cycle of Butterflies, “Animals Growing and Changing” pgs. 10–11.	• STC e-book *"The Life Cycle of Butterflies"*			Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence
Lesson Title/Number: Spinning Silk / Lesson 6	**Learning Objective(s):** Students watch the caterpillar spin its silk and discuss how it uses the silk.				**Lesson Duration:** 40-50 minutes

Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	By revisiting the stages of the life cycle in a "What stage am I?" game				
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Students will interactively read about caterpillars producing silk in STC Literacy Series, The Life Cycle of Butterflies, "Comparing Animals" pgs. 20–21.	• STC e-book "Life Cycle of Butterflies			Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Distribute caterpillars and hand lenses. Allow time for children to observe. Direct student attention to the silk. Ask students to concentrate on the amount of silk the caterpillar has spun and on its crisscross patterns. Then describe the typical head swaying motion of a caterpillar when spinning so students can look for it.	• Caterpillars • Hand lenses	Make observations and/ or measurements to collect data that can be used to make comparisons.		
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Distribute the Activity Sheet. Preview Activity Sheet 5 with the class. Allow students time to complete it. Students use drawings, words, phrases, and/or simple sentences to record changes in their caterpillars and their homes (cups)	• Science Journal (Activity Sheet 5)		Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive.	

Extend: How will students deepen their conceptual understanding through use in new context?	Have the children seen other animals that use strands of silk? (Spiders, of course!) What are the similarities and differences in the ways caterpillars and spiders use silk?	• https://www.youtube.com/watch?v=g5iN0ZaoW7M	Use observations to describe patterns and/ or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.		
Lesson Title/Number: Caterpillars enter the pupa stage in their development to become a butterfly / Lesson 7		**Learning Objective(s):** Students observe the formation of a chrysalis, the third stage in the butterfly's life cycle.			**Lesson Duration:** 40-50 minutes
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Students will view pictures of the caterpillars in their chrysalis stage. They will then generate questions about the pictures that will be revisited at the end of the lesson.		Asking Questions and Defining Problems		
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Interactively read about the chrysalis stage in STC Literacy Series, The Life Cycle of Butterflies, "A Caterpillar Becomes a Butterfly" pgs. 12–13				
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Distribute the caterpillars and hand lenses. Allow time for observations. To help students focus on the changing caterpillar, ask them to notice the size of their caterpillars (about 25 to 35 mm, or 1 to 1½ inches), their level of activity (relatively inactive), whether or not they have spun a silk button on the lid of the cup, and their position in the cup (may be hanging in J-shape from lid).				