



LIFE CYCLES

Essential Question 1 (EQ1): What are life cycles and how are they the same and different?

Essential Question 2 (EQ2): What helps living organisms survive?

Essential Question 3 (EQ3): How do we know that life was here long ago?

Unit Summary: This unit covers two overarching ideas: (a) that all plant and animal life cycles follow the distinct pattern of birth, growth, reproduction, and death, and (b) that habitats affect an organism’s survival (growth and reproduction).

- **Lesson 1:** Focuses on the difference between living and nonliving organisms. (EQ1)
- **Lesson 2:** The life cycle of a mealworm is explored by making observations about the stages. (EQ1)
- **Lesson 3:** The life cycles of two plants (mung beans and lima beans) are compared. (EQ1)
- **Lesson 4:** Focuses on inherited traits from parent to offspring (dog to puppy). The goal is for students to understand that some traits are inherited and help organisms to thrive within particular environments. (EQ2)
- **Lesson 5:** Students will learn about the relationship between predators and prey and analyze the effects of their relationships in an ecosystem. (EQ2)
- **Lesson 6:** Students provide evidence that an organism’s survival, growth, and reproduction can be affected by a variety of circumstances (habitats, group behavior, adaptation and more). Connect back to Lesson 4. (EQ2)
- **Lesson 7:** Students use fossils as a record of how organisms have changed over extended amounts of time. (EQ3)
- **Summative Assessment:** DSPA – Culmination of writing and science DSPA.

Lesson 4 of 7: Inheritance

Standards
3-LS3: Heredity: Inheritance and Variations of Traits
3-LS4: Biological Evolution: Unity and Diversity
Performance Expectations
The lesson outlined in this table is just one step toward reaching the performance expectations listed below
3-LS3-1. Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms
3-LS4-2 Use evidence to construct an explanation for how the variation in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

Dimension	Name and NGSS code/citation	Specific Connections to Classroom Activity
Science and Engineering Practices	<p>SEP 4: Analyzing and Interpreting Data</p> <ul style="list-style-type: none"> Analyze and interpret data to make sense of phenomena using logical reasoning <p>SEP 6: Constructing Explanations and Designing Solutions</p> <ul style="list-style-type: none"> Use evidence (e.g., observations, patterns) to support an explanation. <p>SEP 7: Engaging in Argument from Evidence</p> <ul style="list-style-type: none"> Construct an argument with evidence, data, and/or a model. (3-LS2-1) 	<p>In Activity 1, students review EQ1 by having them share a claim with evidence from previous lessons.</p> <p>In Activity 2, students make a claim of which puppy belongs with each parent. Then they provide evidence to support their claim.</p> <p>In Activity 3, students make a claim with supporting evidence about which puppies will better be able to survive within the litter and why.</p> <p>In Activity 4, students match pictures of adult WY plants and animals to their offspring based on traits using evidence to support their claim. The silent conversation will provide an opportunity for students</p>



		<p>to re-evaluate their claims after reading their peers' ideas and reasoning. The ensuing dialogue allows for students to practice argumentation.</p>
<p>Disciplinary Core Ideas</p>	<p>Inheritance of Traits (LS3.A):</p> <ul style="list-style-type: none"> Many characteristics of organisms are inherited from their parents (3-LS3-1) <p>Variation of Traits (LS3.B):</p> <ul style="list-style-type: none"> Different organisms vary in how they look and function because they have different inherited information (3-LS3-1) <p>Natural Selection (LS4.B) Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, growing, reproducing.</p>	<p><i>Note: The emphasis in this lesson is on inherited traits rather than the environmental effects on an organism's development. The effect of the environment will be covered in Lesson 6.</i></p> <p>In Activity 3, students identify not only inherited traits that offspring receive from their parents, but also how those traits affect that animal's chances of survival.</p> <p>By observing puppies and their parents, students will identify similarities and make claims as to their inherited traits. In addition, students will compare offspring from the same parents to discuss inherited differences and how those traits will affect survival.</p>
<p>Crosscutting Concepts</p>	<p>CCC 2: Cause and Effect</p> <ul style="list-style-type: none"> Cause and effect relationships are routinely identified and used to explain change. (3-LS2-2) 	<p>Students discuss how inherited traits affect the way they survive. Teacher should ask, "What caused the puppies to have this trait?" "What do you think allowed them to survive?" – Make sure they are backing their claim with evidence and reasoning.</p> <p>In Activity 3, students use patterns and cause and effect to compare and contrast which puppies will thrive from the litter based upon their traits. For example, the larger puppies in a litter will have a better chance of survival (effect/claim) because they are stronger and more developed (cause/evidence). The puppies need to be strong to kill prey and defend themselves against others (reasoning). The runt is weaker and less developed and will have a lower chance of survival.</p>

<p>Connections to Engineering, Technology, and Applications of Science:</p>	
<p>Connecting to the Common Core State Standards</p> <p><i>ELA/Literacy -</i></p> <p>RI.3.1 Ask and answer questions to demonstrate understanding of a text (visual representation), referring explicitly to the text as the basis for the answers</p> <p>W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-LS4-1), (3-LS4-3),(3-LS4-4)</p> <p>W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (3-LS3-1), (3-LS3-2)</p>	



W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (3-LS4-1)

SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. (3-LS3-1), (3-LS3-2)

Mathematics -

MP.2 Reason abstractly and quantitatively. (3-LS3-1), (3-LS3-2)

MP.5 Use appropriate tools strategically. (3-LS4-1)

Suggested Procedure

ACTIVITY 1 (targets SEP 6/7, CCC 1):

Review first EQ by having students engage in argumentation to answer the question using evidence from previous lessons. Then, introduce E.Q. #2: What helps living organisms survive? And have them brainstorm possible answers aloud.

- *Note: Teachers should make sure students talk about patterns as evidence for their answers.*

ACTIVITY 2 (targets SEP 4/6/7, DCI LS3.A):

Have students work in pairs. Use the cards to match each puppy with its parent and then answer the questions below:

- Does each puppy look exactly like its parent?
 - What similarities are there? What differences are there?
- What evidence do you have to support your claims?
- What patterns in inherited traits did you use to sort the puppies to match their parents?
 - Animal traits may include: ears, eyes, nose, feet, teeth, fur, tail, color, size, shape, markings

Lead a class discussion in which students share their thinking with supporting evidence. To target the DCI, ask students why they sorted the puppies and parents like they did (Answer: *Many characteristics of organisms are inherited from their parents*).

Individual Assessment: Provide several pictures of puppies and parents. In their journals, students must make a claim and argue with evidence (explain why) which puppy belongs to which parent.

Optional: Students journal comparing Offspring and Adults from: nclack.k12.or.us

ACTIVITY 3 (targets SEP 6/7, CCC 2, DCI LS4.B):

Framing: "Why does it matter that offspring inherit traits from their parents? How does it help us answer EQ2?"

Students will make a claim about which puppies will thrive from a litter based upon their traits and support their claim using evidence (cause and effect relationships). For example, *The biggest puppy will be able to eat more because it can push others out of the way. Therefore, it will become healthier and stronger and thrive better. The smallest puppy will get less food because it will get pushed away from the food. Therefore, it will become weaker and not develop as quickly. For the smaller puppy, this would limit their ability to reproduce and pass along their traits to their own*



offspring. For the larger, stronger puppy, the opposite will be true – they will be more likely to reproduce and pass their traits along within the population (litter) of dogs.

Students make an inference based on the husky pictures:

- What similarities and differences can you observe in this litter of puppies?
 - Describe some of the similarities/differences you see among these puppies. What do you think is causing the differences?
 - Describe how the puppies look similar or different than their parents. What do you think is causing these similarities/differences?

ACTIVITY 4 (targets SEP 4/6/7, CCC 1/2, DCI LS3.A/LS4.B):

Think → Individually, students will use a set of cards with pictures of mature and juvenile Wyoming animals and plants. They will use these cards to answer: “From which parent did this organism come and what characteristics help it survive long enough to have their own babies?” Common animal traits may include: ears, eyes, nose, feet, teeth, fur, tail, color, size, shape, and markings. Plant traits may include: color, size, shape, stem, bark, and leaves.

“Silent Conversation” → Divide students into small groups (4?) and have each student write claim + evidence and reasoning on a piece of paper (“I think ___ offspring belongs to ___ parent because ___. ___ helps the animal survive long enough to have their own babies because ____.”) Students pass papers around in a circle, each student reading and responding to their peers’ statements. Continue to pass until student has original paper. Students modify original claim/evidence if desired.

- **Wyoming place-based example responses about survival:** Rabbits have large feet and eyes on side of their heads to help them move quickly and see prey; Pronghorns have long, lean legs to help them run fast from predators; Bison have a thick coat, which helps them to stay warm in the winter and a big head, which helps them to move snow and uncover food sources.

Share → Verbal discussion to share ideas and practice argumentation.

- Have students share out their ideas and comment on peers. One potential format could be: Have one student share his/her idea. Ask the class, “What evidence was used to support claim?” “Can you add more evidence to support claim?” “Who disagrees with that claim? State your differing claim and evidence.” The purpose of asking such questions is to have students build off of their peers’ ideas and learn to productively refute another’s claim with their own evidence.
- During discussion, consider incorporating the following idea:
 - Provide different scenarios describing what characteristics are most beneficial. It shouldn’t always be biggest and strongest because that is not always the trait that the environment enables, and it might lead to misconceptions that the most “physically fit” is necessarily the most evolutionarily fit.

Optional: [Student Journal Parent and Offspring Comparison](http://nclack.k12.or.us) from nclack.k12.or.us

Exit Ticket:

- In reference to E.Q. (What helps living organisms survive?), have students respond in their journals (Possible sentence frame: “I used to think ___. Now I know ___, because ___.”)