



Inheritance and Variation of Traits: Life Cycles and Traits

Unit Planning Team:

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How are organisms' life cycles similar and different?

How do organisms vary in their traits?

How do variations in traits help organisms to survive and reproduce?

Inheritance and Variation of Traits: Life Cycles and Traits
 Students who demonstrate understanding can:
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. [Clarification Statement: Changes organisms go through during their life form a pattern.] [Assessment Boundary: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.]
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. [Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.] [Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.]
3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment. [Clarification Statement: Examples of the environment affecting a trait could include insufficient water stunting normally tall plants; and, a pet dog becoming overweight that is given too much food and too little exercise.]
3-LS4-2 Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. [AR Clarification Statement: Examples of cause and effect relationships could be plants of the same species with larger thorns may be less likely to be eaten; and, animals of the same species with more effective camouflage or coloration may be more likely to survive and produce offspring.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. <ul style="list-style-type: none"> Develop models to describe phenomena. (3-LS1-1) Analyzing and Interpreting Data Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. <ul style="list-style-type: none"> Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS3-1) Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. <ul style="list-style-type: none"> Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2) 	LS1.B: Growth and Development of Organisms <ul style="list-style-type: none"> Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1) LS3.A: Inheritance of Traits <ul style="list-style-type: none"> Many characteristics of organisms are inherited from their parents. (3-LS3-1) Other characteristics result from individuals’ interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (3-LS3-2) LS3.B: Variation of Traits <ul style="list-style-type: none"> Different organisms vary in how they look and function because they have different inherited information. (3-LS3-1) The environment also affects the traits that an organism develops. (3-LS3-2) LS4.B: Natural Selection <ul style="list-style-type: none"> Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (3-LS4-2) 	Patterns <ul style="list-style-type: none"> Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1) Patterns of change can be used to make predictions. (3-LS1-1) Cause and Effect <ul style="list-style-type: none"> Cause and effect relationships are routinely identified and used to explain change. (3-LS3-2, 3-LS4-2) <hr/> Connections to Nature of Science Scientific Knowledge is Based on Empirical Evidence Science findings are based on recognizing patterns. (3-LS1-1)

Inheritance and Variation of Traits: Life Cycles and Traits

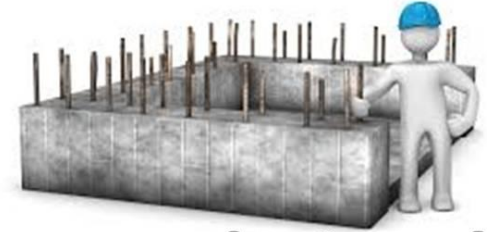
Background knowledge videos:

- LS1A - Structure & Function
- LS3A - Inheritance of Traits
- LS3B - Variation of Traits
- LS4B - Natural Selection

These videos are designed to assist in providing background knowledge with the associated DCI. The information in the videos follows the progression through high school.

Prior to 3rd grade, students should have knowledge, understanding of, and experiences with the following ideas:

- ★ Plants and animals have predictable characteristics at different stages of development.
- ★ Plants and animals grow and change.
- ★ Adult plants and animals can have young.
- ★ In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive.

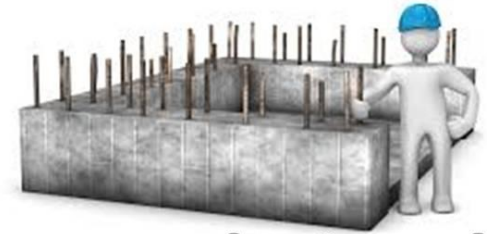


Foundational
Knowledge

With the implementation of new standards, students may not have had opportunities to engage in these foundational understandings and ideas before 3rd grade. You may need to provide opportunities for students to experience these ideas as you move forward.

Prior to 3rd grade, students should have knowledge, understanding of, and experiences with the following ideas:

- ★ Organisms have characteristics that can be similar or different.
- ★ Young animals are very much, but not exactly like their parents, and also resemble other animals of the same kind.
- ★ Plants are also very much, but not exactly like their parents, and also resemble other plants of the same kind.
- ★ Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways.



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Knowledge

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How are organisms' life cycles similar and different?

How do organisms vary in their traits?

How do variations in traits help organisms to survive and reproduce?



Big Ideas

- ★ Reproduction is essential to the continued existence of every kind of organism.
- ★ Plants and animals have unique and diverse life cycles.
- ★ Many characteristics of organisms are inherited from their parents.
- ★ Other characteristics result from individuals' interactions with the environment, which can range from diet to learning.

How are organisms' life cycles similar and different?

How do organisms vary in their traits?

How do variations in traits help organisms to survive and reproduce?



Big Ideas

- ★ Many characteristics involve both inheritance and environment.
- ★ Different organisms vary in how they look and function because they have different inherited information.
- ★ The environment also affects the traits that an organism develops.
- ★ Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.

Inheritance and Variation of Traits: Life Cycles and Traits

Students who demonstrate understanding can:

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.** [Clarification Statement: Changes organisms go through during their life form a pattern.] [Assessment Boundary: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.]



Disciplinary Core Ideas

LS1.B: Growth and Development of Organisms

- Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1)

Clarifications:

- Focus is on the growth and development process of plants and animals.
 - Plants focus on flowering plants
 - Animals does not include human reproduction

Identify and
CLARIFY the
STANDARDS

Inheritance and Variation of Traits: Life Cycles and Traits

Students who demonstrate understanding can:

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. [Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.] [Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.]



Disciplinary Core Ideas

LS3.A: Inheritance of Traits

- Many characteristics of organisms are inherited from their parents. (3-LS3-1)

LS3.B: Variation of Traits

- Different organisms vary in how they look and function because they have different inherited information. (3-LS3-1)

Clarifications:

- Offspring are similar but different
- Emphasis should be placed on organisms other than humans

Identify and
CLARIFY the
STANDARDS

Inheritance and Variation of Traits: Life Cycles and Traits

Students who demonstrate understanding can:

3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment. [Clarification Statement: Examples of the environment affecting a trait could include insufficient water stunting normally tall plants; and, a pet dog becoming overweight that is given too much food and too little exercise.]



Disciplinary Core Ideas

LS3.A: Inheritance of Traits

- Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (3-LS3-2)

LS3.B: Variation of Traits

- The environment also affects the traits that an organism develops. (3-LS3-2)

Clarifications:

- Our differences can come from:
 - Parents (genes/traits shared)
 - Environment
 - What we eat
 - Our experiences
 - What we learn

Identify and
CLARIFY the
STANDARDS

Inheritance and Variation of Traits: Life Cycles and Traits

Students who demonstrate understanding can:

3-LS4-2 Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. **[AR Clarification Statement:** Examples of cause and effect relationships could be plants of the same species with larger thorns may be less likely to be eaten; and, animals of the same species with more effective camouflage or coloration may be more likely to survive and produce offspring.]



Disciplinary Core Ideas

LS4.B: Natural Selection

- Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (3-LS4-2)

Clarifications:

- This is the first time this idea is presented in K-5 Science Standards
- Differences within a population provide advantages
 - Those that survive will reproduce and continue the life cycle

Example:

Within a population of giraffes, some may have longer necks than others. If an event occurred that would prohibit them to eat leaves closer to the ground/lower on the tree, those that had longer necks would survive and be the ones reproducing the next cycle of their population.

Identify and
CLARIFY the
STANDARDS



UNIT: Life Cycles of Organisms

[View Unit](#) ▶

CONCEPT:

Plant Life Cycles

Animal Life Cycles



UNIT: Traits and Inheritance

[View Unit](#) ▶

CONCEPT:

Learning

Similarities of Parents and Offspring

Adaptation

Discovery Education Science Techbook Units



UNIT: Survival and Extinction

[View Unit](#) ▶

CONCEPT:

Organism Needs



**Gather and
study the
RESOURCES**

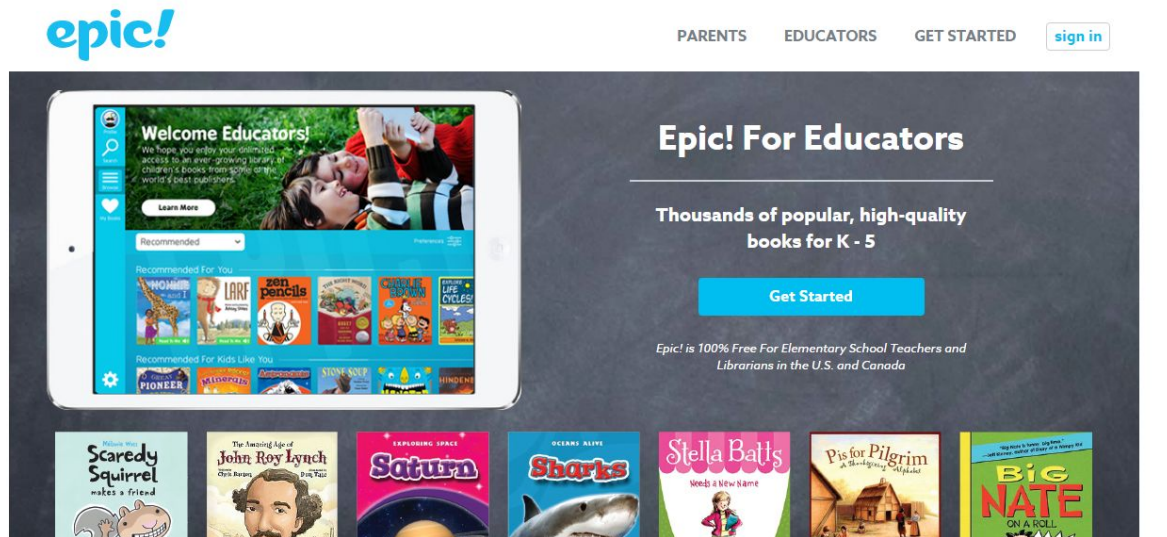
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Go to www.getepic.com and click on the EDUCATORS tab to get started.



We have selected books for you to use in this science unit. In order to use these books, you will need to have an account.

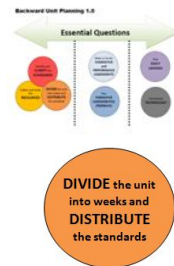
Books will be linked throughout the unit.

NGSS Standard	Simple Explanation	Discovery Education Label
3-1	Inheritance of traits	Similarities of Parents & Offsprings
1-1	Growth and Development	Plants Life Cycle Animals life Cycle
3-1	Variations within similar organisms	Similarities of Parents & Offsprings
3-2	Variation due to environmental factors	Learning Adaptation
4-2	Natural Selection	Organism Needs

Foundational Knowledge prior to 3rd grade (this is encountered throughout K-2 in the NGSS. In order to build missing background knowledge you may need to review these concepts):

- Plants and animals have predictable characteristics at different stages of development.
- Plants and animals grow and change.
- Adult plants and animals can have young.
- In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive.
- Organisms have characteristics that can be similar or different.
- Young animals are very much, but not exactly like their parents, and also resemble other animals of the same kind.
- Plants are also very much, but not exactly like their parents, and also resemble other plants of the same kind.
- Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways.

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.



Weeks

Resource

Start a KLEWS chart with the guiding question:

How are traits, or characteristics, passed from parents to their offspring?

Add to your KLEWS chart as you work through each explore/explain.

Engage:

[DE: Engage Similarities & Differences](#)

Explore/Explain:

[DE: Similarities of Parents and Offsprings Virtual Lab](#) [DE: Student Guide Worksheet](#)

Allow students to complete the exploration and fill in the worksheet as they complete it. After they complete the worksheet, add the new information and evidence to your KLEWS chart.

Watch these two animations and allow students to discuss new information in partners. Add any new information to your KLEWS chart.

[DE: Genetic Trait Animation](#) [DE: Trait Animation](#)

1 - 3

Inheritance of Traits

Part 1

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.



DIVIDE the unit
into weeks and
DISTRIBUTE
the standards

Week

Resource

Explore/Explain

[DE: Parents and Offspring Reading Passage](#)

[DE: A Litter of Kittens Reading Passage](#)

[DE: The Color of Apples Reading Passage](#)

Set out these three reading passages as stations and allow students to rotate through each station and read the passages. Have a class discussion about what they learned and add any new information with evidence to your KLEWS chart.

Add these guiding questions to your KLEWS chart before the Elaborate:

How do humans use their knowledge of traits? How they are passed from parents to offspring?

Elaborate

[DE: Artificial Selection](#)

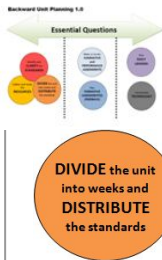
[DE: Engineering and Growing Corn](#)

Evaluate:

[Baby Mice Assessment Probe](#) (intranet password protected page)

[DE: Constructed Response - Similarities of Parents and Offspring](#)

1 - 3
Inheritance
of Traits
Part 2



Week	Performance Expectation/DCI	Resource
<p>3 - 6</p> <p>Life Cycles</p> <p>Part 1</p>	<p>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. [Clarification Statement: Changes organisms go through during their life form a pattern.] [Assessment Boundary: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.]</p> <p>Epic Book Collection: Life Cycles</p> <p>3rd Grade Unit 4 Epic Books</p>	<p>Start (or add to) KLEWS chart with the guiding question: <i>How are organisms' life cycles similar and different?</i></p> <p>Engage: DE - What Is a Life Cycle DE - Life Cycles of Flowering Plants DE - Insect Life Cycles DE - Amphibian Life Cycles DE - Mammals Life Cycles </p> <p>Explore/Explain: Virtual Labs on Life Cycles</p> <p> DE - Life Cycle DE - Life Cycle Stages (only work with the seeds) DE - Apple Tree DE - Fish Life Cycle DE - Lima Bean Life Cycle DE - Sunflower Life Cycle DE - Features of Fish DE Resource: Smart Notebook stages template Students can use this board in addition to the virtual labs: Life Cycles Board </p> <p>As students move through these explore virtual labs, they will complete the graphic organizer matrix and use this to develop a model as an assessment piece at the end of the unit. Graphic organizer-Exploration of Lifecycles </p>

Week	Performance Expectation/DCI	Resource
<p style="text-align: center;">3 - 6 Life Cycles Part 2</p>	<p>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. [Clarification Statement: Changes organisms go through during their life form a pattern.] [Assessment Boundary: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.]</p> <p>Epic Book Collection: Life Cycles</p> <p>3rd Grade Unit 4 Epic Books</p>	<p><u>Explain:</u> Students will use the completed matrix from the virtual labs explorations for discussion and to answer the question: <i>Do all organisms have similar life cycles?</i> (fill in the Evidence section of the KLEWS chart)</p> <p><u>Elaborate:</u> Assessment Probes (Intranet password protected page) *use teacher guide for instructional suggestions</p> <ul style="list-style-type: none"> Does It Have a Life Cycle? Chrysalis <p><u>Evaluate:</u> Students will develop a model to compare and contrast the life cycles of the organisms. (Have students choose to create diagrams, make drawings, create storyboards, dramatization, physical replicas, dioramas, etc.).</p>



DIVIDE the unit
into weeks and
DISTRIBUTE
the standards



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Week	Performance Expectation/ DCI	Resource
<p>7 - 9</p> <p>Variations of Traits - Environmental & Natural Selection Part 1</p>	<p>Students who demonstrate understanding can:</p> <p>3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment.</p> <p>[Clarification Statement: Examples of the environment affecting a trait could include insufficient water stunting normally tall plants; and, a pet dog becoming overweight that is given too much food and too little exercise.]</p>	<p>Continue KLEWS chart with guiding questions. Pose the question: <i>How are traits shaped by an organism's environment?</i></p> <p>Engage: DE-Engage Tab Make sure to view videos in the Engage Section of DE unit...these will be used to complete the explain portion of the 5E lesson</p> <p>Explore DE-Explore Tab Complete Explore Section... Be sure to watch the video clip "What is behavior?" on this tab. Complete the exploration "Learning" Student Guide "Learned vs. Inherited" to check for understanding.</p> <p>DE-Video segment Learned Response Talk about what motivated the duck to do the behaviors. (The food is a stimulus for the behavior.) DE-Explore Tab "Causes of Behaviors" DE-Explore Tab "What is Adaptation"</p>



DIVIDE the unit
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Week

**Performance
Expectation/ DCI**

Resource

7 - 9

Variations of Traits - Environmental & Natural Selection Part 2

Students who demonstrate understanding can:
3-LS4-2 Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. [AR Clarification Statement: Examples of cause and effect relationships could be plants of the same species with larger thorns may be less likely to be eaten; and, animals of the same species with more effective camouflage or coloration may be more likely to survive and produce offspring.]

Explain:

Compare/contrast inherited and learned behaviors

[Venn diagram](#) [Comparison Matrix](#) [Steps for Comparing](#)

Elaborate:

Better Lesson [Adaptations and Environmental Change](#)

Evaluate:

[Assessment Probes](#) (Intranet password protected page)

*use teacher guide for instructional suggestions

- Habitat Change Probe



DIVIDE the unit
into weeks and
DISTRIBUTE
the standards

Week

Performance
Expectation/ DCI

Resource

7 - 9

Variations of
Traits -
Environmental
& Natural
Selection
Part 3

3-LS4-2 Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. [AR Clarification Statement: Examples of cause and effect relationships could be plants of the same species with larger thorns may be less likely to be eaten; and, animals of the same species with more effective camouflage or coloration may be more likely to survive and produce offspring.]

DE Model Lesson [Organism Needs](#)

**It is possible that lessons from Organisms Needs may have been used in the previous unit. [Colorful Clams](#) (BetterLesson.com) can be used to supplement this learning.*

Engage:

Show picture of tiger. [PDF](#) [PPT](#)

Pose Questions:

- *How are the tigers alike and how are they different?*
- *Which of these tigers would survive best in a snowy habitat?*
- *Which of these tigers would survive best in a grassland habitat?*
- *Which of these tigers would survive best in a forest habitat?*

Continue KLEWS chart and pose the question:

How do variations in traits help organisms to survive and reproduce?

Continue to add to the KLEWS chart as you work through each component of the 5E lessons.

Explore/ Explain

DE Video Segment [Exploring the Diversity of Life: Not What They Seem](#)

[DE Video: Natural Selection of Plants and Animals](#)

[Fish, Vertebrates of the Sea](#) (BetterLesson.com)

Week	Performance Expectation/ DCI	Resource
<p style="text-align: center;">7 - 9</p> <p style="text-align: center;">Variations of Traits - Environmental & Natural Selection Part 4</p>	<p>3-LS4-2 Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. [AR]</p> <p>Clarification Statement: Examples of cause and effect relationships could be plants of the same species with larger thorns may be less likely to be eaten; and, animals of the same species with more effective camouflage or coloration may be more likely to survive and produce offspring.]</p>	<p>Elaborate:</p> <p>DE Interactive Lab: Moth of a Different Color</p> <p>DE Article “Too Cold For a Polar Bear”</p> <p>Read to answer questions:</p> <ul style="list-style-type: none"> <i>How is the habitat for this polar bear different than a polar bear in a natural habitat?</i> <i>What would likely happen if this polar bear was released into the wild?</i> <p>Lessons from BetterLesson.com:</p> <ul style="list-style-type: none"> Animal Groups-Benefits and Disadvantages Invasive Species What does the Walrus do When the Ice Is Gone? What Made the Giraffe Decide to Be Tall? <p>Evaluate:</p> <ul style="list-style-type: none"> Aspire-Inspired Unit Assessment Student Teacher Key C-E-R: “How do variations in traits help organisms to survive and reproduce?”



Aspire-Inspired Assessment for Inheritance and Variation of Traits: Life Cycles and Traits



Name: _____

Figure 1

The diagram illustrates the life cycle of a grasshopper in a circular flow. It begins with an **Adult** grasshopper at the top left, which lays **Eggs** at the top right. The eggs hatch into a **Nymph** at the bottom right. This nymph grows into a **Molt Nymph** at the bottom left, which then becomes an **Adult** again, completing the cycle. The central text reads "Life Cycle of a Grasshopper".

Name: _____

The diagram illustrates the life cycle of the European spruce sawfly across the months of April to October. A horizontal timeline at the bottom marks the months: April, May, June, July, August, Sept., and Oct. Above this timeline, three horizontal bars represent the duration of different life stages:

- Overwintering eggs:** Represented by a dashed line from April to May.
- Nymphs:** Represented by a dashed line from May to August.
- Adults:** Represented by a solid green line from July to October.

 Within the 'Adults' bar, a sub-period from August to September is labeled 'Egg laying'.

Grasshoppers are unusual insects. They can walk, hop, and even fly. Grasshoppers have five eyes but no ears. They hear with special eardrums that are on the sides of their bellies. Grasshoppers use their short front legs to eat and walk. They eat grasses weeds flowers and seeds. Their large back legs help grasshoppers hop and make sounds. A grasshopper calls to other grasshoppers by rubbing its back leg against its wings. Can grasshoppers really fly? They can! Their back legs boost them up, and their wings help them fly away from danger such as spiders, birds, and even mice.

Grasshoppers are one of the few animals able to change in response to the environment. If grasshoppers feel crowded, it triggers a special chemical that makes them grow larger, eat more, lay eggs faster and migrate in groups.

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Name: _____

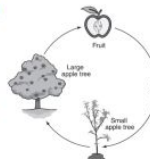
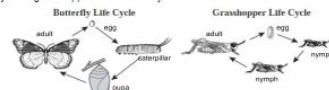
1. According to the passage, how long do adult grasshoppers live?
 - a. 3 1/2 months
 - b. 10 months
 - c. 2 months
 - d. 1 - 2 weeks
2. Use Table 1, in which months would you most likely find a grasshopper nymph.
 - a. April
 - b. June
 - c. September
 - d. October
3. Using Figure 1, predict what will happen to the repeating life cycle pattern if the adult grasshoppers do not lay eggs.

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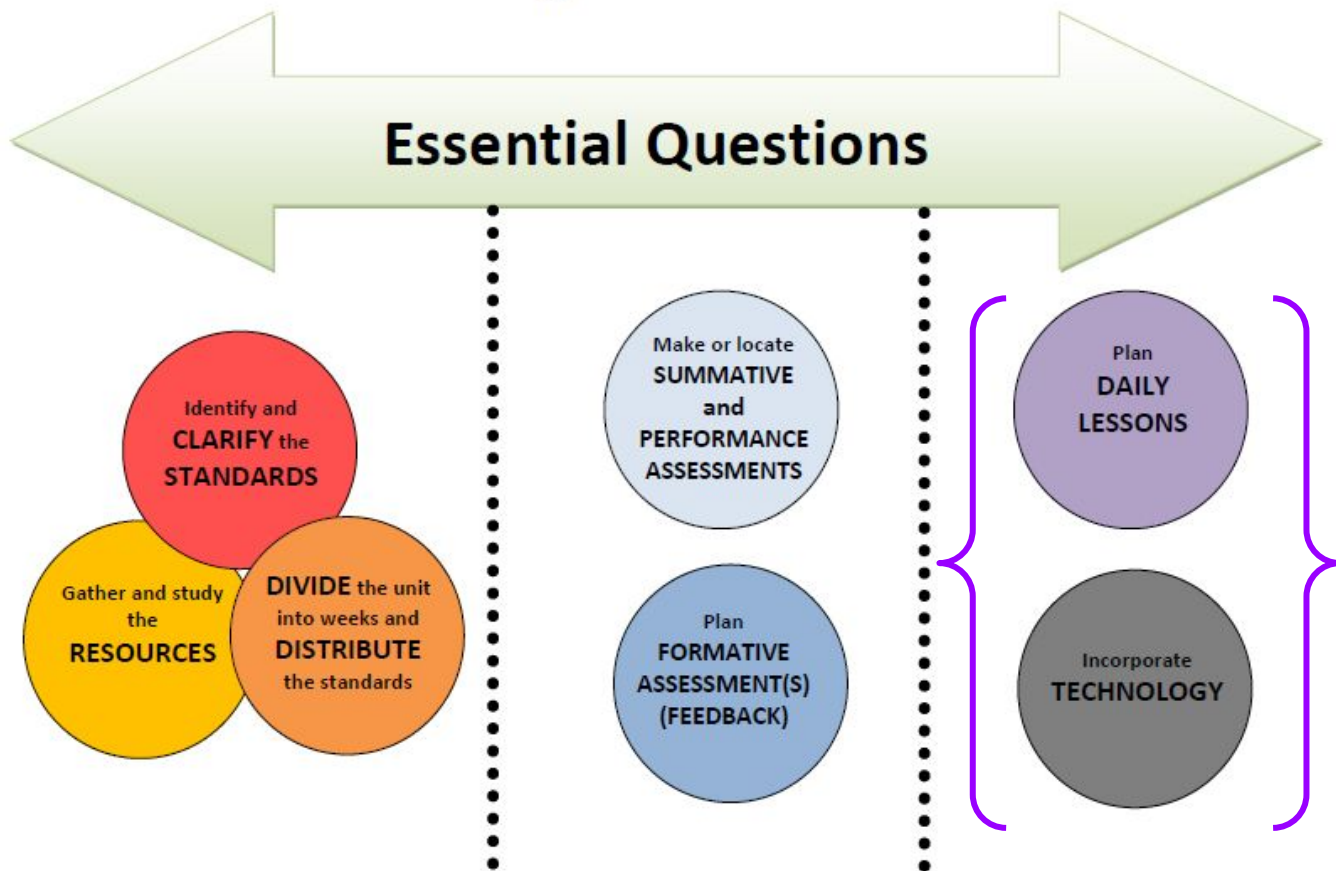
Name: _____

5. What are some ways a grasshopper can change in response to their environment? Provide evidence from the passage to support your answer.

6. Below you will find the life cycle of a butterfly and a grasshopper. Use these diagrams and information from the passage to compare and contrast the life cycle of grasshopper to the butterfly.

(Developed for instructional purposes only by MGA Science Curriculum Specialists, 2016)[[Developed for instructional purposes only by MHA Science Curriculum Specialists, 2016]]

Backward Unit Planning 1.0



Now you're
ready to
plan your
daily
lessons!