3rd Grade Unit Plan Inheritance and Variation of Traits: Life Cycles and Traits Created by: Cassie Miller and Matt Mullen

Next Generation Science Standards:

Inheritance and Variation of Traits: Life Cycles and Traits

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.

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-LS3-2: Use evidence to support the explanation that traits can be influenced by the environment.

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.

Science & Engineering Practice

- 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)
- Science findings are based on recognizing patterns. (3-LS1-1)
- Develop models to describe phenomena. (3-LS1-1)

- Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS3-1)

Crosscutting Concepts

- Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1)

- Cause and effect relationships are routinely identified and used to explain change. (3-LS3-2)

Disciplinary Core Ideas

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

- 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)

- 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)

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

Scientific Background Information

Animal Class	Key Characteristics	Life Cycle	Picture
Mammals	a warm-blooded vertebrate animal of a class that is distinguished by the possession of hair or fur, the secretion of milk by females for the nourishment of the young, and (typically) the birth of live young	Fetus, baby, child, teen, adult, elder	death old ago death old ago death deаth deаth deаth deаth deаth deаth deаth deаth deаth deаth deаth deаth deаth deаth deаth deаth deаth deаth deаth de
Reptiles	A cold-blooded vertebrate animal with dry scaly skin, that typically lays soft-shelled eggs on land	Hard-shelled egg, larvae, protonymph, deutonymph adult	APTILE SECS
Birds	a warm-blooded egg- laying vertebrate distinguished by the possession of feathers, wings, and a beak and (typically) by being able to fly	Hard-shelled egg, hatchling, chick, adult	Contractions of the second sec
Amphibians	A cold-blooded animal with aquatic gill-breathing larval stages followed (typically) by a terrestrial lung- breathing adult stage.	Soft-shelled egg, larvae, adult (metamorphisis of gills → lungs)	

Insects (Arthropods)	an invertebrate animal of the large phylum <i>Arthropoda</i> , such as an insect, spider, or crustaceanmore with more than four jointed legs	Soft-shelled egg, larva, pupa, adult	Adult Adult Adult temerge Mosquito life cycle Eggs Pupa Larva
Fish	a limbless cold- blooded vertebrate animal with scales, gills and fins and living wholly in water	Soft-shelled egg, larva, juvenile, adult	

Life cycles are the series of changes in an organism's life. This includes different generations of species succeeding each other by reproducing. Life cycles differ for each organism but every one consists of different stages of development.

Genes are the portions of an organism's DNA that carry the code responsible for building that organism in a very specific way. Genes -- and, thus, the traits they code for -- are passed from parent to offspring. From generation to generation, well-understood molecular mechanisms reshuffle, duplicate, and alter genes in a way that produces genetic variation. This variation is the raw material for evolution.

The genetic variation on which natural selection acts may occur randomly, but natural selection itself is not random at all. The survival and reproductive success of an individual is directly related to the ways its inherited traits function in the context of its local environment. Whether or not an individual survives and reproduces depends on whether it has genes that produce traits that are well adapted to its environment.

Individual organisms don't evolve. Populations evolve. Because individuals in a population vary, some in the population are better able to survive and reproduce given a particular set of environmental conditions. These individuals generally survive and produce more offspring, thus passing their advantageous traits on to the next generation. Over time, the population changes.

The platypus, specifically the Duck-Billed Platypus, is indigenous to eastern Australia and Tasmania, with the platypus being one of the only mammals that lays eggs (the only other mammal that does lay eggs is the echidna) as mammals generally give birth to live young.

Offspring: an animals young

Inherit: receive or be left with something (i.e. traits) from a previous owner or relative

Traits: a distinguishing quality or characteristic

Adaptation: a change or the process of change by which an organism or species becomes better suited to its environment

Camouflage: an animal's natural coloring or form that enables it to blend in with its surroundings

Defense: the action of defending from or resisting attack

Life Cycle: the series of changes in the life of an organism, including reproduction



Sources:

http://www.pbs.org/wgbh/evolution/library/faq/cat01.html

http://www.brainpopjr.com/science/animals/classifyinganimals/

http://a-z-animals.com/animals/platypus/

http://library.thinkquest.org/05aug/01006/platypus.htm

http://pbskids.org/wildkratts/your-room/

http://www.youtube.com/watch?v=a_D5sk6tNf0

http://sciencenetlinks.com/lessons/animal-adaptations/

Lesson 1

Next Generation Science Standard -

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.

Science & Engineering Practice -

- 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)
- Science findings are based on recognizing patterns. (3-LS1-1)

Crosscutting Concepts -

- Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1)

Materials

- White board & dry erase markers
- Cut-out index cards of imaginary animals
- Large variety of toy animals can include stuffed animals, pictures of animals, etc.
- Internet access and viewing screen

Objectives

- Students will categorize animals into their correct class
- Students will define the characteristics of the six different animal classes
- Students will analyze traits to discover patterns

5E Lesson

Engage: The teacher will have six different empty sections divided on the board ("mystery groups"), and have each student share their favorite animal with the class. As the students share their favorite animals, the teacher will place them into categories based on which animal class they are in (mammals, reptiles, amphibians, fish, birds, insects). However, the categories will not be labeled, and the teacher will give no explanation as to why he/she is placing the animals in the different mystery groups. Once every student has shared, and all the animals are listed and categorized on the board, the class will discuss what the mysterious groups are.

*Note: Try to have each student share a different animal (even if it is not their favorite) so you have a wide variety to discuss and work with for the Explain portion.

Explain: The teacher will ask the students what the groups mean. Ask students questions such as: "Are there any similarities you notice within a group? Do you see any big differences in the characteristics between groups?" As the students brainstorm, add defining characteristics to each group that they come up with. The teacher will then reveal the appropriate titles of the mystery groups (mammals, reptiles, amphibians, fish, birds, and insects).

Explore: The class will be divided into three equal groups to participate in stations as follows:

Station 1 - Classifying New Species: The teacher will set out the cards (attached) that have descriptions of imaginary written out on them. The students will pull out the important information from each card to classify the newly discovered species into the correct animal classification.

Station 2 - Classifying Existing Animals: The teacher will lay out a variety of toy animals and/or pictures of animals. The students will divide them into six different groups based on their knowledge of the animal classes.

Station 3 - Classification Challenge! - Students will read an article about platypus. As they read, they will highlight the characteristics that the platypus possesses that would help define what class it's in using the worksheet provided. Once they have finished reading the article and highlighting key traits, they will make their best guess as to which class it is in. The answer will be discussed as a class after everyone has completed the station.

Elaborate: The teacher will show the *Brainpop Jr. Classifying Animals* video (<u>http://www.brainpopjr.com/science/animals/classifyinganimals/</u>). As the video progresses, the teacher will pause periodically to connect the process of classifying animals in the video to the process the class conducted.

Learning Objectives	Section in which Objective can be Evaluated	How Objective is Evaluated
Students will categorize animals into their correct class	Explore	While students are at the 'Classifying New Species' station, the teacher will talk to each child individually to evaluate their level of understanding. The teacher will do this by listening for students to justify their reasoning using at least two of the defining characteristics for the animal class that were written on the board during the Explain portion of this lesson. The students' understanding of this objective will also be reevaluated during the summative assessment at the end of the unit in questions 2, 3, 7, 11, and 13.
Students will define characteristics of the six different animal classes	Explain, Elaborate	The teacher will evaluate the students' understanding of this through their participation in class discussion during the Explain portion of the lesson. The teacher will ask questions regarding the characteristics of the different animal classes specifically to the students who did not participate in the initial class discussion. If students are able to correctly respond to the teachers questions

Evaluate: This portion of the unit will be assessed formatively. **Assessing Learning Objectives -**

		and/or contribute accurate information to class discussion, the teacher know that he/she is able to move on to the follow-up topics in the unit. The students' understanding of this objective will also be reevaluated during the summative assessment at the end of the unit in questions 1, 2, 3, 11, and 13.
Students will analyze traits to discover patterns	Engage, Explain, Explore	The teacher will evaluate this objective during the Explain portion based on the students' ability to find similarities in animals based on their prior knowledge of animal traits. Once the defining characteristics of each animal class are listed on the board, the teacher will ask the students who did not participate if they can think of any other animals that might belong in each group. All students' will be assessed based on the accuracy of their contribution to class discussion. During all three stations throughout the Explore portion of this lesson, the teacher will listen to conversations amongst classmates to ensure that they are analyzing the specific traits of animals that define the class they are/would be in.

Lesson 3

Next Generation Science Standard -

3-LS3-2: Use evidence to support the explanation that traits can be influenced by the environment

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.

Science & Engineering Practice -

- Analyze and interpret data to make sense of phenomena using logical reasoning. (3-I S3-1)

LS3-1)

- 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) **Disciplinary Core Ideas -**

- Reproduction is essential to the continued existence of every kind of organism.

Plants and animals have unique and diverse life cycles. (3-LS1-1)

- 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)

- 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)

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

Crosscutting Concepts -

- Cause and effect relationships are routinely identified and used to explain change. (3-LS3-2)

Materials

- Computer lab/Internet access for all students
- Internet access and viewing screen
- Lined paper
- Writing utensil
- White board & dry erase markers

Objectives

- Students will define all adaptation vocabulary words (offspring, inherit, traits, adaptation, camouflage, defense)

- Students will evaluate the conditions under which various species can survive
- Students will design a situation in which an animal needs adaptations for survival

5E Lesson

Engage: The teacher will begin this lesson by asking students, "What is special about life

cycles?" Initially the teacher will accept all answers, but guide the students towards the understanding that a cycle never ends, much like a circle (mention The Circle of Life from *The Lion King* for students who have seen it). The teacher should explain that even though an individual member of a species might die, they can live on through their offspring that inherited their traits. At this point in time, the teacher should write down a few vocabulary words on the board for students to understand and reference including:

Offspring	Traits	Camouflage
Inherited	Adaptation	Defense

After defining 'adaptation,' explain that the most successful species (i.e. humans) are able to make changes in order to adjust to the environment around them.

Explain: Watch the short YouTube clip to provide some examples of what adaption can do for many species in the environment.

http://www.youtube.com/watch?v=a_D5sk6tNf0

Explain that the animals that possess the advantageous traits are the ones that are more likely to survive and pass these traits down to their offspring.

Explore: Take the students to a computer lab and allow each of them to play around on the PBS Kids Wild Kratts website.

http://pbskids.org/wildkratts/your-room/

They should start by clicking either *Habitat* or *Creaturepedia*, and then choose an animal to investigate. They should find facts and take a few notes about their animals of choice, including habitat, diet, predators, special traits, and any other fun facts they might find. If there is time at the end, allow students to do some further exploration on this website...it's really cool!

Elaborate: When the teacher and students arrive back to the classroom, put them in pairs and have each of them share the information that the found on their animal with the other. Allow 1-2 minutes of discussion time. Next ask the students, "What would happen if the animals switched habitats?" Give students a chance to elaborate on this idea, and then provide them with some follow-up questions such as:

What adaptation features would be useful or useless in the new habitat?

Do you think the animal could survive in its new, unfamiliar habitat?

What does this tell you about how animals adapt to their environment?

After the students have answered some of these questions with each other, allow a few students to share their ideas with the rest of the class.

Evaluate: Have each student write a short story about an animal or a species of animals that had to adapt to some sort of change in their environment in order to survive. These stories can be real examples or creative/imaginative stories. Each paper should indicate the animals' existing traits, the environmental change, and the adapted traits.

Assessing Learning Objectives -

Learning Objectives	Section in which	How Objective is Evaluated

	Objective can be Evaluated	
Students will define all adaptation vocabulary words	Engage, Elaborate, Evaluate	The students will demonstrate their understanding of these words during the Engage portion of this lesson by participating in class discussion and assisting the teacher in formulating the definitions. The teacher will evaluate the students understanding of these words based on their ability to use them correctly while answering the adaption questions during the Elaborate portion of this lesson. The teacher will see the depth of students' understanding of these words by their ability to correctly incorporate them into their writing on animals adapting to their environment. The students' understanding of this objective will also be reevaluated during the summative assessment at the end of the unit in questions 5 6 10 and 14
Students will evaluate the conditions under which various species can survive	Explain, Explore, Elaborate, Evaluate	The students will be able to reflect on the reasoning for the animals adaptations in the video by describing the advantages of their traits. The students will take notes describing the most suitable conditions for their chosen animal during the Explore portion of this lesson. The teacher will be able to look at these notes and assess their quality. The students will demonstrate their understanding of necessary adaptive traits during the discussion of the Elaborate portion. The teacher will listen for realistic reasoning as to why an animal could/could not survive under certain conditions, and what types of traits they would need to develop in order to survive in their new environment. The teacher will see the depth of students' understanding of this concept by their ability to accurately describe the traits an animal would need to survive under a given set of conditions in their writing.

		The students' understanding of this objective will also be reevaluated during the summative assessment at the end of the unit in questions 10 and 14.
Students will design a situation in which an animal needs adaptations for survival	Elaborate	The teacher will assess the students understanding of this objective through their ability to accurately describe a situation in which adaptation is necessary. The teacher will assess if the students could indicate the animals' existing traits, the environmental change, and the related adaptive traits.
		The students' understanding of this objective will also be reevaluated during the summative assessment at the end of the unit in question 14.

Lesson 4

Next Generation Science Standard -

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.

Science & Engineering Practice -

- Develop models to describe phenomena. (3-LS1-1)

Disciplinary Core Ideas -

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

Crosscutting Concepts -

- Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1)

Materials

- Book: Life Cycles of Nature: Flip Chart
- Three-way venn diagram worksheet
- Cut-outs of each stage of an animal from each animal class
- Animal Class Life Cycle Assessment

Objectives

- Students will compare and contrast the life cycles of animals from different classes
- Students will arrange the stages of various life cycles into the correct order

5E Lesson

Engage: The class will sit in a circle to read a book called *Life Cycles of Nature: Flip* Chart. This is an oversized book that includes information and pictures on the life cycles of each animal class. It should refresh students' memory on animal groups and life cycle content, and begin to connect these two major concepts.

Explain: Divide students up into groups of two and provide them with the three-way venn diagram worksheet (attached). Assign every other group three out of the six animal classes to compare and contrast the life cycles and characteristics of (mammals/birds/reptiles and fish/insects/amphibians), so that there are an equal number of students working with each of the two groups of three.

Explore: Once the students have completed their venn diagrams, combine them into groups of four so that they have all six animal classes covered. Two of the students in each group should have a venn diagram completed for mammals/birds/reptiles, and the other two should have one completed for fish/insects/amphibians. Have the students discuss the commonalities and differences of each animal class, and then brainstorm ideas that they could add to the other groups' venn diagram.

Elaborate: Divide students into six groups and provide each group with the cut-outs of life cycle stages for one of the animal classes (attached). With minimal instruction, give students five minutes to place the cut-outs in the correct order, but do not tell them what the term, "correct," entails. When the five minutes are up, have each group share with the class what order (and shape) they placed their cut-outs in, and why they chose that order. Make sure that each student shares some information during the class presentations. Allow classmates to ask questions and make comments on each other's presentations, ensuring that all groups end up with their pictures oriented in a circle with the individual stages of each life cycle in order of youngest to oldest and back to youngest.

Evaluate: This portion of the unit will be assessed with both formative and summative assessments.

Learning Objectives	Section in which Objective can be Evaluated	How Objective is Evaluated
Students will compare and contrast the life cycles of animals from different classes	Engage, Explain, Explore, Evaluate	As the teacher reads the book during the Engage portion of the lesson, he/she will pause periodically to allow students the opportunity to predict and consider what life cycles and animal classes will be discussed next. During the Explain portion, each student will write the similarities and differences of animal classes and life cycles on their own venn diagram that will be collected and assessed by the teacher based on the students' ability to correctly list the comparisons. The teacher will listen to conversation amongst classmates during the Explore portion of this lesson to determine the depth of students' understanding as well as their ability to communicate their knowledge on life cycles and animal classes. The students' understanding of this objective will also be evaluated during the summative assessment in questions 4, 7, 8, and 11.
Students will arrange the stages of various life	Engage, Elaborate, Evaluate	As the teacher reads the book during the Engage portion of the lesson, he/she will cover various stages with sticky notes and pause periodically to allow students the opportunity to speculate what life cycle

Assessing Learning Objectives -

cycles into the correct order	stage is underneath the sticky note.
	The teacher will evaluate the students' ability to correctly place the cut-outs of life cycle stages in the correct order <i>and</i> in a circle. The teacher will also assess the students' ability to justify their reasoning for the stage placement that they chose during their presentation to the class. The teacher will do this by listening for students to mention the gradual development of organisms and the necessity for them to reproduce during adulthood to continue the cycle of life. The students' understanding of this objective will also be evaluated during the summative assessment in questions 4, 9, 12, and 15.

Name: _____

Multiple Choice Directions: Read each question carefully and circle the best possible answer. Be sure to raise your hand if you have any questions. You'll do great!

- 1. Which of the following is NOT one of the 6 animal classes?
 - a. Birds
 - b. Carnivores
 - c. Amphibians
 - d. Reptiles
- 2. Which of the following is one of the defining characteristics of a mammal?
 - a. Feathers
 - b. Soft-shelled eggs
 - c. Fur or hair
 - d. Scale-y skin
- 3. Which animal class is a turtle a part of?
 - a. Mammals
 - b. Amphibians
 - c. Fish
 - d. Reptiles
- 4. Amphibians and insects go through _____ during their life cycle, which makes their adult stage look very different from their younger stages.
 - a. Metamorphosis
 - b. Change
 - c. Adaptation
 - d. Cocoons
- 5. _____ is a change or the process of change by which an organism or species becomes better suited to its environment.
 - a. Metamorphosis
 - b. Camouflage
 - c. Inheritance
 - d. Adaptation
- 6. Which of the following is NOT an adaptive trait of an animal?
 - a. Giving live birth
 - b. Camouflage
 - c. Defense
 - d. Hibernation

- 7. Which animal classes have gills at one or more stages of their life cycle?
 - a. Birds and insects
 - b. Fish and reptiles
 - c. Fish and amphibians
 - d. Reptiles and amphibians
- 8. Which type animal class consists of animals that lay soft-shelled eggs as the first stage of their life cycle?
 - a. Mammals
 - b. Amphibians
 - c. Reptiles
 - d. Birds

True / False Directions: Read each question carefully and circle whether you think it is true or false. Go with your instinct, I am *not* trying to trick you!

- 9. True / False : All life cycles eventually come to an end.
- 10. True / False : Growing a thicker coat of fur would be a useful adaption for a cougar living in a colder environment.
- 11. True / False : Fish and reptiles are both cold-blooded.
- 12. True / False: In an arthropod's life cycle, the pupa stage comes *before* the larva stage.

Short Answer Directions: Read each question carefully and then write 2-3 short sentences, or create a list in order to answer it.

13. Choose one animal to write about and say which animal class it is in. List the characteristics of this animal that help to classify it.

14. A new species of mice is introduced to Antarctica in an area completely covered with snow. This species includes mice with black, brown, and white fur. Which one of these mice will most likely be the most successful in its' new environment. What do you think will happen to this species of mice over time?

15. Choose one animal class and list all of the stages of its life cycle.

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Directions: Compare and Contrast: Insects, Fish, & Amphibians

Directions: Compare and Contrast: Mammals, Birds, & Reptiles



A new species was discovered in Antarctica. It stays warm underground so it does not have very much fur. It gives birth to about three offspring at a time who rely on their mother's milk for the first 2 weeks of their life. This animal has sharp claws and eats bugs. Which animal class will this species be in? (Answer on back: Mammal)	A new species was discovered off the coast of Hawaii. It has been found in the water and on land in its latest stage of life, but scientists have yet to find this species on land in its youngest life cycle stage. This species is cold-blooded and give birth to soft eggs that their young hatch from. Which animal class will this species be in? (Answer on back: Amphibian)
A new species was discovered right here in Michigan! This animal has scale-y feet, but can only be found here from May through September. Scientists have found the nests of this animal to be filled with 4-5 hard- shelled eggs, and the young are dependent on their mothers for the first 3 weeks of their life. Which animal class will this species be in?	A new species was discovered in a rainforest of Africa. It has 6 jointed legs and reproduces through eggs. The youngest stage of this animal's life looks very different from the oldest. Which animal class will this species be in?
(Answer on back: Bird)	(Answer on back: Insect)
A new species was discovered in Australia's outback. It has marks of red, and gold on it, as well as scale-y skin all over its body, and it gives birth to hard eggshells. Once it lays its eggs, it leaves them to fend for themselves. This animal has sharp teeth and claws and weighs an average of 160 pounds. Which animal class will this species be in? (Answer on back: Reptile)	A new species was discovered off the coast of Chile. It is only found in warm, shallow waters even though it is cold blooded. The adult life stage is about the size of a cell phone and weighs an average of 2 kilograms. It gives birth to soft eggs and has an unconventional respiratory system. Which animal class will this species be in? (Answer on back: Fish)