Curriculum Sample Template

Max. 8 Pages

Grade Level	10th Grade	**Content Area**	Science
Course Title (grades 9-12 Only)	Biology 1-2		
Expected Prior Knowledge *The knowledge/skills mastered earlier in the year foundational to the mastery of the required Standard in the current sample.*	Students are expected to have prior knowledge of and/or skills mastered to: HS.1.1.1, HS.1.1.4; HS.1.2.4, H2.1.2.5; HS.1.3.1, HS.1.3.5; HS.1.4.3, HS.1.4.4 Use scientific process and appropriate tools and techniques to gather data and communicate results. HS.4.4.1 Identify the components of natural selection. HS.4.4.2 Explain how variation can result in adaptations that influence an organism's success in an environment.		
Alignment to Program of Instruction *Briefly outline methods of instruction found in this sequence of lessons that align to the Program of Instruction described in A.3.*	Science lessons focus on discovery and experiential-based learning, the development of background knowledge and skills, and a deep understanding of physical science. Direct Instruction includes lecture (structured overview) and small-group (peer partners, research groups) learning activities. Formative assessments include discussions and reflections, Cornell Notes and graphic organizers, and collaborative activities. Summative assessments designed for student mastery of content.		
Standard Number and Description *List the Number* and the full description for the Required Standard or Science Performance Objective listed in section A.6.*	HS.4.4.3 Describe how the continuing operation of natural selection underlies a population's ability to adapt to changes in the environment and leads to biodiversity and the origin of new species.		
Materials/Resources Needed	Pencils, Paper, Spiral Notebook (Science Dictionary)		

* ***Standard Number****: For English Language Arts (Reading and Writing), use Grade, Strand, Standard (e.g., 3.RI.2). For K-8 Math, use Grade, Domain, Standard (e.g., 6.EE.7). For HS Math, use Conceptual Category-Domain, Standard (e.g., A-REI.6). For Science, use Grade, Strand, Concept, PO (e.g., 4.1.3.1).*

Lesson (add as needed)	**Instructional Strategies**	**Student Activities**
1	**Theory of Natural Selection** 1. Teacher will introduce the lesson by posing the following questions (a) In terms of genetics, what is it about a cluster of islands that makes it a good laboratory for studying variation?; (b) Why would Darwin look to animal and plant breeders as a source of information for studying of variation? 2. Teacher will introduce key vocabulary: artificial selection, heritability, natural selection, population, fitness 3. Teacher will present structured overview of (a) the similarities and differences between artificial and natural selection; (b) the key insights used by Darwin to support the theory of natural selection; (c) the observations that support the principles of variation, overproduction, adaptation, descent with modification.	1. Students will write a short response to the discussion of the questions: (a) In terms of genetics, what is it about a cluster of islands that makes it a good laboratory for studying variation?; (b) Why would Darwin look to animal and plant breeders as a source of information for studying of variation? 2. Students will document key vocabulary and meanings in their Science Dictionary. 3. Students will take Cornell Notes for (a) the similarities and differences between artificial and natural selection; (b) the key insights used by Darwin to support the theory of natural selection; (c) the observations that support the principles of variation, overproduction, adaptation, de-scent with modification. 4. Students will work with peer partner to apply the theory of natural selection to: (a) explain how wings are an adaptation for birds; (b) explain why the phrase "survival of the fittest" does not accurately reflect Darwin's concept of evolutionary fitness; and (c) explain how a species could remain the same for millions of years. 5. **Summative Assessment**: Students will complete Theory of Natural Selection Quiz.
2	**Evidence of Evolution** 1. Teacher will introduce the lesson by posing the following question: (a) Why are the fossil organisms so different from the animals on Earth today? 2. Teacher will introduce key vocabulary: biogeography homologous structure, analogous structure, vestigial structure	1. Students will write a short response to the discussion of the question: (a) Why are the fossil organisms so different from the animals on Earth today? 2. Students will document key vocabulary and meanings in their Science Dictionary.

	3. Teacher will present structured overview of (a) the major sources of evidence for common ancestry among species; (b) the difference between homologous and analogous structures in anatomy; (c) examples of vestigial structures and their evidence to support common ancestry among species.	3. Students will take Cornell Notes for (a) the major sources of evidence for common ancestry among species; (b) the difference between homologous and analogous structures in anatomy; (c) examples of vestigial structures and their evidence to support common ancestry among species. 4. Students will work with peer partner to apply the evidence of evolution to: (a) compare the homologous structures in the human forearm and flipper of a whale; (b) explain why a bat's wing is considered both a homologous and analogous structure; and (c) explain why human wisdom teeth are considered vestigial structures. 5. **Summative Assessment**: Students will complete Evidence of Evolution Quiz.
3	**Predator-Prey Pursuit Lab**	1. **Summative Assessment:** Students will work in research groups to conduct the Predator-Prey Pursuit Lab experiment by: (a) reading the Experiment Guide; (b) performing the experiment in strict accordance with procedures; (c) preparing the Experiment Report; and (d) participating in a post-experiment discussion with another research group.

Summative Assessment Items: *Attach here.* For each summative assessment item, include an answer key or scoring rubric describing how points are to be awarded.

1. **Theory of Natural Selection Quiz:** Assessment is scored on a 40 point scale and each question is worth 5 points. Students will score 32 out of 40 points (80%) to demonstrate mastery.
2. **Evidence of Evolution Quiz:** Assessment is scored on a 30 point scale and each question is worth 5 points. Students will score 24 out of 30 points (80%) to demonstrate mastery.
3. **Predator-Prey Pursuit Lab – Experiment Report:** Assessment is scored on a 5-point rubric scale for analysis of comparison data, prediction using data, and application of data to related concepts. Students will score 12 out of 15 (80%) to demonstrate mastery.*

*assessment independent from instruction

Theory of Natural Selection Quiz

Score: _____

1. The difference in the physical traits of an individual from those of other individuals in a group is called a(n)

   a. change. b. adaptation. c. species. d. variation.

2. Over time, adaptations can lead populations to experience

   a. environmental changes. b. genetic changes. c. geologic changes. d. extinctions.

3. Which of the following describes natural selection?

   a. It acts on genetic material directly. b. It acts on existing physical traits.
   c. It forms new traits. d. It forms new genetic material.

4. In natural selection, the selective agent is the

   a. humans. b. mutations. c. breeders. d. environment.

5. All the rabbits living in a particular area would be an example of a(n)

   a. population. b. species. c. fossil. d. individual organism.

6. A bird that can easily out compete other birds for food and that can produce many eggs has a high

   a. life expectancy. b. mutation rate. c. fitness. d. adaptability.

7. Draw a sketch of a bird that may eats large, hard-shelled nuts. Label the adaptive feature of the bird.

8. Draw a sketch of a bird that may eats fruits and insects. Label the adaptive feature of the bird.

Answer Key

1. D 2. B 3. B 4. D
5. A 6. C
7. The bird should have a strong, thick beak.
8. The bird should have a delicate-looking beak.

Evidence of Evolution Quiz

Score: _____

1. Biogeography is the study of the

   a. distribution of organisms around the world. b. environments around the world.

   c. different types of rocks around the world. d. age of fossils around the world.

2. What is suggested by the similarity of early embryos of different species of vertebrates?

   a. no evolutionary relationship between groups b. recent common ancestry

   c. similar environments in the past d. evolution from distant common ancestor

3. Some organisms that share a common ancestor have features that have different functions, but similar structures. These are known as

   a. vestigial structures. b. analogous structures.

   c. homologous structures. d. fossil structures.

4. If an organism has a vestigial structure, that structure likely once had a function in a(n)

   a. close relative. b. early ancestor.

   c. unrelated organism. d. embryological stage.

5. Describe how the study of fossils supports the theory of evolution.
6. Describe how the study of embryology supports the theory of evolution.

Answer Key

1. A 2. D 3. C 4. B
5. Fossils make it possible to track changes in organisms over long periods of time.
6. The similarities in the early stages of embryos in different groups show that they share a common ancestor.

Predator-Prey Pursuit Lab

Experiment Guide

In this experiment you will act like an owl in search of field mice. Your group will "consume" all the field mice that you see until only 25 percent of the population remains. These remaining field mice will then reproduce. These organisms pass an important trait for survival to their offspring, the ability to blend in with their surroundings. You will continue the process for several generations of mice, with some being consumed and others surviving to pass on their traits.

PURPOSE: To observe the effect of natural selection on a population

OBJECTIVE: To observe the effect of predation on multiple "generations" of a prey population and compare the effects of a beneficial adaptation (camouflage) on survivorship

PROBLEM:

How does a population change as a result of natural selection?

MATERIALS

Piece of fabric, Bag of paper pieces

PROCESS SKILLS

Modeling, Observing, Predicting

PROCEDURES

1. Spread out the fabric habitat given to you on the tabletop.
2. Count out 20 pieces of paper of each of the five different colors for a total of 100 pieces. This will be your initial population of field mice.
3. One person should spread the pieces out randomly over the entire fabric habitat, making sure that none of the pieces cover the others. The remaining members of the group should not watch this process.
4. The other members of the group are now owls. They should pick up the pieces as they see them, one by one, until a total of 25 percent of the field mice remain in the habitat. The owls should pick up 75 field mice. Be sure to count carefully.
5. Carefully shake off the habitat to remove the surviving mice (a total of 25 pieces).
6. Group the survivors by color and record the numbers in your data table on Experiment Report.
7. Next, assume that each survivor has three offspring. Place three additional pieces of the same color with each survivor. Record the number of each color in the table. Note that there should again be 100 total pieces.
8. Mix up the new set of pieces and have a different person spread them over the habitat.
9. Repeat the entire process (steps 3 to 8) two more times, making a total of three generations of field mice being preyed upon.

Predator-Prey Pursuit Lab

Experiment Report

OBSERVATIONS

TABLE 1. INFLUENCE OF SELECTIVE PREDATION ON FIELD MICE POPULATIONS					
	Color 1	**Color 2**	**Color 3**	**Color 4**	**Color 5**
Number at start	20	20	20	20	20
Number after first predation					
Number after first reproduction					
Number after second predation					
Number after second reproduction					
Number after third predation					

ANALYZE AND CONCLUDE

1. **Compare.** Write one-two paragraphs comparing the original population and the survivor populations compare.

2. **Predict.** Write one-two paragraphs predicting how the data would have changed if the experiment were continued until a total of five generations of field mice were preyed upon.

3. **Apply.** Write two-three paragraphs identifying two animals in real life that use camouflage to avoid predators. Include in the paragraphs the habitat in which they are most likely to survive in and the possible traits that would give them a further advantage over their own and others species.

Predator-Prey Pursuit Lab

Experiment Report Rubric

	Score	Description
Analysis and Conclusion	5	All details and evidence is provided clearly and effectively in support of analysis and conclusions presented in report.
	4	Details and evidence is provided in support of analysis and conclusions and is fully developed and presented in report.
	3	Some details and evidence is provided in support of analysis and conclusions but is not fully developed or presented in report.
	2	Details and evidence in support of analysis and conclusions is incomplete and/or inaccurate in report.
Score: _____	1	No analysis or support for conclusions is provided in report.
Accuracy of Scientific Information	5	Science is used predominantly with no significant inaccuracies in the report.
	4	Science is used throughout with no significant inaccuracies in report.
	3	Some science is used with few significant inaccuracies in the report.
	2	Science used is limited and/or significant inaccuracies are presented in report.
Score: _____	1	No science is used in report.
Natural Selection Information	5	Natural selection is described in detail, clearly linked to the results of the experiment, and effectively applied to other species in the report.
	4	Natural selection is linked to the results of the experiment and accurately applied to other species in the report.
Score: _____	3	Natural selection is mentioned and linked to the results of the experiment in report but not fully applied to other species.
	2	Natural selection is mentioned in the report but not linked to the results of the experiment.
	1	Natural selection is not mentioned in the report.