Grade Level	Content Area	Course Title *(9-12 Samples Only)*	Unit Title
9th – 12th Grade	Science	Animal Biology	Animal Behaviors

Length of Unit	Time of Year Taught	Expected Prior Knowledge
Five Days	Any High School Semester Recommended 9th grade	Strand 1- K-8 Strands, focus on Concept 1; Strand 2 – K-8 Strands, focus on Concept 2; Strand 3 – K-8, focus on Concept 1; Strand 4 – K-8 Strands, focus on Concept 2, APA formatting

Unit Description

Animal Behaviors is delivered as an independent, self-paced, computer-based course. Students use ANYWHERE LEARNING SYSTEM *(A+LS™)* for lesson instruction and activities. Although this course and unit are intended to be taken as an independent, self-paced program, teacher involvement is built into the lesson sequence. This allows the science instructor to check student understanding and perform formative assessments to ensure the student is able to master the standards on the summative assessment at the end of the unit.

The following topics are covered in this unit:

Students learn basic purposes and origins of animal behavior. The student will learn the differences between instinctual and learned behaviors. Adaptation, evolutionary behavior and effect on the earth's ecosystem of individuals, species, populations and communities are described. Specific examples are provided. Pure and applied science experimentation will be conducted by the student to observe and identify instinctual and learned organism behavior. The student will support a position on a scientific issue based on animal behavior and affect on the environment.

After completing this unit, the student will be able to:

- describe stimulus response in animal organisms within their environment
- identify the difference between instinctual and learned behavior
- determine whether a behavior is based on instinct or is learned
- identify behavior as altruistic, selfish, group, or social within populations and communities
- distinguish between pure and applied science
- write a testable hypothesis and test through experimentation
- identify the relationship between animal populations and/or communities on the ecosystem or a specific biome
- choose and support a position on a scientific environmental issue by writing a persuasive ERIO essay

Strand(s), Concept(s), and PO(s) *List and define the required Strand(s), Concept(s), and PO(s) for each lesson included in this sample.*	SCHS-S1C1-03 Strand 1: Inquiry Process Concept 1: Observations, Questions, and Hypotheses Formulate predictions, questions, or hypotheses based on observations. Evaluate appropriate resources PO 3. Formulate a testable hypothesis. SCHS-S2C2-03 Strand 2: History and Nature of Science Concept 2: Nature of Scientific Knowledge Understand how science is a process for generating knowledge. PO 3. Distinguish between pure and applied science. SCHS-S3C2-03 Strand 3: Science in Personal and Social Perspectives Concept 2: Science and Technology in Society Develop viable solutions to a need or problem. PO 3. Support a position on a science or technology issue.

	SCHS-S4C3-01 Strand 4: Life Science Concept 3: Interdependence of Organisms Analyze the relationships among various organisms and their environment. PO 1. Identify the relationships among organisms within populations, communities, ecosystems, and biomes.
Summative Assessment *Describe a cumulative and comprehensive activity that allows students to demonstrate mastery of stated POs. A copy of the summative assessment must be included in the application package.*	The summative assessment is at the end of the unit, and consists of 4 parts and measures the mastery of SCHS-S1C1-03; SCHS-S2C2-03; SCHS-S3C2-03; SCHS-S4C3-01 This assessment includes multiple choice, fill in the blank, short answer responses, and a persuasive essay. The student will need to identify different types and purpose of instinctive and learned behaviors for individuals and groups of animals, differentiate between pure and applied science, write a testable hypothesis and support a scientific position based on an environmental issue focused on animal organisms and the relationship to a biome or the earth's ecosystem.
Assessment Scoring *Explain how each assessment is scored, to include points per question, total points possible, criteria, and grading scale. Describe rubric, if applicable, to include components being evaluated and the scoring criteria for each. A copy of the answer key and/or scoring rubric must be included in the application package.*	Multiple choice questions are worth - 3 points; fill in the blank questions - 5 points, short answer response questions are worth 5 – 12 points based on complexity *(see assessment and rubric for specific scoring of questions*). An answer key is provided. The hypotheses statement assessment will be scored using a rubric. (each statement is worth 8 points) The ERIO essay will be assessed by using a rubric based on the ERIO persuasive essay format and science content. (Essay is worth 100 points) A passing score of 70% must be achieved on the unit summative assessment to be considered mastery. A score of less than 70% on the unit test will result in the student having to retake the test. Grade Breakdown: by percent / by points 90 – 100% = A / 180 – 200 = A 80 – 89% = B / 160 – 179= B 70 – 79% = C / 140 – 159=C < 70% = no credit / <139 = no credit
Materials/Resources Needed *(Include all items for the entire unit.)*	Computer with access to ANYWHERE LEARNING SYSTEM (A+LS™)– – Lesson 15 Animal Behavior Earthworm Lab Activities # 1, #2 and #3; Pencil/Paper/tape/scissors/cardboard, paper towels, droppers, soil, variety of biodegradable/non-biodegradable items (can be collected and/or supplied by students) Earthworms, small boxes, access to water ERIO - Generic Persuasive Essay, Rubrics for Scoring APA Manual Science Instructor for lesson activity clarification, further explanations, discussion of content, demonstration of experimentation, experimentation and test proctoring. Scientific resources for conducting research include, but are not limited to, the Internet, research periodicals and articles, and textbooks

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Lesson Instruction Is provided through the study portion of the unit lesson In the *A+LS™* course. A science teacher is readily available when the student needs further help.	Introduction (pgs 1-7) (20 min) • Describe mastery and course expectations. • Overview of writing a Persuasive ERIO essay, and pure and applied science. • Review the Scientific Method process and procedures. Explain how to write a hypothesis that is more than just an educated guess. • Provide an overview of animal behaviors, relationships among organisms, and related vocabulary. • Describe animal behaviors as producers and consumers. • Provide criteria for comparing/contrasting the categories of relationships. Guided Practice (40 min) • Describe and provide examples of stimulus response in animal organisms within their environment. • Describe and provide examples of the difference between instinct and learned behaviors. • Use IDEA organizer for relationship analysis. • Describe and provide the writing prompt for a position paper, persuasive ERIO. • Provide Earthworm Lab, Activity 1, "Pure Science -Response to Stimuli - Moist or Dry?" • Examine primary and secondary sources while researching animal behavior effect on a biome or ecosystem.	Intro/Review (pgs 8-9) (15 min) • Describe how pure and applied science experimentation has been applied when researching animal behavior. • Define imprinting as a learned behavior. • Describe and provide examples of how instinct and learned behaviors are related to adaptation and evolution. • Describe and provide examples of animal behaviors and their relationships within a biome or ecosystem. Guided Practice/Review (15min) • Describe and provide examples of a testable hypothesis. • Use data and observations from Earthworm Lab, Activity 1 to write a specific testable hypothesis based on reasoning and observations. • Examine an organism's behaviors as destructive or constructive relationship with the ecosystem; provide ideas for day three experimentation. Independent Practice (30 min) • Provide Earthworm Lab, Activity 2, "Pure Science-Instinct or Learned Behavior?" for conducting further experimentation. • Research for persuasive essay • Continue using IDEA organizer for sorting research.	Intro/Review (pgs 10-15) (15 min) • Describe and provide examples of selfish, social altruistic, and group behaviors within populations and communities. • Describe and provide examples to demonstrate how experimentation can be altered from pure to applied science. • Provide guidelines for developing an applied science experiment with an organism and its relationship with the ecosystem. • Review ERIO as a framework to gather information from the Internet to provide support for persuasive essay. Independent Practice (45 min) • Provide Earthworm Lab, Activity 3, and "Applied Science - Earthworms as a bio-degrader" for further self-directed experimentation under teacher guidance. • Research for persuasive essay. • Transfer information from IDEA organizer to ERIO. • Write rough draft.	Intro/Review (pgs16-20) (10 min) • Describe, compare and contrast human behavior as it correlates to animal behaviors. • Review animal behaviors, including human, as behaviors relate to adaptation and evolution in the contexts of populations, communities, ecosystems, and biomes. • Review writing a testable hypothesis. Independent Practice (25 min) • Observations conducted and written on applied scientific experiment. • Conventions criteria are provided for peer editing and revision of essay. • Scientific questions are provided for practice of writing hypothesis to mastery criteria found in rubric. Test Toward Mastery (25 Min) • Practice test in A+LS for Animal Behaviors.	Review (Lesson 15) (15 min) • Student reviews notes. • Student meets with teacher for clarification of understanding. Check Mastery (45 min) • Meet with teacher to access final unit summative assessment. • Use written experimentation and essay when completing the assessment. • Turn in complete persuasive essay and experiment documentation.

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Student Activities	Introduction (10 min) • Student takes notes for course expectations, description of mastery, and course expectations. • Student reviews the persuasive ERIO essay required for lesson completion. • Student reviews the process and procedures for the Scientific Method, with a focus on writing a testable hypothesis. • Student takes notes on animal behaviors and related vocabulary. • Student uses IDEA organizer to categorize behavior for comparing and contrasting while researching for essay. Guided Practice (40 min) • Student identifies the difference between a stimulus and a response and between instinct and learned behaviors. • Student selects a persuasive position for the ERIO essay and determines the *what*, *how* and *why* for each paragraph. • Student reads, Earthworm Lab Activity 1, "Response to Stimuli - Moist or Dry?", and writes a testable hypothesis based on the question provided, and using inductive or deductive reasoning, obtains teacher approval. • Using the directions provided, student conducts the experiment, with teacher supervision, to test his/her hypothesis, & writes down observations. • Student conducts the experiment 3 more times completing a data chart each time. • Student writes a conclusion based on the testable hypothesis. • Student examines primary and secondary sources while researching	Intro/Review (15 min) • Student takes notes distinguishing pure and applied science experimentation as based on animal research and related vocabulary. • Student takes notes on animal behaviors as related to adaptation, evolution and their relationships within a biome or ecosystem. Guided Practice/Review(15 min) • Student takes notes and practices writing testable hypothesis using the data and observations from the lab on day one. • Student generates questions to examine animal behaviors as a destructive or constructive relationship with the ecosystem & plans for an experiment for day three through day five. Independent Practice (30 min) • Student reads, Earthworm Lab, Activity 2, "Pure Science-Instinct or Learned Behavior?" and writes a testable hypothesis using inductive or deductive reasoning based on the question provided, and obtains teacher approval. • Student conducts at least four trials of the experiment, with teacher supervision, to test his/her hypothesis, writes down observations. • Student writes a conclusion based on the testable hypothesis. • Student conducts research for persuasive essay. • Student continues using IDEA organizer for sorting research. • Student requests teacher support as needed.	Intro/Review (15 min) • Student takes notes on selfish, social altruistic, and group behaviors within populations and communities. • Student reviews notes on pure and applied science and generates ideas to change the earthworm lab from pure scientific experimentation to applied experimentation. • Student reviews process and progress of persuasive essay including transferring information from IDEA organizer to ERIO. Independent Practice (45 min) • Student reads Earthworm Lab, Activity 3, and "Applied Science - Earthworms as a bio-degrader" for further self-directed experimentation under teacher guidance. • Student writes a testable hypothesis based on the questions provided and obtains teacher approval. • Student designs and prepares experiment for day 4 -5 observations. • Student conducts research for persuasive essay. • Student transfers information from IDEA organizer to ERIO. • Student writes rough draft. • Student uses peer review for feedback. • Student requests teacher support as needed.	Intro/Review ((10 min) • Student takes notes comparing and contrasting human and animal behaviors and effects of behaviors on the ecosystem. • Student reviews writing a testable hypothesis. Independent Practice (25 min) • Student makes observations on applied scientific experiment. • Student revises scientific persuasive ERIO essay using Convention Criteria. • Student practices writing hypothesis to mastery criteria found in rubric. Test Toward Mastery (25 Min) • Student takes practice test in A+LS for Animal behaviors. Student requests teacher support as needed.	Review (Lesson 15) (10 min) • Student reviews notes. • Student meets with teacher for clarification of understanding. Independent Practice (10 min) • Student makes observations on applied scientific experiment, writes conclusions, and submits after assessment. Check Mastery (40 min) • Student meets with teacher to access final unit summative assessment. • Student uses written experimentation and essay when completing the assessment. • Student turns in complete persuasive essay and experiment documentation.

	animal behaviors relationship with the ecosystem, uses IDEA organizer to sort research. • Student requests teacher support as needed.				

Animal Behavior, Hypothesis Statements and Pure and Applied Science Summative Assessment

Strand(s), Concept(s), and PO(s) for Mastery	
SCHS-S1C1-03; Strand 1: Inquiry Process Concept 1: Observations, Questions, and Hypotheses Formulate predictions, questions, or hypotheses based on observations. Evaluate appropriate resources PO 3 Formulate a testable hypothesis. SCHS-S2C2-03 Strand 2: History and Nature of Science Concept 2: Nature of Scientific Knowledge Understand how science is a process for generating knowledge. PO 3 Distinguish between pure and applied science.	SCHS-S3C2-03 Strand 3: Science in Personal and Social Perspectives Concept 2: Science and Technology in Society Develop viable solutions to a need or problem. PO 3. Support a position on a science or technology issue. SCHS-S4C3-01 Strand 4: Life Science Concept 3: Interdependence of Organisms Analyze the relationships among various organisms and their environment. PO 1. Identify the relationships among organisms within populations, communities, ecosystems, and biomes.

Questions 1-13 focus on, *A+LS*™ Lesson 15 Animal Behavior, Life Science content information; choose the letter that represents the best answer for the questions 1 – 8. *(each question is worth 3 points = 24 points)*

1. What is the most common form of behavior in communities of simple animals like cnidarians and worms? (SCHS-S4C3-01)
   a. learned behavior
   b. instinctive behavior
   c. group behavior
   d. altruistic behavior

2. What is the basis of instinct for individual organisms? (SCHS-S4C3-01)
   a. pheromones
   b. imprinting
   c. genes
   d. learned behavior

3. What has been the driving force for the evolution of behavior in all populations of animals? (SCHS-S4C3-01)
   a. adaptation and natural selection
   b. hormones and pheromones
   c. genes and memes
   d. instinct and learned behavior

4. What is always the basis of an organism's behavior? (SCHS-S4C3-01)
   a. response to stimuli
   b. instinct
   c. pheromones
   d. learning

5. Which of these is an example of learned behavior of an individual organism? (SCHS-S4C3-01)
   a. recognition of pheromones
   b. knowing what foods to eat
   c. a human baby mimicking its father
   d. a baby goose imprinting on a human

6. Which of these is an example of selfish behavior within a population? (SCHS-S4C3-01)
   a. a colony of bees serving one queen
   b. a prairie dog barking a warning
   c. two male sea lions fighting for mates
   d. the bee dance

7. Which of these is an example of altruistic behavior within a population? (SCHS-S4C3-01)
    a. group hunting by wolves
    b. two sea lions competing for mates
    c. sterile bees working for a queen
    d. birds singing the song of their groups

8. Which of these is an example of a selfish herd within a community? (SCHS-S4C3-01)
    a. many male sea lions fighting for mates
    b. altruistic behavior in ants
    c. group hunting by wolves
    d. sterile bees working for a queen

For questions 9 - 13, fill in the word that best answers this question. *(each question is worth 5 points = 25 points)*

9. What kind of behavior, for any organism, is genetically preprogrammed? (SCHS-S4C3-01) _____

10. What kind of behavior, for any organism, only benefits an individual? (SCHS-S4C3-01)_____

11. What kind of behavior consists of complex interactions within groups, within different communities, and is seen in humans as well as ants and bees? (SCHS-S4C3-01) _____

12. What kind of behavior is also described as the selfish herd and benefits all members of a population? (SCHS-S4C3-01) _____

13. Self sacrificing behavior, seen in different populations, is a form of what type of behavior? (SCHS-S4C3-01) _____

The following questions 14 – 20 focus on experimentation, the Inquiry in Science process and the Nature of Science. For questions 14 and 15 write a short descriptive paragraph. (SCHS-S2C2-01) *(each question is worth 6 points, 2 points for specific component of question = 12 points)*

14. Describe applied science, provide an example of applied science in action and discuss the value of applied scientific experimentation

15. Describe pure science, provide an example of pure science in action and discuss the value of pure scientific experimentation.

Remember a hypothesis isn't an educated guess. It is a tentative explanation for an observation, phenomenon, or scientific problem that can be tested by further investigation. (SCHS-S1C1-03); *(question is worth 3 points = 3 points)*

16. Which of the following hypotheses is stated best?
    a. If a mouse likes cheese, when a mouse is placed in a maze that leads to two types of food for 3 minutes, then the mouse will locate the part of the maze where the cheese is located.
    b. If a mouse likes cheese, then it will run to area of the maze where the cheese it placed if there are different places for it to go.
    c. If an experiment with a mouse and food is run for 10 minutes, then the mouse will be found in the area with its favorite food.
    d. Mice like cheese, so I predict that the mouse will find the cheese and eat it and then look for more cheese.

For questions 17 and 18, you will write the two hypotheses that you developed for the experiments you conducted on Day 2 and Days 3 – 5. Using the hypothesis rubric, re-evaluate your hypothesis, if all criteria are a 4, then state "meets mastery", if not, then restate your hypothesis to improve your statement to "Meet Mastery". (SCHS-S1C1-03) *(each question is worth 8 points if thesis meets mastery = 16 points)*

17. Hypothesis – Day 2 – Earthworm – Instinct or Learned behavior?

18. Hypothesis – Day 3 - 5 – Earthworm – as a Bio-degrader?

ERIO Persuasive Essay: Write a testable hypothesis and support a scientific position based on an environmental issue focused on animal organisms and the relationship to a biome or the earth's ecosystem. You must include at least 3 examples of evidence to support thesis. You must include at least one primary source and one secondary source. Essay must include APA formatting. (SCHS-S3C2-03) (SCHS-S4C3-01)

Answer Key		
1. b. instinctive behavior	2. c. genes	3. a. adaptation and natural selection
4. a. response to stimuli	5. d. a baby goose imprinting on a human	6. c. two male sea lions fighting for mates
7. c. sterile bees working for a queen	8. c. group hunting by wolves	9. instinctive
10. selfish	11. social	12. group
13. altruistic		
14. research aimed at answering questions that have practical applications, e.g., determining the causes of diseases so that cures might be found, earthworms as a bio-degrader, any logical, reasonable answer		
15. science for the pursuit of scientific knowledge, e.g. earthworms moist or dry, earthworms instinct or learned behavior, any logical, reasonable answer		
16. a. If a mouse likes cheese, when a mouse is placed in a maze that leads to two types of food for 3 minutes, then the mouse will locate the part of the maze where the cheese is located.		
17 & 18. – answer will vary based on personal assessment; Scoring of hypotheses will be completed using the Hypothesis Scoring Rubric (see below).		
ERIO Persuasive Essay - Thesis clearly states a position on a scientific issue based on animal behavior and affect on the environment, evidence supports thesis. Scoring of essay will be completed using the ERIO: Persuasive Essay Rubric (see below)		

Hypothesis Scoring Rubric

	2 points if Met	Met (2 points each)	Not Met (0 points)
		Begin, with a observable phenomena or what is known	Research and prior knowledge is not stated
		Correlates to what is known Then, propose a new relationship or condition to be tested	New relationship or condition does not correlate with research and prior knowledge
		Finally, infer expected measureable phenomena	Expected phenomena is not measureable or built on research and prior knowledge
		Is testable, Is replicable, Is specific	Cannot be tested, replicated or specific
Total Points		*If any item is not met, the hypothesis will need to be revised to meet the criteria.*	

E-RIO: Persuasive Essay Rubric

20 Points For Ea. Section	Met (20 points each)	Not Met (0 points)
	Addresses *why* this is a need for a new solution for a specific scientific need or problem States *how* this need or problem has been addressed up till now States *what* the new solution is for the scientific need or problem	A new solution is not suggested. The need for a new solution has not been justified. Research or prior knowledge was not used to discuss how the problem has been addressed until now.
	Discusses *why* the current solution is valuable Discusses *how* the current solution is not valuable Describes *what* will happen if the current solution is to remain in place	The pros of the current solution are not discussed The cons of the current solution are not discussed If the current solution remains as the constant, there is no repercussion described
	Explains *why* this new solution is valuable Explains *how* this new solution will successfully change things Explains *what* will happen when this new solution becomes established	Pros of a new solution are not explained. Expected changes based on implementation of this new solution are not explained. Expected long term results based on the new solution have not been explained.
	Determines *why* this evidence is true and believable Convinces us *how* the examples support this new solution Describes the facts (*what*) that support this new solution	The value of the evidence has not been determined. The examples used are not convincing enough to support the new solution. The facts are too general or do not support this new solution.
	Explains *why* this new solution is the best resolution now Explains *how* the new solution will resolve the current scientific need or problem Determine *what* the new solution will do for the environment	The new solution as the best alternative has not been justified. There is no explanation how the new solution will resolve the current scientific need or problem. There is no statement that determines what the new solution will do for the environment.
	TOTAL POINTS (If any item is not met, that section will need to be revised to meet the criteria for mastery)	

Grading Table – *Use the following table and scale for compiling points for the assessment and assigning a final grade for the summative assessment.*

Multiple Choice (3 pts. each)	Fill in the Blanks (5 Pts. each)	Short Answer (6 pts. each)	Hypothesis Rubric (8pts each)	ERIO Persuasive Essay	
1.	9.	14.	17.	ERIO Score (100 Points)	
2.	10.	15.	18.		
3.	11.				
4.	12.				
5.	13.				
6.					
7.					
8.					
16.					Total
Total (27 pts. Poss.)	Total (25 pts. Poss.)	Total (12 pts. Poss.)	Total (16 pts. Poss.)	Total (120 Pts. Poss.)	

Grade Breakdown: by points 180 – 200 = A 160 – 179= B 140 – 159=C <139 = no credit