Mechanisms of Animal Behavior

Missouri Grade-Level Expectations (or other standards)

HS-LS1-1: Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS2-6: Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-LS2-8: Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
HS--LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS-LS4-1: Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
HS-LS4-2: Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
HS-LS4-4: Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
HS-LS4-5: Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
CCSS-R.11-12.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
CCSS-W-11-12.7: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a question; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
CCSS-R.11-12.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
CCSS-W.11-12.1e: Provide a concluding statement or section that follows from or supports the argument presented.

Learning Goal	Proficiency Scales

Students will be able to differentiate the biologically determined mechanisms that control behavior and mediate the effects of evolutionary influences.	4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. 3: Student demonstrates mastery with the learning goal as evidenced by: ● Hypothesizing and drawing conclusions about how genes translate into behavior by using techniques such as inbreeding, twin studies, cross fostering, selective breeding, mutations/knockout genes. ● Creating an experiment to analyze how nervous system complexity of organisms relates to behaviors seen in response to various stimuli. ● Generating and testing data about the size of the somatosensory cortex to analyze behavioral adaptations. ● Drawing conclusions about how nerve pathways constitute the structural and functional basis for behavior. 2: Student demonstrates he/she is nearing proficiency by: ● Recognizing or recalling specific vocabulary, such as: *behavior genetics, gene, allele, evolution, epigenesis, polygenic, neuron, synapse, neurotransmitter, hormone.* ● Performing processes such as: ● Recognizing ways that evidence is used to show the evolution of a behavior (phylogeny, domestication and comparative studies). ● Recognizing the Nature/Nurture influences on behavior. ● Identifying the general functions of the nervous system. ● Labeling the parts of a neuron. ● Summarizing how neurons communicate. ● Identifying the types of neurons and types of sensory receptors. ● Labeling the parts and functions of the human brain.

	● Summarizing the behavioral responses caused by hormone secretions. ● Identifying techniques that are used to determine how genes are translated into behavior. ● Identifying how nervous system complexity relates to complexity of behaviors. ● Comparing how the nervous and endocrine system influences behaviors of animals. 1: Student demonstrates limited understanding skill with the learning goal.

WGSD Curriculum -- Animal Behavior
Mating Systems

Missouri Grade-Level Expectations (or other standards)

HS-LS2-6: Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-LS2-8: Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
HS--LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS-LS4-2: Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
HS-LS4-5: Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
CCSS-R.11-12.9: Synthesize information from a range of sources into a coherent understanding of a process, phenomenon, or concept, resolving conflicting

information when possible.

Learning Goal	Proficiency Scales
Students will be able to determine the cost and benefit of different animal mating systems.	4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. 3: Student demonstrates mastery with the learning goal as evidenced by: ● Assessing the costs and benefits of sexual reproduction. ● Explaining the reasons for sexual dimorphism. ● Classifying the types of mating systems. 2: Student demonstrates mastery with the learning goal as evidenced by: ● Recognizing or recalling specific vocabulary, such as: *sexual reproduction, asexual reproduction, sexual dimorphism, gametes, sexual selection, estrus, intrasexual selection, intersexual selection, monogamy, polygyny, and polyandry*. ● Performing processes such as: ● Identifying the causes of reproductive behavior. ● Recognizing the difference between k-selected and r-selected species. ● Recognizing problems animals face with parenthood. ● Identifying the costs and benefits of sexual reproduction. ● Identifying the causes the of sexual dimorphism (gametes and sexual selection). 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum -- Animal Behavior
Learning Mechanisms

Missouri Grade-Level Expectations (or other standards)

HS-LS2-6: Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-LS2-8: Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
CCSS-W.11-12.7: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
CCSS-R.11-12.4: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a question; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Learning Goal	Proficiency Scales
Students will be able to design experiments to determine the effectiveness of different mechanisms of learning.	4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. 3: Student demonstrates mastery with the learning goal as evidenced by: ● Designing and conducting an experiment to determine whether operant conditioning occurs in mice. ● Comparing and contrasting the different types of learning that can occur in the animal kingdom.

	2: Student demonstrates he/she is nearing proficiency by:
	
	● Recognizing or recalling specific vocabulary, such as: *learning, habituation, sensitization, classical conditioning, operant conditioning, reinforcement, observational learning, imitation, imprinting, cognition*.
	
	● Performing processes such as:
	  ● Identifying examples of the different types of learning.
	  ● Recognizing how learning enhances survival and reproductive success.
	  ● Reciting how experiences prompt learning (how memories are formed).
	
	1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum -- Animal Behavior

Communication

Missouri Grade-Level Expectations (or other standards)

HS-LS2-6: Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-LS2-8: Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
CCSS.R.11-12.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or

technical context relevant to grades 11-12 texts and topics.
CCSS.R.11-12.8: Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

Learning Goal	Proficiency Scales
Students will be able to correlate how and why communication occurs within the animal kingdom.	4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. 3: Student demonstrates mastery with the learning goal as evidenced by: ● Classifying the different functions (in terms of survival and reproduction) of communication such as group spacing, recognition, reproduction, social status, alarm, hunting, care and soliciting play. ● Comparing and contrasting the six channels of communication. 2: Student demonstrates he/she is nearing proficiency by: Recognizing or recalling specific vocabulary, such as: ● *Communication, signal, discrete signals, continuous signals, complex communication.* ● Performing processes such as: ● Identifying the characteristics of signals used in communication. ● Identifying examples of complex communication in the animal world. ● Recognizing the six channels of communication. ● Identifying the different functions of animal communication. 1: Student demonstrates a limited understanding or skill with the learning

	goal.

WGSD Curriculum -- Animal Behavior

Approaches and Methods

Missouri Grade-Level Expectations (or other standards)

HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
HS-LS2-8: Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
CCSS.R.11-12.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
CCSS.W.11-12-1e: Provide a concluding statement or section that follows from or supports the argument presented.

Learning Goal	Proficiency Scales
Students will be able to judge the best use of various approaches and methods when studying animal behavior.	4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. 3: Student demonstrates mastery with the learning goal as evidenced by: ● Demonstrating the differences between the 4 approaches to studying animal behavior (ethology, comparative psychology, behavioral ecology and sociobiology).

	● Drawing conclusions about the purposes of studying animal behavior. ● Comparing the advantages and disadvantages of field and lab experiments. ● Creating, analyzing and drawing conclusions about ethograms created in class. 2: Student demonstrates he/she is nearing proficiency by: ● Recognizing or recalling specific vocabulary, such as: *behavior, stimulus, ethology, ethogram, focal sampling, scan sampling, one zero sampling, equal observability, interobserver reliability, proximate factor, ultimate factor.* ● Performing processes such as: ○ Recognizing the difficulties with studying animal behavior. ○ Identifying the four components to studying animal behavior. ○ Explaining how ethograms are beneficial to scientists. ○ Identifying the four approaches to studying animal behavior. ○ Listing the reasons why we study animal behavior. ○ Recognizing the advantages and disadvantages of field and lab studies. ○ Discriminating between an instinctive behavior and a learned behavior 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum -- Animal Behavior
Aggression

Missouri Grade-Level Expectations (or other standards)

HS-LS2-6: Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-LS2-8: Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
HS-LS4-5: Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
CCSS.R.11-12.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
CCSS.W.11-12.7: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a question; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Learning Goal	Proficiency Scales
Students will be able to analyze patterns of aggression in the animal kingdom.	4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. 3: Student demonstrates mastery with the learning goal as evidenced by: ● Categorizing aggressive behaviors of animals. ● Hypothesizing why evolution has not led to an increasingly more aggressive individuals and societies even though aggression is adaptive.

	2: Student demonstrates he/she is nearing proficiency by:
	
	● Recognizing or recalling specific vocabulary, such as: *aggression, territory, home range, core area, individual distance, lek*.
	
	● Performing processes such as:
	  ● Comparing the types of aggression (territorial, dominance, sexual, parental, parent-offspring, anti-predatory, and extreme forms such as cannibalism and infanticide).
	  ● Recognizing the internal and external factors of aggression.
	  ● Understanding why animals use aggressive displays rather than fight for resources.
	
	1: Student demonstrates a limited understanding or skill with the learning goal.