

# INTRODUCTION TO ANIMAL AND VETERINARY SCIENCE CURRICULUM

## Unit 1: Animals in Society/Global Perspective

### OVERVIEW

#### Summary

Students will gain an understanding of the many facets of the animal science industry. They will be able to explain how animals were domesticated and why each category of domesticated animals was chosen to be domesticated. Students will then be able to explain the importance of agricultural animals worldwide and the general trends in the industry in terms of food, milk, and fiber production.

#### Content to Be Learned

- The different facets of the field of animal science.
- The process of domestication.
- Distribution of agricultural animals world wide.
- The value of animal products in providing for the world's food.
- Current rates of growth or decline of animal products worldwide.

#### Practices

- Obtaining, evaluating, and communicating information regarding global animal distribution and importance.
- Analyzing and interpreting data to develop an explanation of the importance of livestock worldwide.
- Constructing an explanation as to the importance of animals to the world's food supply.

#### Crosscutting Concepts

- Cause and effect.
- Stability and change.

#### Essential Questions

- How has the domestication of animals impacted human beings across time and around the globe?

#### Agriculture, Food and Natural Resources (AFNR) Career Cluster Content Standards

- AS.01.01. Performance Indicator: Evaluate the development and implications of animal origin, domestication and distribution.
  - AS.01.01.01.a. Identify the origin, significance, distribution and domestication of animal species.

- AS.01.01.01.b. Evaluate and describe characteristics of animals that developed in response to the animals' environment and led to their domestication.
- AS.01.01.02.a. Define major components of the animal industry.
- AS.01.01.02.b. Outline the development of the animal industry and the resulting products, services and careers.
- AS.01.01.02.c. Predict trends and implications of future development of the animal systems industry.

## **Unit 2: Animal Science Terminology**

### OVERVIEW

#### Summary

Students will learn the common and scientific names of the major agriculturally important livestock. Students will also learn important industry terms to refer to common livestock at different stages of life.

#### Content to Be Learned

- Binomial nomenclature for agriculturally important livestock.
- General and widely used terms for different life stages of agriculturally important livestock.

#### Practices

- Obtaining, evaluating, and communicating information regarding the identification of livestock in various life stages.

#### Crosscutting Concepts

- Patterns.

#### Essential Questions

- How is binomial nomenclature useful in describing living things worldwide, despite language differences?

#### AFNR Standards

- AS.02.01. Performance Indicator: Classify animals according to hierarchical taxonomy and agricultural use.
  - AS.02.01.01.a. Explain the importance of the binomial system of nomenclature.
  - AS.02.01.01.b. Explain how animals are classified using Linnaeus's taxonomical classification system.
  - AS.02.01.01.c. Classify animals according to the taxonomical classification system.
  - AS.02.01.02.a. Identify major animal species by common and scientific names.
  - AS.02.01.02.b. Compare and contrast the hierarchical classification of the major agricultural animal species.

# Unit 3: Feed Nutrients and the Gastrointestinal Tract

## OVERVIEW

### Summary

Students will explain the importance of nutrition in terms of raising animals for products and the implications of those products not being fed the proper nutrition. They will outline the major nutrient groups (carbohydrates, proteins, fats, vitamins, and minerals). Then, students will be able to describe the methods and steps of digestion and classify digestive systems based on stomach type and type of diet consumed.

### Content to Be Learned

- Concept of nutrition and the difference between essential and nonessential nutrients.
- The major nutrient groups and the purposes they serve in an animal's body.
- The major factors that affect an animal's needs for nutrients.
- How to determine the value of feedstuffs to animals.

### Practices

- Obtaining, evaluating and communicating information on specific nutrients and their purpose in the body.
- Constructing an explanation regarding the reasons why different livestock have different methods of digestion.
- Using models to illustrate the differences between ruminant and non-ruminant digestive systems.

### Crosscutting Concepts

- System and system models.
- Structure and function.

### Essential Questions

- How has the evolution of ruminants allowed them to produce products from otherwise unusable materials?

### AFNR Standards

- AS.02.02. Performance Indicator: Apply principles of comparative anatomy and physiology to uses within various animal systems.
  - AS.02.02.05.a. Describe the properties, locations, functions and types of animal organs.
  - AS.02.02.05.b. Compare and contrast organ types and functions among animal species.
  - AS.02.02.06.a. Describe the functions of the animal body systems and system components.
  - AS.02.02.06.b. Compare and contrast body systems and system adaptations between animal species.
- AS.04.01. Performance Indicator: Formulate feed rations to provide for the nutritional needs of animals.
  - AS.04.01.01.a. Compare and contrast common types of feedstuffs and the roles they play in the diets of animals.
  - AS.04.01.01.b. Determine the relative nutritional value of feedstuffs by evaluating their general

quality and condition.

## Next Generation Science Standards (NGSS)

Students who demonstrate understanding can:

**HS-LS1-2.** **Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.** [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]

The performance expectation above was 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
<b>Developing and Using Models</b> Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. <ul style="list-style-type: none"><li>Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.</li></ul>	<b>LS1.A: Structure and Function</b> <ul style="list-style-type: none"><li>Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.</li></ul>	<b>Systems and System Models</b> <ul style="list-style-type: none"><li>Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.</li></ul>
Connections to other DCIs in this grade-band: N/A		
Articulation of DCIs across grade-bands: <b>MS.LS1.A</b>		
Common Core State Standards Connections: ELA/Literacy - <b>SL.11-12.5</b> Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-LS1-2)		

\* The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

The section entitled “Disciplinary Core Ideas” is reproduced verbatim from *A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas*. Integrated and reprinted with permission from the National Academy of Sciences.

## Unit 4: Reproduction

### OVERVIEW

#### Summary

Understanding reproduction is vital to the animal industry. In this unit, students will be able to describe the general structure and function of mammalian and avian reproductive systems. Because not just one system is involved, students will also be able to generally explain how the endocrine system contributes to the functioning of the reproductive system. Additionally, students will be able to correctly state how conception, pregnancy, and parturition occur. Lastly, students will apply the aforementioned content to discuss the uses and advantages of reproductive technologies (superovulation, artificial insemination, and embryo transfer).

#### Content to Be Learned

- Mammalian and avian reproductive anatomy - structure and function.
- Reproductive technologies and their impact on the field of animal science.
- Function of the endocrine system and its importance in the reproductive system.

- Gestation rates of agriculturally important livestock.

### **Practices**

- Carrying out investigations to identify structure and function of the organs of both the mammalian and avian reproductive systems.
- Obtaining, evaluating, and communicating information regarding reproductive technologies and their impact on the field of animal science.

### **Crosscutting Concepts**

- Structure and function.
- Cause and effect.

### **Essential Questions**

- How can selective breeding and reproductive technology be both beneficial and harmful to the livestock industry?

### **AFNR Standards**

- AS.02.02. Performance Indicator: Apply principles of comparative anatomy and physiology to uses within various animal systems.
  - AS.02.02.05.a. Describe the properties, locations, functions and types of animal organs.
  - AS.02.02.05.b. Compare and contrast organ types and functions among animal species.
  - AS.02.02.05.c. Relate the importance of animal organs to the health, growth and reproduction of animals.

### **Next Generation Science Standards (NGSS)**



## HS.Structure and Function

### HS.Structure and Function

Students who demonstrate understanding can:

- 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.** [Assessment Boundary: An assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]
- HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.** [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: An assessment does not include interactions and functions at the molecular or chemical reaction level.]
- HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.** [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.] [Assessment Boundary: An assessment does not include the cellular processes involved in the feedback mechanism.]

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

##### Developing and Using Models

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world.

- Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)

##### Planning and Carrying Out Investigations

Planning and carrying out in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3)

##### Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-1)

#### Connections to Nature of Science

##### Scientific Investigations Use a Variety of Methods

- Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings. (HS-LS1-3)

#### Disciplinary Core Ideas

##### LS1.A: Structure and Function

- Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1) *(Note: This Disciplinary Core Idea is also addressed by HS-LS3-1.)*
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

#### Crosscutting Concepts

##### Systems and System Models

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2)

##### Structure and Function

- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)

##### Stability and Change

- Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3)

## HS-LS3-1 Heredity: Inheritance and Variation of Traits

Students who demonstrate understanding can:

**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.** *[Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]*

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

### Science and Engineering Practices

#### Asking Questions and Defining Problems

Asking questions and defining problems in 9-12 builds on K-8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.

- Ask questions that arise from examining models or a theory to clarify relationships.

### Disciplinary Core Ideas

#### LS1.A: Structure and Function

- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins. *(secondary) (Note: This Disciplinary Core Idea is also addressed by HS-LS1-1.)*

#### LS3.A: Inheritance of Traits

- Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function.

### Crosscutting Concepts

#### Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Connections to other DCIs in this grade-band: N/A

Articulation of DCIs across grade-bands:

**MS.LS3.A ; MS.LS3.B**

Common Core State Standards Connections:

ELA/Literacy -

- RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. *(HS-LS3-1)*
- RST.11-12.9** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. *(HS-LS3-1)*

\* The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

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## Unit 5: The Dairy Industry

### OVERVIEW

#### Summary

Students will be able to describe the U.S. dairy cattle industry in terms of size and structure. They will be able to explain the structure and function of the mammary gland (including hormones and diseases of) and how it relates to the milking process. Students will be able to relate the milking process and the many management techniques employed to maximize milk production. Students will be able to identify the major products of the dairy industry and describe how they are produced.

#### Content to Be Learned

- The size and structure of the dairy industry and the reasons for it.
- The general basis of managing dairy cattle for reproductive efficiency.

- Structure and function of the mammary gland.
- Hormones that are specific to the production of milk.
- Nutritional benefits of milk to humans.
- The path milk takes from farm to table.

### **Practices**

- Analyzing and interpreting data that illustrates trends in the U.S. dairy industry.
- Obtaining, evaluating, and communicating information regarding the role of hormones in the production of milk.
- Constructing an explanation as to how milk gets from the dairy farm to retail.

### **Crosscutting Concepts**

- Cause and effect.
- Structure and function.

### **Essential Questions**

- How does maintaining animal health on the farm level translate to higher quality products for human consumption?

### **AFNR**

- AS.05.02. Performance Indicator: Evaluate animals for breeding readiness and soundness.
  - AS.05.02.02.a. Discuss the importance of efficient and economic reproduction in animals.
- AS.07.01. Performance Indicator: Design animal housing, equipment and handling facilities for the major systems of animal production.
  - AS.07.01.01.a. Identify facilities needed to house and produce each animal species safely and efficiently.
  - AS.07.01.02.a. Identify equipment and handling facilities used in modern animal production.
- AS.08.02. Performance Indicator: Evaluate the effects of environmental conditions on animals.
  - AS.08.02.01.a. Identify optimal environmental conditions for animals.

## **Unit 6: Livestock and Poultry Industries**

### **OVERVIEW**

#### **Summary**

Students will gain experience in the production of livestock and poultry industry products. The term livestock includes beef cattle, swine, and sheep while the term poultry includes chickens, turkeys, and ducks. Students will be able to identify and describe major trends in each of the industries. They will also compare and contrast management practices across these industries. Students will be able to describe desirable characteristics and identify high quality products and low quality products.

#### **Content to Be Learned**

- Beef, swine, sheep, and poultry breed identification.



- Common beef cattle, poultry, swine, sheep industry practices to improve production (feeding, breeding, and processing).
- Desirable characteristics of livestock and poultry products.
- Trends in the livestock and poultry industries in the United States.

### **Practices**

- Calculating dress percentage based on carcass and live weights.
- Constructing explanations that describe the similarities and differences among livestock and poultry management practices.
- Engaging in an argument to defend potentially controversial industry practices.
- Using models to illustrate and identify different grades of products and their quality.

### **Crosscutting Concepts**

- Cause and effect.
- Structure and function.

### **Essential Questions**

- What contributes to the success of the livestock and poultry industries in the United States?

### **AFNR Standards**

- AS.05.02. Performance Indicator: Evaluate animals for breeding readiness and soundness.
  - AS.05.02.02.a. Discuss the importance of efficient and economic reproduction in animals.
- AS.07.01. Performance Indicator: Design animal housing, equipment and handling facilities for the major systems of animal production.
  - AS.07.01.01.a. Identify facilities needed to house and produce each animal species safely and efficiently.
  - AS.07.01.02.a. Identify equipment and handling facilities used in modern animal production.
- AS.08.02. Performance Indicator: Evaluate the effects of environmental conditions on animals.
  - AS.08.02.01.a. Identify optimal environmental conditions for animals.

## **Unit 7: Horse Management and Disease**

### **OVERVIEW**

#### **Summary**

Students will describe the size and impact of the horse industry in the United states by identifying and describing the purpose of the modern horse. They will learn to differentiate between a good quality horse and a poor quality horse by identifying desirable characteristics as well as a variety of common diseases. Additionally, students will identify the major breeds of horses and the functions of each.

## **Content to Be Learned**

- Depth of the horse industry in the United States.
- Desirable characteristics of horses.
- Common breeds of horses in the United States and the functions.
- Types and signs of disease in horses.

## **Practices**

- Analyzing and interpreting data to show trends in the horse industry in the United States.
- Obtaining, evaluating, and communicating information regarding signs of disease in horses, factors causing disease, as well as how to treat common diseases.

## **Crosscutting Concepts**

- Structure and Function.
- Cause and Effect.

## **Essential Questions**

- How does the proper treatment of horses (health, management, etc) impact the horse industry in the United States?

## **AFNR Standards**

- AS.05.02. Performance Indicator: Evaluate animals for breeding readiness and soundness.
  - AS.05.02.02.a. Discuss the importance of efficient and economic reproduction in animals.
- AS.07.01. Performance Indicator: Design animal housing, equipment and handling facilities for the major systems of animal production.
  - AS.07.01.01.a. Identify facilities needed to house and produce each animal species safely and efficiently.
  - AS.07.01.02.a. Identify equipment and handling facilities used in modern animal production.
- AS.08.02. Performance Indicator: Evaluate the effects of environmental conditions on animals.
  - AS.08.02.01.a. Identify optimal environmental conditions for animals.

# **Unit 8: Companion Animal Care and Management**

## **OVERVIEW**

### **Summary**

Students will describe the basic requirements for the major types and breeds of companion animals (cats, dogs, rodents, reptiles, and birds) and make recommendations to select and maintain the wellbeing of these animals. Student focus will then turn to more detailed knowledge of the two largest segments of the companion animal industry - cats and dogs. They will be able to identify cat and dog breeds by sight, describe common diseases of cats and dogs, and describe the idiosyncrasies of care for each breed.

## **Content to Be Learned**

- Major cat and dog breeds.
- The basic requirements of cat, dog, rodent, reptile, and bird care.
- Common diseases and treatment of those diseases of cats and dogs.

## **Practices**

- Constructing explanations for how companion animal ownership positively impacts human beings.
- Obtaining, evaluating, and communicating information regarding the care of cats, dogs, rodents, reptiles, and birds.
- Obtaining, evaluating, and communicating information regarding selecting a companion animal.

## **Crosscutting Concepts**

- Structure and Function.
- Cause and Effect.

## **Essential Questions**

- What makes animal ownership so popular in the United States and worldwide?

## **AFNR Standards**

- AS.07.01. Performance Indicator: Design animal housing, equipment and handling facilities for the major systems of animal production.
  - AS.07.01.01.a. Identify facilities needed to house and produce each animal species safely and efficiently
  - AS.07.01.01.b. Critique designs for an animal facility and prescribe alternative layouts and adjustments for the safe and efficient use of the facility