



Statewide Framework Document for: 010901

Standards may be added to this document prior to submission, but may not be removed for the framework to meet state credit equivalency requirements. Performance assessments may be developed at the local level and to achieve state approval, must be submitted within this framework. **This course is eligible for 1 credit of biology or 1 credit of laboratory science.** The Washington State Science Standards performance expectations for high school blend core ideas (Disciplinary Core Ideas, or DCIs) with scientific and engineering practices (SEPs) and crosscutting concepts (CCCs) to support students in developing usable knowledge that can be applied across the science disciplines. These courses are to be taught in a [three-dimensional manner](#). The details about each performance expectation can be found at [Next Generation Science Standards](#) and the supporting evidence statements can be found under [Resources](#).

Animal Science

Course Title: Animal Science		Total Framework Hours: 180
CIP Code: 010901	<input checked="" type="checkbox"/> Exploratory <input type="checkbox"/> Preparatory	Date Last Modified: May 4, 2015
Career Cluster: Agriculture, Food and Natural Resources		Cluster Pathway: Animal Systems
Eligible for Equivalent Credit in: <input type="checkbox"/> Math <input checked="" type="checkbox"/> Science		Total Number of Units: 9

Course Overview

Summary:

This is a general course that focuses on the scientific principles that underlie the breeding and husbandry of agricultural animals. Students will also learn about the production, processing, and distribution of agricultural animal products. Instruction in the animal sciences includes animal husbandry and production, as well as agricultural and food products processing.

As with all agriculture courses, instruction and assessment in the Supervised Agriculture Experience (SAE) is a requirement. The Supervised Agriculture Experience includes placing a student in a position where he or she will learn the practices of entrepreneurship and the fundamentals of research and experimentation in the agricultural field. Participants in the SAE will conduct exploratory projects with the purpose of learning about and improving practices in their surroundings.

SAE.01. This course will include instruction in and Student involvement in Supervised Agriculture Experience Projects (SAE).

Unit 1: Career Exploration and Opportunities**Total Learning Hours for Unit: 8****Unit Summary:**

This unit includes instruction and investigation by the student to understand the current world of agricultural education including learning about agriculture systems, natural resource management, science, business, communication, and leadership. Additional instruction and assessment should revolve around establishing an SAE project as students begin to research animal use, purpose, and products in relation to human use.

Competencies include:

- 1.1.1 Many people work in a variety of agricultural enterprises to produce food, fiber, and fuel, which are essential to daily life.
- 1.1.2 Agricultural education includes learning about agriculture systems, natural resource management, science, business, communication, and leadership.
- 1.1.3 The National FFA Organization provides opportunities to build necessary life skills, such as leadership and personal character.
- 1.1.4 Supervised Agricultural Experience programs (SAE) provide opportunities to explore potential career choices and develop professional career goals.
- 1.2.1 Animals are used to sustain human existence by providing many essential products.
- 1.2.2 Animals serve many purposes in the lives of humans.

Performance Assessments:

Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Develop and keep an Animal Science Notebook to record and store information presented in classroom discussions and activities throughout the course.
- Interpret types of activities associated with agriculture from a case study about an agricultural entrepreneur.
- Set personal goals for premier leadership, personal growth, and career success.
- Develop a Supervised Agricultural Experience (SAE) implementation plan.
- Utilize the Agriculture Experience Tracker (AET) online record keeping system to maintain accurate records on the SAE project.
- Develop and present to the class a presentation about an animal industry and related careers.
- Document and record animal industries and career opportunities shared during student presentations.
- Determine and analyze their usage of various animal products over the course of one day.
- Develop a list of animal products commonly used based on previous investigations.

Leadership Alignment:

Students will think creatively, manage goals and time, and be self-directed learners while planning and implementing their SAE project. Students will access and evaluate information through the use of the animal science notebook to store information accessed in this course.

Industry Standards and Competencies**Agriculture, Food, and Natural Resources (AFNR) Standards: Animal Science Pathway:**

AS.01.01. Performance Indicator: Evaluate the development and implications of animal origin, domestication and distribution.

Level I: AS.01.01.01.a. Identify the origin, significance, distribution and domestication of animal species.

Level II: AS.01.01.01.b. Evaluate and describe characteristics of animals that developed in response to the animals' environment and led to their domestication.

Level III: AS.01.01.01.c. Predict adaptations of animals to production practices and environments.

Level I: AS.01.01.02.a. Define major components of the animal industry.

Level II: AS.01.01.02.b. Outline the development of the animal industry and the resulting products, services and careers.

Level III: AS.01.01.02.c. Predict trends and implications of future development of the animal systems industry.

Aligned Washington State Standards:

Washington Science Standards (Next Generation Science Standards):

- 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-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
- HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
- HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Educational Technology:

- 2.2 Operate systems: Understand technology systems and use hardware and networks to support learning.
 - 2.2.1 Develop skills to use technology effectively.
 - 2.2.2 Use a variety of hardware to support learning.
- 2.3 Select and use applications: Use productivity tools and common applications effectively and constructively.
 - 2.3.1 Select and use common applications.
 - 2.3.2 Select and use online applications.

Unit 2: History and Use of Animals

Total Learning Hours for Unit: 9

Unit Summary:

Competencies include:

- 2.1.1 Animal species were domesticated at different times throughout history using different methodologies.
- 2.1.2 Humans benefit from the domestication of animals.
- 2.1.3 Domesticated animals receive their basic needs, such as water, feed, and shelter, from humans.
- 2.1.4 Domestication of animals is achieved through breeding, handling, and training.
- 2.2.1 All living organisms are classified using kingdom, phylum, class, order, family, genus, and species.
- 2.2.2 Animals are classified several different ways, such as binomial nomenclature, purpose, and characteristics of anatomy and physiology.
- 2.2.3 There are different breeds of animals with common ancestors that have defining characteristics displayed in offspring.
- 2.2.4 Dichotomous keys are classification tools that can be used to identify objects based on their physical features.

Performance Assessments:

Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Record notes and self-reflection for presentations made in class through the use of *Presentation Notes*.
- Conduct behavioral and historical research on a variety of animals.
- Compare domestic and wild animals using the characteristics of domestication.
- Examine the development and domestication of a common animal over time.

- Design a timeline recording the history of an animal.
- Present to the class historical data collected regarding a selected animal species.
- Classify objects based on their physical characteristics.
- Apply the hierarchical organizational system to a food group.
- Determine the classification of the animal in their *Producer's Management Guide*.
- Categorize animals by gender and species.
- Design a dichotomous key for five breeds of an animal species.

Leadership Alignment:

Students will communicate clearly and work effectively in diverse teams to present historical data on animal species. Students will use and manage information to determine and classify species.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards: Animal Science Pathway:

AS.01.01. Performance Indicator: Evaluate the development and implications of animal origin, domestication and distribution.

Level I: AS.01.01.01.a. Identify the origin, significance, distribution and domestication of animal species.

Level II: AS.01.01.01.b. Evaluate and describe characteristics of animals that developed in response to the animals' environment and led to their domestication.

Level III: AS.01.01.01.c. Predict adaptations of animals to production practices and environments.

AS.02.01. Performance Indicator: Classify animals according to hierarchical taxonomy and agricultural use.

Level I: AS.02.01.01.a. Explain the importance of the binomial system of nomenclature.

Level II: AS.02.01.01.b. Explain how animals are classified using Linnaeus's taxonomical classification system.

Level III: AS.02.01.01.c. Classify animals according to the taxonomical classification system.

Level I: AS.02.01.02.a. Identify major animal species by common and scientific names.

Level II: AS.02.01.02.b. Compare and contrast the hierarchical classification of the major agricultural animal species.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):

HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

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.

HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 9-10):

RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.

Educational Technology:

- 2.0 Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior.
- 2.1 Practice safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.
- 2.2 Operate systems: Understand technology systems and use hardware and networks to support learning.
 - 2.2.1 Develop skills to use technology effectively.
 - 2.2.2 Use a variety of hardware to support learning.
- 2.3 Select and use applications: Use productivity tools and common applications effectively and constructively.
 - 2.3.1 Select and use common applications.
 - 2.3.2 Select and use online applications.
- 2.4 Adapt to change (Technology Fluency): Transfer current knowledge to new and emerging technologies.

Unit 3: Animal Handling and Safety**Total Learning Hours for Unit: 22****Unit Summary:**

Competencies include:

- 3.1.1 Animal welfare and animal rights are differing belief systems pertaining to the acceptable use of animals.
- 3.1.2 The value humans place on live animals and the use of products derived from animals is influenced by the beliefs of an individual.
- 3.1.3 The use of animals for food and fiber sometimes create ethical dilemmas for producers and consumers.
- 3.1.4 Producers of animal products must consider the welfare of animals during the production process.
- 3.1.5 Profitability is maximized when animals are properly managed.
- 3.2.1 Animals respond instinctively to stimuli and changes in their surroundings.
- 3.2.2 Animals exhibit both instinctive and learned behaviors.
- 3.2.3 Safe handling and restraint procedures protect the animal and handler.
- 3.3.1 Animals require food, shelter, and water for survival.
- 3.3.2 Animal facilities differ based on environmental factors, species, use, and size of operations.
- 3.3.3 Animal facilities are designed to protect the safety and health of animals and handlers.
- 3.3.4 Animal facilities should include biosecurity precautions.
- 3.3.5 Biosecurity practices are implemented to reduce the spread of pathogens on farms.
- 3.3.6 Safe laboratory procedures include reading and following all instructions, wearing proper personal protective equipment, and cleaning up thoroughly when finished.

Performance Assessments:

Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Discuss the differences in the interpretation of the meaning of the word value.
- Assess their personal values to determine their beliefs pertaining to animal use.
- Recognize issues in animal agriculture and discuss the positive and negative impacts of each issue.
- Analyze animal rights and animal welfare videos to determine the message and intent of each video.
- Develop a Producer's Code of Care document for the humane use of a species of animal under their care.
- Determine their current opinions towards the beliefs of animal rightists and animal welfarists.
- Investigate the behavior of pillbugs in response to stimuli.
- Conduct an inquiry lab on the behaviors of pillbugs.

- Research and determine the typical behaviors of a species of animal and become familiar with the safe handling procedures of that animal.
- Write a brief with annotated references that may be used as a preparatory guide for farm tours and field trips pertaining to animal behavior and safety.
- Research the basic feed, water, and shelter requirements for animals.
- Determine the average environmental conditions of the students' location.
- Calculate proportions, scale ratios, and dimensions of building plans.
- Select a type of animal facility that provides for the safe handling and efficient production of animals.
- Design and construct a model animal facility.
- Practice safe laboratory procedures.
- Conduct experiments to determine the risk levels related to spreading pathogens in a farm scenario.
- Observe and record growth of cultures.

Leadership Alignment:

Students will think creatively and collaborate with others to conduct an inquiry lab on pillbug behavior. Students will interact effectively, make judgments and decisions, and reason effectively while discussing the concept of value, animal agriculture issues, and analyzing animal rights and animal welfare videos.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards: Animal Science Pathway:

- AS.02.03. Performance Indicator: Select animals for specific purposes and maximum performance based on anatomy and physiology.
 Level I: AS.02.03.02.a. Create a program to develop an animal to its highest potential performance.
 Level III: AS.02.03.02.c. Develop efficient procedures to produce consistently high-quality animals, well suited for their intended purposes.
- AS.03.02. Performance Indicator: Provide for the biosecurity of agricultural animals and production facilities.
 Level I: AS.03.02.01.a. Explain the importance of biosecurity to the animal industry.
 Level II: AS.03.02.01.b. Discuss procedures at the local, state and national levels to ensure biosecurity of the animal industry.
- AS.06.01. Performance Indicator: Demonstrate safe animal handling and management techniques.
 Level I: AS.06.01.01.a. Discuss the dangers involved in working with animals.
 Level II: AS.06.01.01.b. Outline safety procedures for working with animals by species.
 Level III: AS.06.01.01.c. Interpret animal behaviors and execute protocols for safe handling of animals.
 Level I: AS.06.01.02.a. Explain the implications of animal welfare and animal rights for animal agriculture.
 Level II: AS.06.01.02.b. Design programs that assure the welfare of animals and prevent abuse or mistreatment.
 Level III: AS.06.01.02.c. Implement quality-assurance programs and procedures for animal production.
- AS.06.02. Performance Indicator: Implement procedures to ensure that animal products are safe.
 Level I: AS.06.02.01.a. Identify animal production practices that could pose health risks or are considered to pose risks by some.
 Level II: AS.06.02.01.b. Discuss consumer concerns with animal production practices relative to human health.
- AS.07.01. Performance Indicator: Design animal housing, equipment and handling facilities for the major systems of animal production.
 Level I: AS.07.01.01.a. Identify facilities needed to house and produce each animal species safely and efficiently.
 Level II: 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.
 Level III: AS.07.01.01.c. Design an animal facility, focusing on animal requirements, efficiency, safety and ease of handling.
 Level I: AS.07.01.02.a. Identify equipment and handling facilities used in modern animal production.
 Level II: AS.07.01.02.b. Explain how modern equipment and handling facilities enhance the safe and economic production of animals.
 Level III: AS.07.01.02.c. Select equipment and implement animal handling procedures and improvements to enhance production efficiency.
- AS.07.02. Performance Indicator: Comply with government regulations and safety standards for facilities used in animal production.
 Level II: AS.07.02.01.b. Evaluate an animal facility to determine if standards have been met.
 Level III: AS.07.02.01.c. Design a facility that meets standards for the legal, safe, ethical and efficient production of animals.

AS.08.01. Performance Indicator: Reduce the effects of animal production on the environment.

Level I: AS.08.01.01.a. Evaluate the effects of animal agriculture on the environment.

AS.08.02. Performance Indicator: Evaluate the effects of environmental conditions on animals.

Level III: AS.08.02.01.c. Establish and maintain favorable environmental conditions for animal growth and performance.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):

HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 9-10):

RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.

Educational Technology:

2.0 Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior.

2.1 Practice safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.

2.2 Operate systems: Understand technology systems and use hardware and networks to support learning.

2.2.1 Develop skills to use technology effectively.

2.2.2 Use a variety of hardware to support learning.

2.3 Select and use applications: Use productivity tools and common applications effectively and constructively.

2.3.1 Select and use common applications.

2.3.2 Select and use online applications.

2.4 Adapt to change (Technology Fluency): Transfer current knowledge to new and emerging technologies.

Unit Summary:

Students will investigate cell parts and functions, compare animal and plant cells, and investigate their use and function. Further investigation will focus on systems and functions.

Competencies include:

- 4.1.1 Animal cells share similarities and differences with plant cells.
- 4.1.2 Animal cells are comprised of many parts that have essential functions for the survival of animal tissue, such as respiration.
- 4.1.3 Cell organelles can only be seen using a microscope.
- 4.1.4 There are many different classifications of cells based on their utility.
- 4.1.5 Cells use water, oxygen, and glucose to produce energy and metabolic by-products of carbon dioxide and water.
- 4.1.6 Cells use the processes of osmosis and diffusion for the uptake of water and dissolved nutrients required for metabolism and growth.
- 4.2.1 External body parts of animals vary among different species and are important as reference tools for animal selection, health, and management.
- 4.2.2 A collection of organized cells creates tissue responsible for various life-sustaining functions.
- 4.2.3 The body structure of a vertebrate animal is comprised of a skeleton made of bone and cartilage with ligaments attached to muscle tissue to provide motion.
- 4.2.4 The collection of epithelium, connective, muscle, and nerve tissues in an organ interact to perform specific functions within an animal's body.
- 4.2.5 Multiple organs work together and form physiological systems.
- 4.3.1 The respiratory and circulatory systems are closely related and essential for animal life.
- 4.3.2 External respiration is a process of gas exchanges between the lungs and blood.
- 4.3.3 The circulatory system relies on the heart to pump blood throughout the body.
- 4.3.4 Respiration and heart rates may be affected by external conditions, such as temperature and physical activity.
- 4.4.1 The information control center of the body, the nervous system, uses the central nervous system and the peripheral nervous system to transmit messages.
- 4.4.2 The endocrine system secretes hormones that regulate, stimulate, or inhibit activities within the body.
- 4.4.3 The body's filtering system, the renal system, is designed to remove wastes produced in the cells.
- 4.4.4 Body systems work in harmony to maintain the essential processes needed to sustain life.

Performance Assessments:

Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Identify and label animal and plant cell organelles.
- Distinguish structural differences between animal and plant cells.
- Develop a pictorial representation of cell function.
- Correctly prepare slides of animal and plant cells for viewing under a microscope.
- Collect and analyze data to provide evidence of cell metabolism.
- Conduct an experiment to simulate the osmosis process of animal cells.
- Identify common external animal parts and explain the purpose of each.
- Identify unique external parts specific for livestock and poultry species and explain the purpose of each part.
- Dissect a chicken wing and identify epithelial and connective tissues.
- Examine two different types of muscle tissue and describe the differences.
- Dissect a fetal pig and identify internal parts and organs that comprise systems.
- Identify and explain the function of the parts of the respiratory and circulatory systems.
- Describe the process of gas exchange in external respiration.

- Determine the presence of carbon dioxide in exhaled air.
- Design a travel brochure that highlights the flow of blood throughout the body.
- Conduct an inquiry on the effects of external conditions on respiration rate, pulse, and blood pressure.
- Study the relationships of the nervous, endocrine, renal, and urinary systems.
- Determine and use a concept map to demonstrate the connection of the systems studied to the respiratory and circulatory systems.
- Map the functions of body systems, specifically the nervous, endocrine, and renal systems.

Leadership Alignment:

Students will reason effectively and be self-directed learners through the dissection labs of the chicken wing and fetal pig. Students will apply technology effectively through testing the carbon dioxide levels in exhaled air. They will use and manage information by collecting and analyzing data to demonstrate cell metabolism.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards: Animal Science Pathway:

AS.02.02. Performance Indicator: Apply principles of comparative anatomy and physiology to uses within various animal systems.

Level I: AS.02.02.01.a. Identify basic characteristics of animal cells, tissues, organs and body systems.

Level II: AS.02.02.01.b. Compare and contrast animal cells, tissues, organs and body systems.

Level I: AS.02.02.02.a. Diagram a typical animal cell and identify the organelles.

Level II: AS.02.02.02.b. Describe the functions of animal cell structures.

Level III: AS.02.02.02.c. Describe the molecular makeup of animal cells and its importance in animal production and management.

Level I: AS.02.02.03.a. Describe the basic functions of animal cells in growth and reproduction.

Level I: AS.02.02.04.a. Describe the properties, locations, functions and types of animal tissues.

Level II: AS.02.02.04.b. Explain the relationship of animal tissues to growth, performance and health.

Level III: AS.02.02.04.c. Explain the importance and uses made of animal tissues in the agriculture industry.

Level I: AS.02.02.05.a. Describe the properties, locations, functions and types of animal organs.

Level II: AS.02.02.05.b. Compare and contrast organ types and functions among animal species.

Level III: AS.02.02.05.c. Relate the importance of animal organs to the health, growth and reproduction of animals.

Level I: AS.02.02.06.a. Describe the functions of the animal body systems and system components.

Level II: AS.02.02.06.b. Compare and contrast body systems and system adaptations between animal species.

Level III: AS.02.02.06.c. Explain the impact of animal body systems on performance, health, growth and reproduction.

Aligned Washington State Standards:

Washington Science Standards (Next Generation Science 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-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 9-10):

RST.9-10.4 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 9-10 texts and topics.

RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.

Educational Technology:

- 2.0 Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior.
- 2.1 Practice safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.
- 2.2 Operate systems: Understand technology systems and use hardware and networks to support learning.
 - 2.2.1 Develop skills to use technology effectively.
 - 2.2.2 Use a variety of hardware to support learning.
- 2.3 Select and use applications: Use productivity tools and common applications effectively and constructively.
 - 2.3.1 Select and use common applications.
 - 2.3.2 Select and use online applications.
- 2.4 Adapt to change (Technology Fluency): Transfer current knowledge to new and emerging technologies.

Unit 5: Animal Nutrition

Total Learning Hours for Unit: 24

Unit Summary:

Competencies include:

- 5.1.1 Digestive systems vary among species of animals.
- 5.1.2 Ruminants have a four-chambered stomach consisting of the rumen, reticulum, omasum, and abomasum, each with a specific function.
- 5.1.3 Digestion and absorption is accomplished through a process of mechanical, chemical, and biological decomposition of food by the organs of monogastric, ruminant, pseudo-ruminant, and avian digestive systems.
- 5.1.4 The diet of an animal is determined by its type of digestive system.
- 5.2.1 Animals require nutrients from all six nutrient groups to thrive, survive, and reproduce.
- 5.2.2 The specific nutritional requirements of individual animals are dependent upon species, age, and level of production.
- 5.3.1 Animals derive nutrition from a variety of sources including roughages and concentrates.
- 5.3.2 Feedstuffs of the same type can vary in nutrient composition and nutritional value.
- 5.3.3 The nutritional value of a feed can be determined through feed analysis.
- 5.3.4 Feed labels are an important source of nutritional information.
- 5.3.5 The nutrient content of feeds varies based on the location, time of harvest, growing conditions, water availability, and soil conditions of the area in which the feed is grown.
- 5.4.1 Animal growth, development, and health are directly related to meeting nutrient requirements of the animal.
- 5.4.2 A deficiency or toxicity of one or more nutrients may result in poor growth and performance.

- 5.4.3 Animals at various stages of growth and development have different nutrient requirements.
- 5.4.4 Nutrient deficiencies in animals may result in poor performance and economic losses.
- 5.5.1 Livestock rations are developed to meet animals' requirements, maximize feed efficiency, and minimize cost of production.
- 5.5.2 Concentrates and roughages form the bulk of a ration, which can be formulated using a variety of methods.
- 5.5.3 Supplements are used to complete a ration in order to meet an animal's nutritional requirements.
- 5.5.4 Using mathematics and problem solving are important skills for animal producers when formulating rations.
- 5.5.5 Marketing one's products is essential to the success of an animal enterprise.

Performance Assessments:

Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Define the terminology commonly used in digestive anatomy.
- Label, identify, and explain the function of various parts of animal digestive systems.
- Match livestock species with the proper digestive system.
- Build a model of a digestive system.
- Identify the six classes of nutrients, the function they serve in the body, and sources of each nutrient.
- Compare their own personal nutritional needs to those of a production animal.
- Research and record the nutritional needs of an animal using Nutritional Requirement tables.
- Evaluate nutrient requirements of various animals at different stages of production.
- Conduct an inquiry experiment to determine the energy in feedstuffs.
- Categorize feedstuffs into the nutrient group each feedstuff provides.
- Classify feedstuffs as roughages, concentrates, and supplements.
- Identify and define feed analysis terms.
- Read a feed label and interpret the information included on the label.
- Compare the information on a feed label to the information found on a food label.
- Research the nutritional disorders of a species of animal.
- Create a computer presentation outlining nutritional disorders of a species of animal.
- Present as a team their findings of the nutritional disorders to the class.
- Develop a reference for common nutritional disorders of many animals to include in their *Producer's Management Guide*.
- Read sections of a book and complete a concept of definition map as a note-taking tool.
- Describe the characteristics of a good ration.
- List the steps in balancing a ration.
- Complete conversions of feedstuffs from a dry-matter basis to an as-fed basis.
- Use the Pearson Square to balance a ration using two feedstuffs.
- Formulate a ration and create a recipe using the Pearson Square.
- Create a balanced ration for livestock by hand and by using a computer-based ration-balancing program.
- Develop a balanced ration for their *Producer's Management Guide*.
- Design and develop a marketing brochure for the feed they develop.

Leadership Alignment:

Students will work creatively with others, and communicate clearly through the development of the Producer's Management Guide and marketing brochure. Students will access and evaluate information by researching nutritional disorders of a species of animal. Students will create a computer presentation while practicing the skills of applying technology effectively and communicating clearly when outlining nutritional disorders.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards: Animal Science Pathway:

- AS.02.02. Performance Indicator: Apply principles of comparative anatomy and physiology to uses within various animal systems.
- Level III: AS.02.02.01.c. Explain how the components and systems of animal anatomy and physiology relate to the production and use of animals.
 - Level II: AS.02.02.05.b. Compare and contrast organ types and functions among animal species.
 - Level III: AS.02.02.05.c. Relate the importance of animal organs to the health, growth and reproduction of animals.
 - Level III: AS.02.02.06.c. Explain the impact of animal body systems on performance, health, growth and reproduction.
- AS.04.01. Performance Indicator: Formulate feed rations to provide for the nutritional needs of animals.
- Level I: AS.04.01.01.a. Compare and contrast common types of feedstuffs and the roles they play in the diets of animals.
 - Level II: AS.04.01.01.b. Determine the relative nutritional value of feedstuffs by evaluating their general quality and condition.
 - Level III: AS.04.01.01.c. Select appropriate feedstuffs for animals based on factors such as economics, digestive system and nutritional needs.
 - Level I: AS.04.01.02.a. Explain the importance of a balanced ration for animals.
 - Level II: AS.04.01.02.b. Appraise the adequacy of feed rations using data from the analysis of feedstuffs, animal requirements and performance.
 - Level III: AS.04.01.02.c. Formulate animal feeds based on nutritional requirements, using feed ingredients for maximum nutrition and optimal economic production.
- AS.04.02. Performance Indicator: Prescribe and administer animal feed additives and growth promotants in animal production.
- Level I: AS.04.02.01.a. Explain the purpose and benefits of feed additives and growth promotants in animal production.
 - Level II: AS.04.02.01.b. Discuss how feed additives and growth promotants are administered and the precautions that should be taken.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):

- HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
- HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
- HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
- HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
- HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
- HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 9-10):

- RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
- RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- RST.9-10.4 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 9-10 texts and topics.
- RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
- RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

Educational Technology:

- 2.0 Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior.
- 2.1 Practice safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.
- 2.2 Operate systems: Understand technology systems and use hardware and networks to support learning.
 - 2.2.1 Develop skills to use technology effectively.
 - 2.2.2 Use a variety of hardware to support learning.
- 2.3 Select and use applications: Use productivity tools and common applications effectively and constructively.
 - 2.3.1 Select and use common applications.
 - 2.3.2 Select and use online applications.
- 2.4 Adapt to change (Technology Fluency): Transfer current knowledge to new and emerging technologies.

Unit 6: Animal Reproduction**Total Learning Hours for Unit: 15****Unit Summary:**

Competencies include:

- 6.1.1 Male and female reproductive systems differ in structure and function.
- 6.1.2 The female reproductive system consists of the ovary, infundibulum, fallopian tubes (oviducts), uterus, cervix, vagina, and vulva.
- 6.1.3 The male reproductive system consists of seminiferous tubules, testes, scrotum, epididymis, vas deferens, prostate gland, Cowper's gland, seminal vesicle, urethra, and penis.
- 6.2.1 Straight breeding is used to produce purebred breeding stock while crossbreeding is used to produce vigorous market animals.
- 6.2.2 There are four breeding methods a livestock producer may choose when breeding livestock. Each has advantages and disadvantages.
- 6.2.3 Artificial insemination and embryo transfer allow producers to improve the genetics of their animals more efficiently.
- 6.2.4 Cloning is possible in livestock, but not practical or widely used at present.
- 6.2.5 The potential fertility and viability of semen may be determined based on its motility, morphology, and concentration.
- 6.3.1 Reproductive processes vary by species of animal.
- 6.3.2 The reproductive cycle of females consists of puberty, the estrous cycle, gestation, parturition, and lactation.
- 6.3.3 Understanding of the estrus cycle and hormonal control is essential for reproductive success.
- 6.3.4 The breeding season of animals may be manipulated for economic gain.

Performance Assessments:

Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Identify and label the parts of the male and female reproductive tract.
- Describe the function of each part of the male and female reproductive tract.
- Observe a dissection of the male reproductive tract and identify the parts within the tract.
- Draw a flow chart to show the process of sperm maturation.
- Dissect a female reproductive tract and identify parts within the tract.
- Observe and compare the reproductive tracts of cows, sows, and ewes.
- Describe the path of an egg from the ovary to birth.
- Distinguish between the different livestock breeding systems.
- Understand the advantages and disadvantages of breeding methods.
- Prepare slides using a variety of buffers and stains.

- Evaluate semen samples for sperm motility, morphology, and concentration.
- Identify the main hormones of the estrous cycle and graph the levels of each hormone throughout the cycle.
- Research and record reproductive facts regarding the species of animal identified in the *Producer's Management Guide*.
- Determine the best time to breed a horse and manage the breeding season.
-

Leadership Alignment:

Students will manage goals and time, manage products, and produce results to identify, label, and describe the function of each part of the male and female reproductive tract. Students will work independently, reason effectively, and communicate clearly to describe the path of an egg from ovary to birth. Students will access, evaluate, use, and manage information to research and record reproductive facts.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards: Animal Science Pathway:

AS.02.02. Performance Indicator: Apply principles of comparative anatomy and physiology to uses within various animal systems.

Level I: AS.02.02.01.a. Identify basic characteristics of animal cells, tissues, organs and body systems.

Level II: AS.02.02.01.b. Compare and contrast animal cells, tissues, organs and body systems.

Level III: AS.02.02.01.c. Explain how the components and systems of animal anatomy and physiology relate to the production and use of animals.

Level I: AS.02.02.03.a. Describe the basic functions of animal cells in growth and reproduction.

Level II: AS.02.02.05.b. Compare and contrast organ types and functions among animal species.

Level III: AS.02.02.05.c. Relate the importance of animal organs to the health, growth and reproduction of animals.

Level I: AS.02.02.06.a. Describe the functions of the animal body systems and system components.

Level II: AS.02.02.06.b. Compare and contrast body systems and system adaptations between animal species.

Level III: AS.02.02.06.c. Explain the impact of animal body systems on performance, health, growth and reproduction.

AS.02.03. Performance Indicator: Select animals for specific purposes and maximum performance based on anatomy and physiology.

Level II: AS.02.03.01.b. Compare and contrast desirable anatomical and physiological characteristics of animals within and between species.

AS.05.01. Performance Indicator: Evaluate the male and female reproductive systems in selecting animals.

Level I: AS.05.01.01.a. Explain the male and female reproductive organs of the major animal species.

Level II: AS.05.01.01.b. Describe the functions of major organs in the male and female reproductive systems.

Level III: AS.05.01.01.c. Select breeding animals based on characteristics of the reproductive organs.

AS.05.02. Performance Indicator: Evaluate animals for breeding readiness and soundness.

Level I: AS.05.02.01.a. Explain how age, size, life cycle, maturity level and health status affect the reproductive efficiency of male and female animals.

Level II: AS.05.02.01.b. Summarize factors that lead to reproductive maturity.

Level III: AS.05.02.01.c. Evaluate and select animals for reproductive readiness.

Level I: AS.05.02.02.a. Discuss the importance of efficient and economic reproduction in animals.

Level II: AS.05.02.02.b. Evaluate reproductive problems that occur in animals.

Level III: AS.05.02.02.c. Treat or cull animals with reproductive problems.

AS.05.03. Performance Indicator: Apply scientific principles in the selection and breeding of animals.

Level I: AS.05.03.02.a. Define natural and artificial breeding methods.

Level II: AS.05.03.02.b. Explain the processes of natural and artificial breeding methods.

Level III: AS.05.03.02.c. Select animal breeding methods based on reproductive and economic efficiency.

Level I: AS.05.03.04.a. Explain the advantages of major reproductive management practices, including estrous synchronization, superovulation, flushing and embryo transfer.

Level II: AS.05.03.04.b. Explain the processes of major reproductive management practices, including estrous synchronization, superovulation, flushing and embryo transfer.

Level III: S.05.03.04.c. Perform procedures for estrous synchronization, superovulation, flushing, embryo transfer and other reproductive management practices.

Level I: AS.05.03.05.a. Discuss the uses and advantages and disadvantages of natural breeding and artificial insemination.
Level II: AS.05.03.05.b. Explain the materials, methods and processes of artificial insemination.
Level III: AS.05.03.05.c. Demonstrate artificial insemination techniques.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science 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-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

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-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

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-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 9-10):

RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

RST.9-10.4 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 9-10 texts and topics.

RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.

Educational Technology:

2.0 Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior.

2.1 Practice safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.

2.2 Operate systems: Understand technology systems and use hardware and networks to support learning.

2.2.1 Develop skills to use technology effectively.

2.2.2 Use a variety of hardware to support learning.

2.3 Select and use applications: Use productivity tools and common applications effectively and constructively.

2.3.1 Select and use common applications.

2.3.2 Select and use online applications.

2.4 Adapt to change (Technology Fluency): Transfer current knowledge to new and emerging technologies.

Unit 7: Animal Genetics**Total Learning Hours for Unit: 20****Unit Summary:**

Competencies include:

- 7.1.1 Fertilization of egg cells requires the joining of genetic material in the form of gametes from both male and female parents.
- 7.1.2 Eggs, or ova, undergo meiosis and mitosis for development of new cell tissue.
- 7.1.3 Mitosis has five distinct phases necessary for cell division.
- 7.1.4 Genetic traits, such as coat color, muscling, and horns are passed from one generation to the next by discrete units called genes.
- 7.1.5 Economically relevant traits can be predictably changed through genetic improvement by selective breeding.
- 7.1.6 Dominant and recessive genes determine the phenotypic characteristics of animals.
- 7.1.7 Some animals' phenotypic characteristics are expressed as sex-linked traits.
- 7.2.1 Genetic inheritance may be from a single gene pair, which is called a qualitative trait or through multiple gene pairs, which is called a quantitative trait.
- 7.2.2 Punnett Squares are used to predict the probability of inheriting qualitative traits.
- 7.2.3 Ratios are used to compare animals within a contemporary group.
- 7.2.4 Quantitative traits are a combination of heritable traits and the environment in which the animals are raised.
- 7.2.5 Expected Progeny Differences are utilized by producers to select animals for heritable traits.
- 7.2.6 Pedigrees contain important information for tracing genetic history.

Performance Assessments:

Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Classify, evaluate, select, and manage animals based on anatomical and physiological characteristics.
- Evaluate and select animals based on scientific principles of animal production.

Leadership Alignment:

Students will reason effectively, use systems thinking, and access and evaluate information to classify, select, and manage animals based on anatomical and physiological characteristics. Students will work independently, be self-directed learners, and produce results to evaluate and select animals based on scientific principles of animal production.

Industry Standards and Competencies**Agriculture, Food, and Natural Resources (AFNR) Standards: Animal Science Pathway:**

AS.02.02. Performance Indicator: Apply principles of comparative anatomy and physiology to uses within various animal systems.

Level II: AS.02.02.03.b. Detail the processes of meiosis and mitosis in animal growth, development, health and reproduction.

Level III: AS.02.02.03.c. Explain the application of the processes of meiosis and mitosis to animal growth, development, health and reproduction.

Level III: AS.02.02.06.c. Explain the impact of animal body systems on performance, health, growth and reproduction.

AS.02.03. Performance Indicator: Select animals for specific purposes and maximum performance based on anatomy and physiology.

Level III: AS.02.03.01.c. Evaluate and select animals to maximize performance based on anatomical and physiological characteristics that affect health, growth and reproduction.

AS.05.03. Performance Indicator: Apply scientific principles in the selection and breeding of animals.

Level I: AS.05.03.01.a. Explain genetic inheritance in agricultural animals.

Level II: AS.05.03.01.b. Explain the advantages of using genetically superior animals in the production of animals and animal products.

Level I: AS.05.03.03.a. Explain the use of quantitative breeding values (e.g., EPDs) in the selection of genetically superior breeding stock.

Level II: AS.05.03.03.b. Compare and contrast quantitative breeding value differences between genetically superior animals and animals of average genetic value.
Level III: AS.05.03.03.c. Select animals based on quantitative breeding values for specific characteristics.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):

- HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
- 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-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
- HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
- 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-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
- 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.
- HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
- HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
- HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
- HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 9-10):

- RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
- RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- RST.9-10.4 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 9-10 texts and topics.
- RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
- RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
- RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.

Educational Technology:

- 2.0 Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior.
- 2.1 Practice safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.
- 2.2 Operate systems: Understand technology systems and use hardware and networks to support learning.
 - 2.2.1 Develop skills to use technology effectively.
 - 2.2.2 Use a variety of hardware to support learning.
- 2.3 Select and use applications: Use productivity tools and common applications effectively and constructively.
 - 2.3.1 Select and use common applications.
 - 2.3.2 Select and use online applications.
- 2.4 Adapt to change (Technology Fluency): Transfer current knowledge to new and emerging technologies.

Unit 8: Animal Health

Total Learning Hours for Unit: 20

Unit Summary:

Competencies include:

- 8.1.1 Diseases are transmitted in a variety of ways.
- 8.1.2 Infectious disease agents can be spread by vectors and fomites.
- 8.1.3 Infectious diseases are caused by bacteria, viruses, fungi, protozoa, and prions.
- 8.1.4 Animal health management results in limiting disease and maximizing production.
- 8.2.1 Signs of good health and poor health are used to identify illnesses.
- 8.2.2 The vital signs of animals vary among species.
- 8.2.3 Diseases are diagnosed through observation of symptoms and physical examinations.
- 8.3.1 External parasites live on and in the animals' skin at the expense of the host.
- 8.3.2 Internal parasites live in the organs of an animal at the expense of the host.
- 8.3.3 Knowledge of the life cycle of parasites can aid in their control.
- 8.3.4 Prevention and control of parasites is important in the production of agricultural, alternative, and companion animals.
- 8.3.5 There are multiple methods to determine the presence of parasite eggs in an animal, of which the laboratory is the most accurate.
- 8.4.1 Disease prevention includes vaccination, sanitation, ventilation, and nutrition and is morally and economically warranted.
- 8.4.2 Vaccines are available for many common diseases.
- 8.4.3 Record keeping is important in scheduling and administering preventative medications.

Performance Assessments:

Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Define the differences of infectious, contagious, and non-infectious diseases.
- Simulate the spread of a contagious disease and trace the route the disease takes through a population.
- Identify and sketch bacteria, mold, and protozoa from prepared slides.

- Research governmental regulatory agencies and identify primary purposes and responsibilities each agency has regarding disease prevention and control.
- Argue the role of a regulatory agency in a disease-outbreak scenario.
- Research and record the vital signs of an animal.
- Determine their own personal vital signs.
- Compare the vital signs of an animal to a person.
- Research and record key facts and symptoms of two animal-related diseases.
- Use a template to create Diagnosing Disease cards to be used in a project and in the *Producer's Management Guide*.
- Diagnose diseases described in case studies using diagnostic cards.
- Identify and diagram the life cycle of a common parasite.
- Classify parasites according to their phylum and site of infestation on the body.
- Prepare slides and observe to determine the presence of parasite eggs.
- Demonstrate the proper procedures for filling a syringe for the purpose of giving shots.
- Administer intramuscular and subcutaneous shots.
- Research diseases and parasites of their animals and the preventative controls of the diseases and parasites.
- Develop a preventative care plan for their animal.
- Use publishing software to design a pamphlet for producers to use.

Leadership Alignment:

Students will reason effectively, use and manage information, and work independently to define the difference of infectious, contagious, and non-infectious diseases. Students will be self-directed learners and produce results to diagnose diseases described in case studies using diagnostic cards. Students will access and evaluate information, collaborate with others, and communicate clearly while arguing the role of a regulatory agency in a disease outbreak scenario.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards: Animal Science Pathway:

AS.02.02. Performance Indicator: Apply principles of comparative anatomy and physiology to uses within various animal systems.

Level III: AS.02.02.06.c. Explain the impact of animal body systems on performance, health, growth and reproduction.

AS.02.03. Performance Indicator: Select animals for specific purposes and maximum performance based on anatomy and physiology.

Level I: AS.02.03.01.a. Identify ways an animal's health can be affected by anatomical and physiological disorders.

AS.03.01. Performance Indicator: Prescribe and implement a prevention and treatment program for animal diseases, parasites and other disorders.

Level I: AS.03.01.01.a. Explain methods of determining animal health and disorders.

Level II: AS.03.01.01.b. Perform simple health-check evaluations on animals.

Level III: AS.03.01.01.c. Perform diagnostic tests to detect health problems in animals.

Level I: AS.03.01.02.a. Identify common diseases, parasites and physiological disorders that affect animals.

Level II: AS.03.01.02.b. Diagnose illnesses and disorders of animals based on symptoms and problems caused by diseases, parasites and physiological disorders.

Level III: AS.03.01.02.c. Treat common diseases, parasites and physiological disorders of animals.

Level I: AS.03.01.03.a. Explain characteristics of causative agents and vectors of diseases and disorders in animals.

Level II: AS.03.01.03.b. Evaluate preventive measures for controlling and limiting the spread of diseases, parasites and disorders among animals.

Level III: AS.03.01.03.c. Design and implement a health maintenance and disease and disorder prevention plan for animals in their natural and/or confined environments.

Level I: AS.03.01.04.a. Explain the clinical significance of common considerations in veterinary treatments, such as aseptic techniques.

Level I: AS.03.01.05.a. Identify and describe zoonotic diseases.

Level II: AS.03.01.05.b. Explain the health risk of zoonotic diseases to humans and their historical significance and future implications.

Level III: AS.03.01.05.c. Implement zoonotic disease prevention methods and procedures for the safe handling and treatment of animals.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):

- 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.
- HS-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
- HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
- HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
- HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.
- HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 9-10):

- RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
- RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- RST.9-10.4 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 9-10 texts and topics.
- RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

Educational Technology:

- 2.0 Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior.
- 2.1 Practice safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.
- 2.2 Operate systems: Understand technology systems and use hardware and networks to support learning.
- 2.2.1 Develop skills to use technology effectively.
- 2.2.2 Use a variety of hardware to support learning.
- 2.3 Select and use applications: Use productivity tools and common applications effectively and constructively.
- 2.3.1 Select and use common applications.
- 2.3.2 Select and use online applications.
- 2.4 Adapt to change (Technology Fluency): Transfer current knowledge to new and emerging technologies.

Unit 9: Animal Products, Marketing, and Selection

Total Learning Hours for Unit: 3

Unit Summary:

Competencies include:

- 9.1.1 The primary purpose of livestock production is food and fiber.
- 9.1.2 Grading is used to provide a consistent and palatable product.
- 9.1.3 Products may be categorized as fresh or processed.

- 9.1.4 Consumer demand drives production and availability of fresh and processed goods.
- 9.2.1 Criterion-based selection establishes priorities and provides consistency when evaluating animals.
- 9.2.2 Animal conformation is evaluated using priorities for each species and purpose of animal.
- 9.2.3 Producers use qualitative and quantitative comparison of live animals to predict value in the marketplace.
- 9.2.4 Offspring performance may be predicted and improved by selecting animals based on performance records.
- 9.3.1 The four elements of marketing are product, price, place, and promotion.
- 9.3.2 Marketing of agricultural products is necessary to move goods from producer to consumer.
- 9.3.3 Brand name recognition, niche marketing, and value-added products increase the value of a good.
- 9.3.4 A solid marketing plan is necessary to increase the value and sales of a product.

Performance Assessments:

Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Research an animal product and develop a presentation on that animal product.
- Work as a team to prepare and present a class lecture.
- Conduct sensory evaluation trials on meat samples and evaluate the samples.
- Taste milk samples and determine the defects, if present.
- Identify samples of cheese based on appearance and taste.
- Grade eggs based on their interior qualities using the candling and breakout methods.
- Make decisions based on given priorities and criteria, and analyze objects as they compare ideal criteria.
- Research and identify the priorities for evaluating an animal most commonly used in that animal industry.
- Write, illustrate, and publish a children’s storybook on how to select an animal.
- Determine and recommend most appropriate sires using Expected Progeny Differences.
- Compare similar products based on their features, pricing, distribution, and promotion.
- Determine a target market and potential products based on the local community.
- Develop a plan to market a product from their project for the *Producer’s Management Guide*.
- Work on a team to determine a market for a product in an appropriate local marketplace.

Leadership Alignment:

Students will access and evaluate information, collaborate with others, and communicate clearly to research an animal product and develop a class presentation. Students will be responsible to others, interact effectively with others, and produce results in preparing and presenting a class lecture. Students will think creatively, communicate clearly, and be self-directed learners through the development of a children’s storybook. Students will reason effectively, use systems thinking, and make judgments and decisions by comparing similar products based on features, pricing, and promotion and determining target market for products.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards: Animal Science Pathway:

- AS.01.01. Performance Indicator: Evaluate the development and implications of animal origin, domestication and distribution.
 - Level I: AS.01.01.02.a. Define major components of the animal industry.
 - Level II: AS.01.01.02.b. Outline the development of the animal industry and the resulting products, services and careers.
 - Level III: AS.01.01.02.c. Predict trends and implications of future development of the animal systems industry.

- AS.02.01. Performance Indicator: Classify animals according to hierarchical taxonomy and agricultural use.
 Level III: AS.02.01.02.c. Appraise and evaluate the economic value of animals for various applications in the agriculture industry.
- AS.02.02. Performance Indicator: Apply principles of comparative anatomy and physiology to uses within various animal systems.
 Level III: AS.02.02.04.c. Explain the importance and uses made of animal tissues in the agriculture industry.
- AS.02.03. Performance Indicator: Select animals for specific purposes and maximum performance based on anatomy and physiology.
 Level II: AS.02.03.01.b. Compare and contrast desirable anatomical and physiological characteristics of animals within and between species.
 Level III: AS.02.03.01.c. Evaluate and select animals to maximize performance based on anatomical and physiological characteristics that affect health, growth and reproduction.
 Level II: AS.02.03.02.b. Assess an animal to determine if it has reached its optimal performance level based on anatomical and physiological characteristics.
- AS.05.02. Performance Indicator: Evaluate animals for breeding readiness and soundness.
 Level I: AS.05.02.02.a. Discuss the importance of efficient and economic reproduction in animals.
- AS.05.03. Performance Indicator: Apply scientific principles in the selection and breeding of animals.
 Level I: AS.05.03.03.a. Explain the use of quantitative breeding values (e.g., EPDs) in the selection of genetically superior breeding stock.
 Level III: AS.05.03.03.c. Select animals based on quantitative breeding values for specific characteristics.
- AS.06.02. Performance Indicator: Implement procedures to ensure that animal products are safe.
 Level I: AS.06.02.01.a. Identify animal production practices that could pose health risks or are considered to pose risks by some.
 Level II: AS.06.02.01.b. Discuss consumer concerns with animal production practices relative to human health.
 Level II: AS.06.02.02.b. Explain why animal trace-back capability, using individual animal and farm identification systems, is important to producers and consumers.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):

- HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
- HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

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21st Century Skills

Students will demonstrate in this course:

LEARNING & INNOVATION

Creativity and Innovation

- Think Creatively
- Work Creatively with Others
- Implement Innovations

Critical Thinking and Problem Solving

- Reason Effectively
- Use Systems Thinking
- Make Judgments and Decisions
- Solve Problems

Communication and Collaboration

- Communicate Clearly
- Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS

Information Literacy

- Access and Evaluate Information
- Use and Manage Information

Media Literacy

- Analyze Media
- Create Media Products

Information, Communications and Technology (ICT Literacy)

- Apply Technology Effectively

LIFE & CAREER SKILLS

Flexibility and Adaptability

- Adapt to Change
- Be Flexible

Initiative and Self-Direction

- Manage Goals and Time
- Work Independently
- Be Self-Directed Learners

Social and Cross-Cultural

- Interact Effectively with Others
- Work Effectively in Diverse Teams

Productivity and Accountability

- Manage Projects
- Produce Results

Leadership and Responsibility

- Guide and Lead Others
- Be Responsible to Others