Animal Science

Agriculture

Grade(s) 10th - 12th, Duration 1 Year, 1 Credit
Elective Course

Course Overview

Scope And Sequence

Timeframe	Unit	Instructional Topics
Ongoing	Leadership and Personal Development for Advanced Students	1. Record books
16 Day(s)	History & Use of Animals	1. Animal Planet 2. Taming & Naming 3. Livestock Across the United States
24 Day(s)	Animal Handling & Safety	1. Animal Rights or Animal Wrongs? 2. Manipulating Manners 3. Home Sweet Home
20 Day(s)	Cells & Tissues	1. Units of Life 2. Putting the Puzzle Together 3. Breathing, Beating, and Body Control Centers
27 Day(s)	Animal Nutrition	1. Digestion Junction 2. The Need for Feedstuffs 3. Nutritional Disorders 4. What's for Dinner
11 Day(s)	Animal Reproduction	1. Where Do Calves Come From? 2. The Pathway to Production
20 Day(s)	Genetics	1. A New Pair of Genes 2. Predicting Genetic Inheritance 3. Evolutionary Ideas
21 Day(s)	Animal Health	1. Diseased 2. Bugged 3. Pathogens Prevented
29 Day(s)	Animal Products, Selection, and Marketing	1. The Products of Our Toil 2. In the Search of the Ideal Animal 3. Value Added

Course Details

Unit: Leadership and Personal Development for Advanced Students

Duration: Ongoing

Topic: Record books — **Duration:** Ongoing

Learning Targets

I can keep accurate records of my SAE in my SAE recordbook

Learning Targets linked to Priority Standard = ✣

Unit: History & Use of Animals

Duration: 16 Day(s)

Unit Description

Students will learn the deep history of animal agriculture and how agricultural animals were domesticated.

Topic: Animal Planet — **Duration:** 4 Day(s)

Topic Description (short)

Animals have an important part in our everyday lives. Students will learn how to stay organized and the importance of records in the animal agriculture industry.

Learning Targets

1. Animals serve many purposes in the lives of humans, including providing life-sustaining products such as meat, milk, and fiber.
2. Organization and record-keeping are important to the success of an agricultural business.
3. Career opportunities exist in animal agriculture for all levels of education in the areas of production, processing, marketing, and regulation.

Formative Assessment

1. Determine and analyze the use of animal products over the course of one day and develop a list of animal products commonly used based on previous experience.
2. Prepare and maintain an Agriscience Notebook to record and store information presented in classroom discussion.
3. Research an animal industry and related careers and share with the class.

Topic: Taming & Naming **Duration:** 8 Day(s)

Topic Description (short)

As people moved from a culture of hunter-gatherers to a more agrarian society, using animals was an adaptation that provided benefits to humans. Students will learn about domestication, and how it led to structured civilizations, growing populations, and the advent of production agriculture.

Learning Targets

1. Domestication of animals is achieved through breeding, handling, and training. m
2. Animals are classified several different ways, such as binomial nomenclature, purpose, and characteristics of anatomy and physiology.
3. All living organisms are classified using kingdom, phylum, class, order, family, genus, and species.
4. Dichotomous keys are a classification tool used to identify objects based on their physical features.
5. Animal species were domesticated at different times throughout history for the benefit of the animals and humans.

Formative Assessment

1. Compare domestic an wild animals using the characteristics of domestication.
2. Apply hierarchical organizational system to a food group.
3. Determine the classification of the animal in their Producer's Management Guide.
4. Design a dichotomous key for the animal in their PMG.
5. Design a timeline recording the development of and domestication of an animal species.

Topic: Livestock Across the United States **Duration:** 8 Day(s)

Topic Description (short)

In areas of limited resources for successful farming, production of animals is less profitable. This topic will help students understand the importance of knowing specific needs of different livestock breed and species.

Learning Targets

1. Livestock production occurs in different regions of the US.
2. Characteristics, such as climate, land prices, population, industry infrastructure, feed resources, and transportation systems influence where commercial animals are produced in the US.

Formative Assessment

1. Develop a poster examining the characteristics of a livestock production region and explain how the resources available in different regions support and promote the production of animals.
2. Map the regions of commercial animal production.

Unit: Animal Handling & Safety **Duration:** 24 Day(s)

Unit Description

Animal welfare, training livestock, and facility design all work together to develop profitable animal businesses.

Topic: Animal Rights or Animal Wrongs? **Duration:** 8 Day(s)

Topic Description (short)

Students will discuss animal welfare and research animal handling issues related to the care and production of animals.

Learning Targets

1. The beliefs of an individual influence the value humans place on live animals and the use of products derived from animals.
2. Animal welfare and animal rights are different belief systems pertaining to the acceptable use of animals.
3. The use of animals for food and fiber sometimes creates ethical dilemmas for producers and consumers.
4. Producers of animal products must consider the welfare of animals for maximum profitability.

Formative Assessment

1. Discuss the differences in the interpretation of the meaning of the word value.
2. Determine their current opinions towards the beliefs of animal rightists and animal welfarist.
3. Recognize issues in animal agriculture and discuss the positive and negative impacts of each issue.
4. Develop a Producer's Code of Care document for the humane use of a species of animal under their care.

Topic: Manipulating Manners **Duration:** 7 Day(s)

Topic Description (short)

Students will study how animals respond to differences in their environment and the typical behaviors of specific species of animals.

Learning Targets
1. Animals respond instinctively to stimuli and changes in their surroundings.
2. Animals exhibit both instinctive and learned behaviors.
3. Safe handling and restraint procedures protect the animal and handler.

Formative Assessment
1. Investigate the behavior of pillbugs in response to stimuli and conduct an inquiry lab on the behaviors of pillbugs.
2. Simulate instinctive behaviors for predator and prey animals.
3. Research and determine the typical behaviors of a species of animal and become familiar with the safe handling procedures of that animal.

Topic: Home Sweet Home **Duration:** 9 Day(s)

Topic Description (short)
In this lesson, students explore livestock needs and how those needs affect facilities and biosecurity measures. Students research needs for the animals in their PMG's, examine possible scenarios involving biosecurity measures an design a facility meeting biosecurity needs.

Learning Targets
1. Animal facilities differ based on food requirements, environmental factors, species, use, and size of operations.
2. Producers implement biosecurity practices to reduce the spread of pathogens on farms.
3. Proper use of scale is important when designing animal facilities.
4. Animal facilities are designed to protect the safety and health of animals and handlers and should include biosecurity protocols.

Formative Assessment
1. Research the basic feed, water, and shelter requirements of animals.
2. Experiment to determine the risk levels related to spreading pathogens in a farm scenario.
3. Calculate proportions, scale ratios, and dimensions of building plans.
4. Select an animal facility that provides safe handling and efficient production practices for animals.

Unit: Cells & Tissues **Duration:** 20 Day(s)

Unit Description
Students will learn about the livestock industry at a cellular level.

Topic: Units of Life **Duration:** 8 Day(s)

Topic Description (short)
Students will review cell organelles and structure introduced in the previous course. Students will look at each organelle and determine their contribution the cell makes to the function of an animal.

Learning Targets
1. Animal cells are comprised of many parts that have essential functions for the survival of animal tissue.
2. Cells use water, oxygen, and glucose to produce energy and metabolic by-products of carbon dioxide and water.
3. Cells use the processes of osmosis and diffusion for the uptake of water and dissolved nutrients required for metabolism and growth.

Formative Assessment
1. Identify and label animal cell organelles and develop pictorial representation of cell function.
2. Collect and analyze data to provide evidence of cell metabolism.
3. Observe molecules moving across a membrane in a simulation and conduct an experiment to simulate the process of osmosis in animal cells.

Topic: Putting the Puzzle Together **Duration:** 6 Day(s)

Topic Description (short)
Students will examine common external parts and complete a series of dissections of internal systems found in animals.

Learning Targets
1. External body parts of animals vary among different species and are important as reference tools for animal selection, health, and management.
2. A collection of organized cells create tissue responsible for various life-sustaining functions.
3. The collection of epithelial, connective, muscle, and nerve tissues interact to perform specific functions within the body of an animal.
4. 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.
5. Multiple organs work together and form physiological systems.

Formative Assessment
1. Identify common external animal parts and explain the purpose of each.
2. Examine two types of muscle tissue and describe the differences.

3. Dissect a chicken wing and identify epithelial and connective tissues.
4. Dissect a chicken wing and observe how tendons and ligaments provide movement to the structure of the skeleton.
5. Dissect a fetal pig and identify internal parts and organs that comprise systems.

Topic: Breathing, Beating, and Body Control Centers **Duration:** 3 Day(s)

Topic Description (short)
In this lesson students explore respiration and heart rate under various conditions. Students also study the relationships of the nervous, renal, and endocrine system, as well as their connection to the respiratory and circulatory system.

Learning Targets
1. The respiratory and circulatory systems are closely related and essential for animal life.
2. External respiration is a process of gas exchange between the lungs and blood.
3. The circulatory system relies on the heart pump blood throughout the body.
4. Respiration and heart rates may be affected by external conditions, such as temperature and physical activity.
5. The nervous, endocrine, and renal systems work together to transmit signals, secrete hormones, and filter wastes.

Formative Assessment
1. Identify and explain the function of the parts of the respiratory and circulatory systems.
2. Describe the process of gas exchange in external respiration and determine the presence of carbon dioxide in exhaled air.
3. Design a travel brochure that highlights the low of blood throughout the body.
4. Conduct an inquiry on the effects of external conditions on respiration rate, pulse, and blood pressure.
5. Map the functions of body systems, specifically the nervous, endocrine, and renal systems, to demonstrate their connection to each other and other systems in the body.

Unit: Animal Nutrition **Duration:** 27 Day(s)

Unit Description
Students will learn about different feedstuffs and their purpose in our food supply chain.

Topic: Digestion Junction **Duration:** 6 Day(s)

Topic Description (short)
In this lesson, students will learn about the complex digestive systems of animals. Students will explore the unique differences in digestive systems by building models, reviewing digestive terms, and observing the differences in animals.

Learning Targets
1. Digestive systems vary among species of animals.
2. Ruminants have a four-chambered stomach consisting of the rumen, reticulum, omasum, and abomasum, each with a specific function.
3. Digestion systems break down, decompose, and absorb nutrients through mechanical, chemical, and biological processes.

Formative Assessment
1. Define the terminology commonly used in digestive anatomy and match livestock species with the proper digestive system.
2. Label, identify and explain the function of various parts of animal digestive system.
3. Build a model of a digestive system.

Topic: The Need for Feedstuffs **Duration:** 10 Day(s)

Topic Description (short)
In this lesson, students will learn how to read and use nutritional information labels for animals and compare those labels with nutritional information on food labels for humans. They will identify feeds as roughages and concentrates and determine what nutrient each provides.

Learning Targets
1. The six nutrient groups required by animals include water, carbohydrates, protein, fats, vitamins, and minerals
2. Animals derive nutrition from a variety of sources, including roughages and concentrates.
3. Feedstuffs of the same type can vary in nutrient composition and nutritional value based on the location, time of harvest, growing conditions, water availability, and soil conditions of the area in which the feed is grown.
4. The nutritional value of a feed can be determined through feed analysis.
5. The specific nutritional requirements of individual animals are dependent upon species, age, and level of production.
6. Animals require nutrients from all six nutrient groups to thrive, survive, and reproduce.
7. Feed labels are an important source of nutritional information.

Formative Assessment
1. Identify the six classes of nutrients, the function they serve in the body, and sources of each nutrient.
2. Classify feedstuffs as roughages, concentrates, and supplements.
3. Categorize feedstuffs into the nutrient group each feedstuff provides.
4. Identify and define feed analysis terms, and conduct a dry matter analysis for two feedstuff samples.
5. Evaluate nutrient requirements of various animals at different stages of production.

6. Research and record the nutritional needs of an animal using Nutritional Requirement tables.
7. Read a feed label and interpret the information included on the label.

Topic: Nutritional Disorders **Duration:** 6 Day(s)

Topic Description (short)
Students study nutritional disorders and develop a guide for diagnosing nutritional disorders in the future.

Learning Targets
1. Animal growth, development, and health are directly related to meeting the nutrient requirements of the animal.
2. Nutrient deficiencies in animals may result in poor performance and contribute to economic losses.

Formative Assessment
1. Study the nutritional disorders of one species and examine supplement labels to substantiate nutritional disorders associated with feed nutrients.
2. Develop a reference for common nutritional disorders of many animals.

Topic: What's for Dinner **Duration:** 5 Day(s)

Topic Description (short)
In this lesson, students will determine the components of a ration and calculate dry matter and as-fed basis of feeds. They will use the Pearson Square to balance two feeds in a ration and develop a recipe using the Pearson Square method. Students will use a spreadsheet application to determine a ration for animals.

Learning Targets
1. Livestock rations meet the requirements of animals, maximize feed efficiency, and minimize the cost of production.
2. Using mathematics and problem solving are important skills for animal producers when formulating rations.
3. The animal industry uses mathematical calculations to formulate rations.

Formative Assessment
1. Describe the characteristics of a good ration and list the steps in balancing a ration.
2. Complete conversions of feedstuffs from a dry-matter basis to an as-fed basis.
3. Use the Pearson Square to balance a ration using two feedstuffs and formulate a ration and make a recipe using the Pearson Square.

Unit: Animal Reproduction **Duration:** 11 Day(s)

Unit Description
Students will learn about animal reproduction and essential hormones and organs that make reproducing offspring occur.

Topic: Where Do Calves Come From? **Duration:** 5 Day(s)

Topic Description (short)
Students will explore the male and female reproductive systems to provide a foundation of information on which to build more in-depth knowledge of reproduction. This will help students optimize their success of an animal business. By observing and participating in dissections of reproductive tracts, students will understand the function of the reproductive organs of the female and male.

Learning Targets
1. Male and female reproductive systems differ in structure and function.
2. The basic female reproductive system for both mammals and avians includes the ovary, infundibulum, oviducts, uterus, and vagina.
3. The mammalian male reproductive system consists of testes, scrotum, epididymis, vas deferens, prostate gland, Cowper's gland, seminal vesicle, urethra, and penis.

Formative Assessment
1. Identify and label the parts mammalian male and female reproductive tracts.
2. Identify and label the parts of the avian female reproductive tract and dissect a female tract.
3. Observe a dissection of a mammalian male reproductive tract and identify the parts within the tract.

Topic: The Pathway to Production **Duration:** 6 Day(s)

Topic Description (short)
In this lesson, students study the function of hormones in the estrous cycle and how the reproductive process differs among species. They study the factors used in determining the quality of semen when used for artificial insemination or embryo transfer. Students will identify breeding systems and discuss the advantages and disadvantages of each. The lesson culminates in the development of a plan to manage and synchronize the reproductive process for one species for production purposes.

Learning Targets
1. Understanding of the estrus cycle and hormonal control is essential for reproductive success.
2. The reproductive cycle of females consists of puberty, the estrous cycle, gestation, parturition, and lactation.
3. The potential fertility and viability of semen may be determined based on its motility, morphology, and concentration.

4. Four main breeding methods commonly chosen by producers when breeding livestock have advantages and disadvantages.
5. The breeding season of animals may be manipulated for economic gain.

Formative Assessment
1. Identify the main hormones of the estrous cycle and graph the levels of each hormone throughout the cycle.
2. Research and record reproductive facts regarding the species of the animal identified in the Producer's Management Guide.
3. Prepare slides using a variety of buffers and stains and evaluate semen samples for sperm motility, morphology, and concentration.
4. Distinguish between the different livestock breeding systems and understand the advantages and disadvantages of breeding methods.
5. Determine the best time to breed an animal and manage the breeding season.

Unit: Genetics
Duration: 20 Day(s)

Unit Description
Students will gain understanding of genes and their role in inheritance of traits for livestock. They will learn about expected progeny differences and swine performance indicators.

Topic: A New Pair of Genes
Duration: 7 Day(s)

Topic Description (short)
In this lesson, students observe the stages of mitosis using a microscope. They use Punnett squares to predict the probability of offspring exhibiting traits in monohybrid and dihybrid crosses as well as in genes that exhibit co-dominance. Students explore mendelian genetics using simulation software, which allows students to predict offspring of Drosophila breeding flies. Students breed fruit fly parents with different genotypes to simulate the production of offspring, then test their predictions to understand the role genetics plays in animal production.

Learning Targets
1. Mitosis has five distinct phases necessary for cell division.
2. Eggs, or ova, and sperm undergo meiosis and mitosis for the development of new cell tissue.
3. Egg cell fertilization requires the joining of genetic material in the form of gametes from both male and female parents.
4. Dominant and recessive genes determine the phenotypic characteristics of animals.
5. Genetic traits, such as coat color, muscling, and horns are passed from generation to the next.
6. Genetic variations among species occur due to exceptions to the law of dominance.
7. Some animals phenotypic characteristics are expressed as sex-linked traits.

Formative Assessment
1. Prepare a slide to examine mitosis in plant tissue and examine a prepared slide of animal mitosis and make observations about the stages.
2. Sketch and label cells depicting meiosis.
3. Write a paragraph describing what occurs during fertilization.
4. Perform computer simulations related to genetic inheritance to learn about the role genetics play in animal production.
5. Simulate Drosophila mating to study the role genetics plays in animal production.
6. Conduct a trial to test the probability of co-dominance.
7. Perform computer simulations to predict sex-linked traits in drosophila.

Topic: Predicting Genetic Inheritance
Duration: 5 Day(s)

Topic Description (short)
In this lesson, students use EPDs, ratios, and pedigrees to predict inheritance for quantitative and qualitative traits that are economically important to livestock producers and animal breeders.

Learning Targets
1. Punnett squares predict qualitative traits inherited from a single gene pair.
2. Producers use ratios to compare animals within a contemporary group.
3. Expected Progeny Differences (EPDs) are utilized by producers to select animals for heritable traits.
4. Quantitative traits are inherited through multiple gene pairs and can be affected by the environment.
5. Economically relevant traits can be predictably changed through genetic improvement by selective breeding using EPDs.
6. Pedigrees contain important information for examining genetic history.

Formative Assessment
1. Use Punnett Squares to predict the probability of genetic frequencies and complete a Punnett square wit a dihybrid cross.
2. Calculate a contemporary group ratio.
3. Compare animals based on their Expected Progeny Differences.
4. Evaluate the quantitative traits of livestock using EPDs.
5. Use EPDs in mating decisions.
6. Trace genetic inheritance through a pedigree.

Topic: Evolutionary Ideas
Duration: 8 Day(s)

Topic Description (short)
In this lesson, students will use a computer simulation to see the connection to modern animals and extinct animals. They will diagram the

evolution of seven types of animals using a cladogram. Students will also study different types of natural selection and determine the evolutionary path of an animal.

Learning Targets
1. Animals today have descended from common ancestors.
2. Natural selection is an involuntary process of evolution where species adapt to their environment.
3. The diversity of organisms is the result of billions of years of evolutionary adaptation.
4. Genetic mutations are separate events that can lead to change in the characteristics of a species.

Formative Assessment
1. Study the process used to determine the common ancestors of species and diagram a cladogram of seven types of animals.
2. Conduct an experiment on the process of natural selection using the peppered moth.
3. Determine the types of selection that occur in certain environments.
4. Determine the evolutionary path of a species of animal.

Unit: Animal Health
Duration: 21 Day(s)

Unit Description
Students will learn about animal health and their responsibility to plan and execute proper care to livestock.

Topic: Diseased
Duration: 9 Day(s)

Topic Description (short)
In this lesson, students will simulate the transmission of a contagious disease; observe bacteria, fungi, and protozoa, and research the role of government regulatory agencies I protecting public health.

Learning Targets
1. Animal caretakers observe vital signs, which vary among species, to identify health or illness.
2. Bacteria, viruses, fungi, protozoa, and prions cause infectious disease.
3. Vectors and fomites are ways of spreading disease agents.
4. Veterinarians and caretakers diagnose diseases through observation of symptoms and physical examinations.
5. Regulatory agencies are responsible for disease prevention and control.

Formative Assessment
1. Research and record the vital signs of an animal and assess vital signs of an animal.
2. Identify and sketch bacteria, mold, and protozoa, from prepared slides.
3. Simulate the spread of a contagious disease and trace the route the disease takes through a population.
4. Research and record key facts and symptoms of two animal-related diseases.
5. Research government regulatory agencies and identify primary purposes and responsibilities each agency has regarding disease prevention and control.

Topic: Bugged
Duration: 5 Day(s)

Topic Description (short)
In this lesson, students will explore the life cycle and classification of parasites and determine the presence of parasitic eggs in fecal material. Students also interpret product labels to determine when and how to administer dewormer products as part of a parasite prevention plan.

Learning Targets
1. A livestock producer's knowledge of parasite life cycles can aid in parasite control and prevention.
2. There are multiple methods to determine the presence of parasitic eggs in an animal, of which the laboratory is the most accurate.

Formative Assessment
1. Identify and diagram the life cycle of a common parasite.
2. Classify parasites according to their phylum and site of infestation on the body.
3. Dissect product labels for common dewormers.
4. Prepare slides and observe to determine the presence of parasite eggs.

Topic: Pathogens Prevented
Duration: 7 Day(s)

Topic Description (short)
Students will learn how to administer shots and will develop a health care plan for their Producer's Management Guide.

Learning Targets
1. Disease prevention, morally and economically warranted, includes vaccination, sanitation, ventilation, and nutrition.
2. Record keeping is important in scheduling and administering preventative medications.
3. Vaccines are available for many common diseases.

Formative Assessment
1. Demonstrate the proper procedures for filling a syringe to administer medication.

2. Administer intramuscular and subcutaneous shots.
3. Produce an observation tool to use in comparing symptoms of health to symptoms of poor health for their animals.
4. Plan preventative care for their animal.
5. Design a record-keeping system for medications and vaccines for their animal.
6. List common diseases and parasites as well as preventative controls related to their animals.

Unit: Animal Products, Selection, and Marketing

Duration: 29 Day(s)

Unit Description

Students will learn about products consumers use from livestock and how they are properly marketed.

Topic: The Products of Our Toil

Duration: 11 Day(s)

Topic Description (short)

Students study consumer products from animals, the methods used to ensure. consistent products, and how processing improves lower quality goods and adds value. Students will work in teams to teach the class about a product and will use sensory evaluation tests to detect differences in samples of products.

Learning Targets

1. The primary purpose of livestock production is food and fiber.
2. Grading is used to provide consistent and palatable food products.

Formative Assessment

1. Research an animal product and develop a presentation on that animal product.
2. Work as a team to prepare and present a class lecture.
3. Conduct sensory evaluation trials on meat samples and evaluate the samples.
4. Taste milk samples and determine the defects, if present.
5. Identify samples of cheese based on appearance and taste.
6. Grade eggs based on their interior qualities using the candling and breakout methods.

Topic: In the Search of the Ideal Animal

Duration: 11 Day(s)

Topic Description (short)

In this lesson, students will make decisions based on given priorities and criteria and analyze objects as they compare the ideal criteria. They will study the ideal confirmation of an animal and write a children's storybook to use as a guide in selecting animals. Finally, they will solve a problem using performance data to select a herd sire.

Learning Targets

1. Criterion-based selection establishes priorities and provides consistency when evaluating animal conformation for specific species and purposes.
2. Producers use qualitative and quantitative comparison of live animals to predict value in the marketplace.
3. Offspring performance may be predicted and improved by selecting animals based on performance records.

Formative Assessment

1. Make decisions based on given priorities and criteria, and analyze objects as they compare ideal criteria.
2. Research and identify the most-used priorities for evaluating an animal within that animal industry.
3. Write, illustrate, and publish a children's storybook on how to select an animal.
4. Determine and recommend most appropriate sires using expected progeny differences.

Topic: Value Added

Duration: 7 Day(s)

Topic Description (short)

Throughout this lesson, students develop an awareness of the products and marketing opportunities around them. Students explore branding, placement, niches and value-added marketing.

Learning Targets

1. The four elements of marketing are product, price, place, and promotion.
2. Brand name recognition, niche marketing, and value-added products increase the value of a good.
3. A solid marketing plan is necessary to increase the value and sales of a product and move goods from producer to consumer.

Formative Assessment

1. Compare similar products based on their features, pricing, distribution, and promotion.
2. Determine a target market and potential products based on the local community.
3. Develop a plan to market a product from their project for the Producer's Management Guide.
4. Work on a team to determine a market for a product in an appropriate local marketplace.