Animal Science

Cluster Big Idea:

- Sustaining life through the contributions made by animal science.

Cluster Enduring Understandings:

- Animal life is dynamical.
- Animal science is a global economic system.
- Human decisions and choices affect the sustainability of animal life.
- Animals serve a multifaceted role to sustain or improve the quality of human life.

Cluster Essential Questions:

- What is animal science?
- How is animal science a global economic system?
- Why is animal science considered a dynamic process?
- How is the development of life skills supported by animal sciences?
- In what ways do animals affect the quality of life?

Standard Statement: Students will study animal science and its relationship to the environment.

Animal Science

Performance Element AS.01: Demonstrate the correct use of safety procedures related to animal production.		
Performance Indicator AS.01.01: Identify safety procedures used in animal science.		
Basic	**Proficient**	**Advanced**
Demonstrate the proper handling techniques for production, laboratory, and recreation animals. Properly store and sanitize safety equipment used with laboratory animals. Maintain animal records. Recognize the normality curve of animal behavior.	Develop specific safety rules and regulations to guide the treatment of animals during hands-on applications. Establish data recording sheets and observation charts for laboratory animals. Maintain a laboratory animal first-aid kit and injury reporting procedure. Explain factors that serve to stimulate or discourage various types of animal behavior.	Demonstrate the use of safety equipment used with laboratory animals. Perform inspections of the animal science laboratory, pasture areas, out buildings, and transport equipment to help ensure handler and animal safety.
Performance Indicator AS.01.02: Handle and manage animals safely.		
Basic	**Proficient**	**Advanced**
Demonstrate animal restraining and handling techniques. Identify the strengths and weaknesses of an animal-safety handling plan. Identify good performance in various animals. Identify reasons why some animals perform better than others. Identify factors that can be manipulated to control animal performance.	Safely examine laboratory animals. Demonstrate animal restraining and handling techniques. Explain ethical show techniques. Safely handle animal products. Generate ways to increase animal performance.	Safely cage, stable, pen, corral, tank, or herd laboratory animals. Demonstrate proper leading techniques. Manage laboratory animals in ways that promote animal health. Perform safe handling procedures while working with animals. Operate animal facilities in ways that ensure animal safety. Make appropriate changes to an animal's environment in order to achieve optimal performance.

Performance Element AS.02: Research and interpret data related to the global implications of animal agriscience.

Performance Indicator AS.02.01: Identify and locate global applications of animal agriscience.

Basic	Proficient	Advanced
Map the global concentrations of economically important agriscience animals and identify the uses for these animals. Identify cultural and societal uses of animals. Map the dispersion of domesticated animals from their native ranges and discuss the impacts of these animals on their new locations.	Research and display animal uses. Collect, examine, and display data concerning the use of animals across Delaware, the United States, and the globe. Discuss the historical significance of agriculture for the U.S. and global economy. Identify agribusiness support agencies.	Search the Internet for global post-secondary institutions in order to access and review research in animal agriscience. Examine the commodities market and the influence of global conditions on values. Research global food outlook, population, and trade issues. Formulate agricultural issue-and-policy statements and ideas.

Performance Indicator AS.02.02: Understand the economic value of animal agriscience.

Basic	Proficient	Advanced
Develop charts that depict the percentage of income in Delaware that results from animal agriscience activity. View and discuss industry and commodity group publications and videos about animal agriscience. Identify and analyze business inputs and resources.	Collect data and then analyze and graph animal economic information. Determine the marketing and distribution of animal products and services in the local community. Visit an animal agriscience research, production, processing, or recreation facility to learn how economics is related to animal agriscience. Analyze financial data to determine business opportunities and costs. Practice goal setting and production planning.	Analyze school-based animal projects and demonstrations. Evaluate the role that economics plays in animal production. Examine entrepreneurship principles for agribusiness. Utilize budgets and conduct a budget analysis.

Performance Indicator AS.02.03: Identify technological advances in animal agriscience.

Basic	Proficient	Advanced
Develop a historical timeline of the advances in animal agriscience.	Research current biotechnology in relation to animal agriscience. Review biotechnology research and envision future animal	Discuss or debate issues of animal agriscience in relation to the environment, food and medicine, public safety, and biosecurity.

	uses or benefits. Recognize the impact of human management decisions on animal welfare. Identify various cultural practices associated with animals and the level of technology needed for each of these practices.	Demonstrate or display ways in which animal agriscience helps improve the standard of living in the United States.
Performance Indicator AS.02.04: Use the scientific method to conduct research in animal agriscience.		
Basic	**Proficient**	**Advanced**
Discuss animal agriscience research. State and describe the steps in the scientific method.	Illustrate, through the scientific method, hands-on animal agricultural activities.	Examine animal-feed trial results and analyze the data. Design and conduct experimental research on animal growth, development, and behavior (e.g., student agricultural experience projects, agriscience research projects, or integration projects).

Performance Element AS.03: Identify breeds of economically important animal species.		
Performance Indicator AS.03.01: Identify species and breeds of animals.		
Basic	**Proficient**	**Advanced**
Participate in picture, video, live-specimen, line-drawings, or scale-model identification exercises.	Explain terminology associated with particular species and breeds of animals.	Select animals of superior quality based on breed standards and justify the criteria on which the evaluations were made.
Performance Indicator AS.03.02: Recognize breed improvements and industry standards.		
Basic	**Proficient**	**Advanced**
Examine and review industry standards for economically important species and breeds.	Research topics in biotechnology, genetics, and genetic engineering to learn how to improve animals and animal products. Investigate the use of animals for biotechnology.	Discuss or debate the future needs for animals and animal products.

Performance Element AS.04: Describe the functions of reproductive organs, biological events of reproduction, and advances in reproductive technology and management.

Performance Indicator AS.04.01: Identify the biological aspects of animal reproduction.

Basic	Proficient	Advanced
Develop vocabulary related to anatomy and physiology. Identify the parts that comprise male and female animal reproductive tracts. Identify problems associated with reproduction and ways these problems can be prevented.	Examine reproductive organs. Conduct a microscopic examination of reproductive cells. Investigate laboratory data, charts, diagrams, and timelines. Analyze the reproductive cycle of various animals. Select animals based on their breeding soundness.	Establish classroom or laboratory breeding experiments with fish, birds, or small laboratory or hobby animals. Conduct animal behavioral studies that are related to reproductive development. Plan, develop, and maintain recreational projects with fish, birds, or large, companion, or hobby animals. Identify reproduction management practices (e.g., male-to-female ratios, ages and weights for breeding, breeding fertility and soundness, heat synchronization, and flushing).

Performance Indicator AS.04.02: Explain animal genetics and the heritability of animal traits.

Basic	Proficient	Advanced
Examine pedigrees of particular animals. Predict animal genotypes by using the Punnet square.	Examine and analyze the breed selection and genetic guides of various dairy, equine, swine, poultry, beef, and aquatic breed associations. Interpret genetic research.	Conduct probability experiments. Conduct a DNA-extraction experiment. Observe and discuss electrophoresis. Debate the use or release of transgenic organisms into the environment. Discuss the implications of genetic variation.

Performance Indicator AS.04.03: Identify reproductive techniques and evaluate reproductive efficiency.

Basic	Proficient	Advanced
Observe natural and artificial breeding and insemination techniques. Visit a dairy farm to view superovulation techniques and procedures.	Identify heat detection techniques. Use breed directory guides to analyze animal breeding potential. Identify the sex of dairy, poultry, small animal, fish, and	Examine animals with ultrasonic techniques. Discuss reproductive efficiency and identify significant factors associated with specific animals (e.g., accelerated lambing).

Observe and describe embryo transfer techniques and procedures. Discuss the pros and cons of breeding through natural cover or artificial insemination.	wildlife livestock. Describe techniques for artificial insemination. Describe the procedure used to determine the breeding readiness of an animal.	Evaluate the breeding readiness of an animal.
Performance Indicator AS.04.04: Describe animal mating systems.		
Basic	**Proficient**	**Advanced**
Compare and contrast animal production facilities (e.g., kennels, fish hatcheries, incubation operations, or breeding stables). Compare and contrast purebred animal mating systems.	Develop criteria for breeding animals in order to achieve desirable results. Display or chart a crossbreeding system for a specific animal.	Demonstrate crossbreeding in order to achieve heterosis.

Performance Element AS.05: Explain and describe the functions of nutrients and the physiology of digestion.

Performance Indicator AS.05.01: Identify nutrients essential for animal growth, performance, maintenance, and reproduction.

Basic	Proficient	Advanced
List and describe the functions of the six essential nutrients. Examine animal feed labels and feed analysis tags. Identify characteristics of good- and poor-quality feed stuffs.	Develop and display feed substances that are based on growth stage or maturity. Display and chart the six essential nutrients and their functions in the digestive process. Identify and evaluate the differences between good- and poor-quality feed stuffs.	Identify feed ingredients needed for a specific animal in a particular stage of growth and development. Conduct a nutrition experiment that demonstrates the roles of the six essential nutrients in animals.

Performance Indicator AS.05.02: Identify types of feeds and formulate feed rations.

Basic	Proficient	Advanced
Identify human food products that are sensitive to enzymes such as lactase, amylase, protease, and lipase. Visit a local pet store, feed store, or animal production facility to observe feed ration formulation.	Determine the economic impact of improper and inefficient feeding. Display raw feed ingredients and demonstrate the processing procedures required to formulate specific feed rations. Examine and analyze feed formulations. Select diets that provide the appropriate quantity of nutrients for each developmental stage of an animal.	Conduct an experiment on feed chemistry (e.g., starch digestion or the effects of the chemical treatment of forage samples on digestibility). Display and qualitatively judge animal feeds and rations. Calculate the costs of feed rations and determine the least expensive formulation for a particular animal species. Create a balanced feed ration for an animal. Use different types of feed stuffs to create a feed ration that contains the appropriate amounts of required nutrients.

Performance Indicator AS.05.03: Explain the physiology of digestion.

Basic	Proficient	Advanced
Examine digested or partially digested materials gathered from fistulated animals. Recognize the different phases of animal life cycles.	Distinguish between a ruminant and nonruminant stomach. Chart a comparison of monogastric and polygastric digestion. Examine, with a microscope, enzymatic, protozoan,	Demonstrate how environmental variables affect digestion. Measure and examine the effects of ammonia nitrogen on aquatic organisms or poultry as a result of manure

	bacterial, and fungal agents of digestion. Compare and contrast the digestibility of various cellulose materials (e.g., cottonseed, hay, bark, or grass). Compare and contrast the digestive systems of various animal species (e.g., aquatic, wild, and equine) in relation to feed digestion and efficiency.	management.

Performance Element AS.06: Recognize animal health concerns and recommend appropriate action**.**

Performance Indicator AS.06.01: Identify housing, sanitation, and safety considerations related to animal health.

Basic	Proficient	Advanced
Utilize safety equipment and follow safety procedures to protect both humans and animals. Describe the process of composting. Observe and discuss wastewater. Discuss animal facility engineering. Discuss animal health issues. Identify the external environmental factors that affect animal health.	Formulate and design facilities that are appropriate for the production of a particular animal species. Calculate the proper carrying capacity for an animal housing facility.	Research, plan, and develop animal handling equipment (e.g., sheep stand, aquatic biofilter, hay racks, or mineral feeders). Debate agricultural land preservation, suburban development, zoning, and production farming issues. Make decisions regarding new techniques and methods in a production facility to maximize profit and animal safety. Analyze the external environmental factors that affect animal health.

Performance Indicator AS.06.02: Recognize, identify, and evaluate the effects of diseases and parasites on animals.

Basic	Proficient	Advanced
Review and discuss state laws that govern animal health and transportation. List treatments for disease and parasites. Discuss the communicability of diseases. Identify the symptoms of disease, illness, parasites, and other health-related problems.	Identify insects and parasites that affect animals. Discuss health management issues related to wildlife. Discuss the economic impact of animal disease and parasites and the potential transfer of disease to humans. Identify ways in which animal health can be affected by anatomy-and-physiology problems. Demonstrate procedures used to evaluate the health status of an animal.	Evaluate the health of an organism. Diagnose animal ailments. Implement a program that prevents disease and improves the health of an animal. Identify and implement treatment options.

Performance Indicator AS.06.03: Evaluate animal health management.

Basic	Proficient	Advanced
List and describe methods of animal health management.	Develop a health management plan, which includes diet and exercise, for a particular animal. Discuss animal health certificates, regulations, permits, and procedures.	Administer medicine to an animal, groom an animal, and evaluate the health status of an animal, all of which will be done under supervision. Compare the costs of construction materials used in

	Develop and identify the components of a first-aid kit used with a small or laboratory animal.	animal facility engineering and construction.
Performance Indicator AS.06.04: Perform animal health procedures to maintain animal health.		
Basic	**Proficient**	**Advanced**
Identify various procedures used to administer injections to animals. Identify various technology and equipment used to care for the health of animals. Recognize the signs of a healthy animal.	Describe preventative procedures for animal health.	Administer animal treatments that support proper health.

Performance Element AS.07: Gain practical experience with animal management.		
Performance Indicator AS.07.01: Demonstrate the training and showing of animals.		
Basic	**Proficient**	**Advanced**
Discuss show ring ethics and the responsibilities of animal owners, show people, trainers, and judges.	Analyze and explain safe animal handling techniques. Demonstrate safety procedures for handlers.	Prepare an animal for a show or judging exhibition. Train an animal or alter its behavior. Demonstrate proper animal handling and transportation techniques.
Performance Indicator AS.07.02: Identify cultural practices and skills used to manage animals.		
Basic	**Proficient**	**Advanced**
Identify necessary daily care for animals. Describe practices of animal management. Identify appropriate facilities and housing for various animal species.	Identify the scientific and industry standards related to animal research and how animal welfare issues affect these standards. Illustrate ways to repair cages, fences, gates, tanks, and handling equipment. Explain how to clean and repair both tack and show equipment. Develop a plan to improve a habitat for wildlife. Calculate the proper spacing requirements and stocking rates needed for livestock, wildlife, agricultural animal species, or hobby or recreational animals.	Operate and maintain components of laboratory systems (e.g., ventilation, water, heat, storage, and lighting). Farrow, calve, foal, hatch, lamb, whelp, or wean animals.

Performance Element AS.08: Analyze and evaluate animals according to industry standards.		
Performance Indicator AS.08.01: Evaluate production and performance data.		
Basic	**Proficient**	**Advanced**
Identify the desirable production numbers (e.g., birth weight, age of maturity, or age of sexual maturity) for a particular animal species.	Use data analysis to determine the rate of gain for various animals. Examine breed selection guides and select which animals to breed based on industry standards. Describe the proper usage of tools used to manipulate animal performance.	Analyze production and performance data to make management decisions. Use production or performance data to formulate a management plan.
Performance Indicator AS.08.02: Visually observe and recite the elements of animal selection processes and then judge animals according to these processes.		
Basic	**Proficient**	**Advanced**
Identify breed and industry standards for domestic farm animals, aquatic organisms, and recreational, companion, or hobby animals. Describe functional differences in various animal structures and body systems. Classify animals according to their anatomy and physiology. Identify various animal parts.	Examine and explain functional differences in various animal structures and body systems.	Judge and justify functional differences in various animal structures and body systems. Develop and orally deliver reasons about particular animal species. Evaluate the desired traits of animals.

Performance Element AS.09: Understand processing safety and consumer safety associated with animal marketing.

Performance Indicator AS.09.01: Determine marketing options for animals and animal products.

Basic	Proficient	Advanced
Identify local market outlets for animal products and animals. Identify and distinguish animal products and the animals from which they were processed.	Research state and federal guidelines and regulations concerning animal processing and marketing. Identify and devise marketing strategies.	Chart or graph commodity cash and contract and futures prices to identify market trends and evaluate market conditions.

Performance Indicator AS.09.02: Explain animal processing procedures and techniques.

Basic	Proficient	Advanced
Utilize data transmission and the Internet to gather animal processing information. Find and discuss production schedules and processing efficiencies. Describe historical methods of animal harvest, processing, and utilization. Recognize animal welfare issues related to the processing and preparation of animal products and by-products.	Examine global, cultural, and ethnic customs as they pertain to animal processing. Discuss global animal processing procedures. Identify industry standards, grades, and inspection procedures for agricultural products.	

Performance Indicator AS.09.03: Identify consumer safety regulations related to animal processing and marketing.

Basic	Proficient	Advanced
Identify government agencies and guidelines concerned with consumer safety. Discuss regulations and procedures related to animal agricultural issues.	Research past consumer concerns regarding issues of animal product processing and food safety. Examine and discuss consumer safety regulations. Examine global food safety issues and consumer protection regulations. Identify industry standards, grades, and inspection procedures for agricultural products.	

Performance Element AS.10: Understand the legal responsibilities associated with animal production and management.

Performance Indicator AS.10.01: Recognize issues of animal use and welfare.

Basic	Proficient	Advanced
State the global historical use of animals by humans. Investigate animal use and welfare issues. State town, county, or state regulations concerning animal use and welfare.	Identify and discuss optimal management practices. Identify issues of animal use in medicine, education, research, and nutritional testing. Identify and explain the effects of hunting and restocking wild animal populations.	Conduct student research and prepare presentations on issues of animal use and welfare. Debate current local issues of animal use and welfare. Discuss and debate the introduction of non-native species to an environment. Define the terms "animal rights" and "animal welfare," conduct research on human-animal issues, and then compare and debate the different definitions and positions.

Performance Indicator AS.10.02: Identify and examine environmental issues related to animal use and welfare.

Basic	Proficient	Advanced
Examine biosecurity measures undertaken by animal producers and processors. Discuss animal production factors that have an impact on the environment. Identify sources of groundwater contamination. Interpret governmental regulations related to animal welfare.	Display information related to manure handling systems, the management of animal waste, and the processing of wastes and by-products. Compare the environmental effects of confinement-based systems with pasture-based systems.	Design a nutrient management plan for a livestock operation.

Performance Indicator AS.10.03: Identify biotechnology issues related to animal use and welfare.

Basic	Proficient	Advanced
Identify biotechnology uses.	Investigate and illustrate nutritional, pharmaceutical, genetic, and environmental advancements in animal production. Compare and contrast ways in which animals and animal products have been improved through biotechnology. Examine and review current global animal production methods and future global animal needs.	Discuss and debate ways in which animals and animal products have been improved through biotechnology.

Performance Element AS.11: Use classification systems to explain basic functions of animal anatomy and physiology.		
Performance Indicator AS.11.01: Explain the importance of scientifically classifying animals.		
Basic	**Proficient**	**Advanced**
List various animal characteristics that lead to different classifications. Explain how breeds of animals were developed.	Compare animal species based on their classifications.	Analyze the anatomy and physiology of animals as they relate to the classification of the animals.