

Program Concentration: **Agriculture**
Career Pathway: **Agriscience**
Course Title: **Animal Science and Biotechnology**

Course Description: As part of the Agriscience pathway program of study, this course is designed to introduce students to the scientific principles that underlie the breeding and husbandry of agricultural animals, and the production, processing, and distribution of agricultural animal products. Introduces scientific principles applied to the animal industry; covers reproduction, production technology, processing, and distribution of agricultural animal products. Classroom and laboratory activities are supplemented through supervised agricultural experiences and leadership programs and activities.

- AG-ASB-1 The student demonstrates the application of scientific processes in agricultural animal research and production.**
- a. Discusses the advances made in American agriculture.
 - b. Analyzes how agricultural research has benefited the consumer.
 - c. Connects scientific discoveries in animal agriculture to increase production and efficiency within the industry-
 - d. Explains scientific developments that have revolutionized animal agriculture.
 - e. Identifies pharmaceuticals that are derived from animals and lists their uses.

Academic Standards:

ELA10RC4 The student establishes a context for information acquired by reading across subject areas. The student

- a. Determines strategies for finding content and contextual meaning for unfamiliar words or concepts.*

- AG-ASB-2 The student identifies and explains the various phases, segments, trends, consumption and economic scope of the large animal industry.**
- a. Describes ecological balance and makes connections to the use of land for animal production.
 - b. Describes the various segments of the beef industry.
 - c. Researches the various phases of the sheep industry and the importance of wool as a consumer fabric.
 - d. Assesses the various phases of the swine industry.
 - e. Analyzes per capita consumption of products from different large animals grown in the United States.
 - f. Justifies the use of agricultural land to produce meat animals.
 - g. Identifies key production areas of beef cattle and hogs.
 - h. Determines relationships between feed crop production and the production of meat animals.
 - i. Identifies breeds of large animals and the various contributions each makes to the large animal industry (i.e. efficient growth, exceptional amounts of lean

muscle mass).

- j. Locates on a map the states and regions foremost in the production of meat animals and analyzes geographical and structural reasons for these distributions.

Academic Standards:

ELA10RC4 The student establishes a context for information acquired by reading across subject areas. The student

- a. *Explores life experiences related to subject area content.*

SSWG1 The student will explain the physical aspects of geography.

- a. *Describe the concept of place by explaining how physical characteristics such as landforms, bodies of water, climate, soils, natural vegetation, and animal life are used to describe a place.*

SEV1. Students will investigate the flow of energy and cycling of matter within an ecosystem and relate these phenomena to human society.

- c. *Relate food production and quality of nutrition to population growth and the trophic levels*

SZ5. Students will evaluate the relationships between humans and other animals.

- b. *Explain the importance of species diversity to the biological resources needed by human populations including food, medicine, and natural aesthetics*
- c. *Compare and contrast how humans can preserve animal diversity in captive and natural environments with regard to habitat creation and conservation, research, legislation, animal enrichment, diet, medical, breeding programs and management of genetic diversity at local and global levels.*

AG-ASB-3 The student identifies and explains the various phases, segments, trends, consumption and economic scope of the poultry industry.

- a. Summarizes growth trends of the poultry industry.
- b. Evaluates the production of poultry products in each state, considering geographical and structural advantages that make some areas more prolific.
- c. Identifies on a map the states and regions foremost in production of poultry previously mentioned.
- d. Computes the per capita consumption of chicken, turkey and eggs.
- e. Describes vertical integration using segments of the poultry industry as examples.
- f. Outlines the operation of modern poultry operations.
- g. Explains the operation of modern hatcheries.
- h. Identifies breeds of poultry.
- i. Outlines a modern poultry production operation.
- j. Describes the process of egg development in poultry.

- k. Traces the biological processes involved in the production of eggs.
- l. Analyzes egg composition.
- m. Describes chick embryo development.
- n. Discusses proper storage conditions of hatching eggs.

Academic Standards:

ELA10RC2 The student participates in discussions related to curricular learning in all subject areas. The student

- c. Relates messages and themes from one subject area to those in another area.*

SSEMI2 The student will explain how the Law of Demand, the Law of Supply, prices, and profits work to determine production and distribution in a market economy.

- a. Define the Law of Supply and the Law of Demand.*

SEV1. Students will investigate the flow of energy and cycling of matter within an ecosystem and relate these phenomena to human society.

- c. Relate food production and quality of nutrition to population growth and the trophic levels*

SZ5. Students will evaluate the relationships between humans and other animals.

- b. Explain the importance of species diversity to the biological resources needed by human populations including food, medicine, and natural aesthetics*
- c. Compare and contrast how humans can preserve animal diversity in captive and natural environments with regard to habitat creation and conservation, research, legislation, animal enrichment, diet, medical, breeding programs and management of genetic diversity at local and global levels.*

AG-ASB-4 The student analyzes the various phases, segments, trends, consumption and economic scope of the dairy industry.

- a. Identifies the major areas and characteristics of dairy production in the United States and compares dairy production among the states.
- b. Discusses breeds of dairy cows and their characteristics.
- c. Demonstrates the steps used to milk cows in the modern dairy.
- d. Determines the per capita consumption of various dairy products.
- e. Assesses the uses of milk from species other than cows and their importance in the dairy industry.
- f. Identifies dairy products, their use and their economic importance.
- g. Examines the scientific process by which milk is produced.
- h. Traces the hormonal activity that controls lactation.
- i. Reviews the equipment and procedures involved in milking.
- j. Identifies the breeds of dairy cattle.
- k. Contrasts the breeds of dairy cattle, including their origin and breed characteristics.

- l. Assesses the uses of goat and sheep milk in cheese manufacturing.
- m. Describes the nutritive content of milk.
- n. Explores the scientific processes of pasteurization and homogenization in milk processing.
- o. Recognizes and explains the differences in milk classifying and grading.
- p. Demonstrates the conversion of milk to butter, cheese and ice cream products.

Academic Standards:

ELA10RC3 The student acquires new vocabulary in each content area and uses it correctly.

The student

- c. Explores understanding of new words found in subject area texts.*

SSEMI2 The student will explain how the Law of Demand, the Law of Supply, prices, and profits work to determine production and distribution in a market economy.

- a. Define the Law of Supply and the Law of Demand.*

SEV1. Students will investigate the flow of energy and cycling of matter within an ecosystem and relate these phenomena to human society.

- c. Relate food production and quality of nutrition to population growth and the trophic levels.*

SZ5. Students will evaluate the relationships between humans and other animals.

- d. Explain the importance of species diversity to the biological resources needed by human populations including food, medicine, and natural aesthetics*
- e. Compare and contrast how humans can preserve animal diversity in captive and natural environments with regard to habitat creation and conservation, research, legislation, animal enrichment, diet, medical, breeding programs and management of genetic diversity at local and global levels.*

AG-ASB-5 The student evaluates trends in the aquaculture industry and the scientific principles involved in the production of aquatic animals.

- a. Explores the scope of the aquaculture industry.
- b. Classifies the characteristics of ectothermic animals.
- c. Evaluates the feed-conversion efficiency of fish.
- d. Researches types of aquatic animal production in the United States.
- e. Investigates the physical characteristics of water and its relationship to fish production.
- f. Estimates fish populations in production operations by scientific sampling.
- g. Measures and adjusts water pH as it relates to fish growth and development.
- h. Describes how fish attain oxygen.
- i. Explains how oxygen is dissolved into and depleted from water.
- j. Tests pond and river and other water for dissolved oxygen levels.
- k. Provides for the addition of oxygen to water by mechanical agitation.

- l. Describes the methods and facilities used in the production of various aquatic animals.
- m. Interprets the behavioral characteristics of bullfrogs and alligators that make them difficult to produce in confinement.

Academic Standards:

ELA10LSV1 The student participates in student-to-teacher, student-to-student, and group verbal interactions. The student

- c. Responds to questions with appropriate information.*
- d. Actively solicits another person's comments or opinion.*

SES5. Students will explain how life on Earth responds to and shapes Earth systems.

- a. Relate the nature and distribution of life on Earth, including humans, to the chemistry and availability of water.*
- b. Relate the distribution of biomes (terrestrial, freshwater, and marine) to climate regions through time.*

SPS6. Students will investigate the properties of solutions.

- a. Describe solutions in terms of, solute/solvent, conductivity, concentration.*
- b. Observe factors affecting the rate a solute dissolves in a specific solvent.*
- c. Demonstrate that solubility is related to temperature by constructing a solubility curve.*

SSWG1 The student will explain the physical aspects of geography.

- a. Describe the concept of place by explaining how physical characteristics such as landforms, bodies of water, climate, soils, natural vegetation, and animal life are used to describe a place.*

SSEMI2 The student will explain how the Law of Demand, the Law of Supply, prices, and profits work to determine production and distribution in a market economy.

- a. Define the Law of Supply and the Law of Demand.*

AG-ASB-6 The student evaluates the various phases, segments, trends, demand, consumption and economic scope of the alternative and laboratory animals.

- a. Analyzes the advantages and disadvantages of raising alternative agricultural animals.
- b. Describes alternative animal agriculture industry.
- c. Explains the potential of ostriches, goats and other alternative animals as food animals.
- d. Describes the production of certified laboratory animal.
- e. Relates animals most often used in scientific research to the reason for their selection and use.
- f. Identifies useful insect characteristics for agricultural animal production

- g. Explains the importance of the honeybee to agriculture and the society of the honeybee.
- h. Discusses the threat to American agriculture by the Africanized honeybee and explains the biological reasons for the problem.
- i. Outlines production practices to produce organic and natural animal products.

Academic Standards:

- SZ1. Students will evaluate the relationships between humans and other animals.*
- b. Explain the importance of species diversity to the biological resources needed by human populations including food, medicine, and natural aesthetics*
 - c. Compare and contrast how humans can preserve animal diversity in captive and natural environments with regard to habitat creation and conservation, research, legislation, animal enrichment, diet, medical, breeding programs and management of genetic diversity at local and global levels.*

AG-ASB-7 The student classifies animals using scientific binomial nomenclature as well as classifies agriculture animals by breed and use.

- a. Explains how agricultural animals are classified scientifically into different kingdoms based on varying characteristics and the importance of this binomial classification system.
- b. Explains how breeds of livestock were developed.
- c. Applies knowledge of binomial nomenclature by correctly classifying different agricultural animals.
- d. Categorizes common and distinguishing characteristics of several agricultural animals.
- e. Explains the purpose of breed associations in recording and promoting these distinguishing characteristics.

Academic Standards:

ELA10RC2 The student participates in discussions related to curricular learning in all subject areas. The student

- a. Identifies messages and themes from books in all subject areas.*

SB3. Students will derive the relationship between single-celled and multi-celled organisms and the increasing complexity of systems.

- b. Compare how structures and function vary between the six kingdoms (archaebacteria, eubacteria, protists, fungi, plants, and animals).*

SB5. Students will evaluate the role of natural selection in the development of the theory of evolution.

- d. Relate natural selection to changes in organisms.*

SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

- b. Explain the similarities and differences among major body plans (e.g., asymmetry, radial and bilateral symmetry).

AG-ASB-8 The student recognizes and analyzes the causes and legitimacy of the general public's food safety and environmental concerns.

- a. Assesses consumer concerns for food safety.
- b. Explains the causes of problems with meat.
- c. Demonstrates knowledge of how safety problems can be solved.
- d. Differentiates between meat grading and meat inspection.
- e. Discusses examples of how genetic engineering has benefited the producer and consumer as well as the concerns over genetic engineering.
- f. Evaluates producers of agricultural animals as caretakers of the environment.
- g. Explains and analyzes the consequences of the greenhouse effect.
- h. Summarizes the carbon cycle.
- i. Discusses how bacteria can be beneficial to the environment.
- j. Explains the growth in organically produced animal products.

Academic Standards:

SEV1. Students will investigate the flow of energy and cycling of matter within an ecosystem and relate these phenomena to human society.

- a. Interpret biogeochemical cycles including hydrologic, nitrogen, phosphorus, oxygen, and carbon cycles. Recognize that energy is not recycled in ecosystems.

SEV5. Students will recognize that human beings are part of the global ecosystem and will evaluate the effects of human activities and technology on ecosystems.

- c. Explain how human activities affect global and local sustainability.

SB6. Students will analyze how biological traits are passed on to successive generations.

- f. Examine the use of DNA technology in forensics, medicine, and agriculture.

ELA10RC4 The student establishes a context for information acquired by reading across subject areas. The student

- b. Discusses in both writing and speaking how certain words and concepts relate to multiple subjects.

ELA10LSV1 The student participates in student-to-teacher, student-to-student, and group verbal interactions. The student

- e. Offers own opinion forcefully without domineering.
- f. Contributes voluntarily and responds directly when solicited by teacher or discussion leader.
- g. Gives reasons in support of opinions expressed.
- i. Employs group decision-making techniques such as brainstorming or a problem-solving sequence (i.e., recognizes problem, defines problem, identifies

possible solutions, selects optimal solution, implements solution, evaluates solution).

AG-ASB-9 The student assesses crucial animal welfare issues and explains the benefits of treating animals in a human manner and providing for the animals needs.

- a. Discerns the difference between animal welfare and animal rights.
- b. Researches potential problems brought about by animals being raised in confinement.
- c. Interprets the reasons given by some people for their objections to raising farm animals.
- d. Debates the use of production practices such as confinement operations.
- e. Debates management practices used in the production of agricultural animals.
- f. Investigates the benefit to producers of content and healthy animals.
- g. Explains potential problems of animal production such as the continuous use of antibiotics.
- h. Cites examples of how the use of animals in research has benefited humans.
- i. Investigates the laws that govern the use of laboratory animals for research.
- j. Interprets the laws governing the use of agricultural animals.
- k. Discusses the production and increasing popularity of natural and organically produced animal products.

Academic Standards:

SEV6. Students will recognize that human beings are part of the global ecosystem and will evaluate the effects of human activities and technology on ecosystems.

- c. Explain how human activities affect global and local sustainability.*

SZ5. Students will evaluate the relationships between humans and other animals.

- b. Explain the importance of species diversity to the biological resources needed by human populations including food, medicine, and natural aesthetics*
- c. Compare and contrast how humans can preserve animal diversity in captive and natural environments with regard to habitat creation and conservation, research, legislation, animal enrichment, diet, medical, breeding programs and management of genetic diversity at local and global levels.*
- d. Investigate how moral, legal, societal, political, and economic decisions impact animal diversity with short-term and long-term effects.*

ELA10LSV2 The student participates in student-to-teacher, student-to-student, and group verbal interactions. The student

- e. Offers own opinion forcefully without domineering.*
- f. Contributes voluntarily and responds directly when solicited by teacher or discussion leader.*
- g. Gives reasons in support of opinions expressed.*

- i. *Employs group decision-making techniques such as brainstorming or a problem-solving sequence (i.e., recognizes problem, defines problem, identifies possible solutions, selects optimal solution, implements solution, evaluates solution).*

ELA1ORL4 The student employs a variety of writing genres to demonstrate a comprehensive grasp of significant ideas in selected literary works. The student composes essays, narratives, poems, or technical documents. The student

- d. *Includes a formal works cited or bibliography when applicable.*

AG-ASB-10 The student observes and interprets the natural behavior of agricultural animals and relates these behaviors to production practices yielding more content, healthier, and productive animals.

- a. Describes the importance of ethology in the production of agricultural animals.
- b. Differentiates between instinctive and learned behaviors of animals.
- c. Judges animal intelligence based on behavior.
- d. Describes the conditioning response and its use in animal production.
- e. Explains how animal behaviors are developed.
- f. Infers how unusual stimuli and surroundings affect animals.
- g. Examines how cattle view their surroundings and how that behavior is used to design cattle facilities.
- h. Describes and identifies social, dominate, flight, and protective behaviors in animals.
- i. Investigates the social behaviors of agricultural animals.
- j. Identifies dominant animals in a group.
- k. Discusses how dominant behavior contributes to natural selection.
- l. Analyzes the types of sexual and reproductive behaviors in agricultural animals.
- m. Observes animal behavior and successfully collects data for an ethogram.
- n. Describes the methods used by agricultural animals to communicate.
- o. Describes the types of ingestive behaviors in agricultural animals.
- p. Explains how the natural behaviors of agricultural animals can be used to provide the animals with a safer, more comfortable environment.

Academic Standards:

SB4. Students will assess the dependence of all organisms on one another and the flow of energy and matter within their ecosystems.

- f. *Relate animal adaptations, including behaviors, to the ability to survive stressful environmental conditions.*

SB5. Students will evaluate the role of natural selection in the development of the theory of evolution.

- d. *Relate natural selection to changes in organisms.*

- SEV5. Students will recognize that human beings are part of the global ecosystem and will evaluate the effects of human activities and technology on ecosystems.*
- Describe factors affecting population growth of all organisms, including humans. Relate these to factors affecting growth rates and carrying capacity of the environment.*

AG-ASB-11 The student applies genetic principles to animal selection, breeding, and production.

- Explains the basic function of deoxyribonucleic acid (DNA) and ribonucleic acid (RNA).
- Explains how traits are passed from parent to offspring through genetic transfer.
- Researches and explains the concept of dominant genes versus recessive genes.
- Describes the concept of co-dominant genes.
- Explains how producers use the genetic principles to produce desired types of animals.
- Explains how the sex of an animal is determined.
- Explains the difference between phenotypic and genotypic characteristics.
- Computes mathematically the expected color of offspring.
- Compares the expected coat color with results obtained through scientific observation.
- Describes how the concept of heritability is used in the selection of livestock.
- Predicts phenotypic and genotypic characteristics in animals.
- Utilizes performance data in the selection of livestock.
- Describes Expected Progeny Difference (EPD).

Academic Standards:

- SB7. Students will analyze how biological traits are passed on to successive generations.*
- Distinguish between DNA and RNA.*
 - Explain the role of DNA in storing and transmitting cellular information.*
 - Using Mendel's laws, explain the role of meiosis in reproductive variability.*
 - Describe the relationships between changes in DNA and potential appearance of new traits including*
 - *Alterations during replication.*
 - *Insertions*
 - *Deletions*
 - *Substitutions*
 - *Mutagenic factors that can alter DNA.*
 - *High energy radiation (x-rays and ultraviolet)*
 - *Chemical*

ELA10RC2 The student participates in discussions related to curricular learning in all subject areas. The student

c. Relates messages and themes from one subject area to those in another area.

ELA10LSV1 The student participates in student-to-teacher, student-to-student, and group verbal interactions. The student

e. Offers own opinion forcefully without domineering.

f. Contributes voluntarily and responds directly when solicited by teacher or discussion leader.

g. Gives reasons in support of opinions expressed.

MM1D2 Students will use the basic laws of probability.

a. Find the probabilities of mutually exclusive events.

d. Use expected value to predict outcomes.

MM1D1 Students will determine the number of outcomes related to a given event.

b. Calculate and use simple permutations and combinations.

MM2P1 Students will solve problems (using appropriate technology).

b. Solve problems that arise in mathematics and in other contexts.

c. Apply and adapt a variety of appropriate strategies to solve problems.

AG-ASB-12 The student applies scientific methods of animal selection and explains the advantages and disadvantages.

a. Explains the concept of natural selection.

b. Discusses how humans have influenced the development of animals.

c. Cites examples of how problems have developed in animals because of the selection process controlled by humans.

d. Compares and contrasts the benefits of scientific animal selection and breeding by the producer with natural selection and random mating.

e. Traces the stages in the development of modern swine.

f. Discusses problems associated with overly muscled pigs.

g. Interprets the reasoning behind the selection of sex character in agricultural animals.

h. Outlines selection criteria for specific agricultural animals and uses.

i. Outlines the physical characteristics associated with growth in animals.

j. Compares and contrasts the characteristics of modern beef, swine, and dairy animals with those of their ancestors.

k. Cites examples of heterosis in agricultural animal production.

Academic Standards:

ELA10RC3 *The student acquires new vocabulary in each content area and uses it correctly.*
The student

c. Explores understanding of new words found in subject area texts.

SB5. *Students will evaluate the role of natural selection in the development of the theory of evolution.*

b. Explain the history of life in terms of biodiversity, ancestry, and the rates of evolution.

c. Explain how fossil and biochemical evidence support the theory.

d. Relate natural selection to changes in organisms.

SZ2. *Students will explain the evolutionary history of animals over the geological history of Earth.*

b. Explain the concepts evolution, adaptation, natural selection, convergence, and speciation.

c. Describe the fossil record of the animals including discussing the Cambrian Explosion and major extinction events.

SZ5. *Students will evaluate the relationships between humans and other animals.*

c. Compare and contrast how humans can preserve animal diversity in captive and natural environments with regard to habitat creation and conservation, research, legislation, animal enrichment, diet, medical, breeding programs and management of genetic diversity at local and global levels.

AG-ASB-13 **The student demonstrates an understanding of the reproductive anatomy and biological processes involved in the reproduction of agricultural animals.**

a. Distinguishes between asexual and sexual reproduction.

b. Explains the process by which gametes are produced in both the male and female.

c. Diagrams and explains the steps involved in meiosis and mitosis.

d. Describes the parts and functions of the male and female reproductive system.

e. Analyzes the functions of the hormones that control reproduction.

f. Describes the phases of the female reproductive cycle.

g. Explains the process by which fertilization takes place.

h. Compares the size and shape of sperm cells and egg cells.

i. Demonstrates the procedures used in artificial insemination.

j. Explains the use and procedures of embryo transfer and evaluates its economic importance.

k. Describes the process and advantages of estrus synchronization.

l. Researches and predicts new scientific technology that will be of benefit to livestock producers.

Academic Standards:

SB1. Students will analyze the nature of the relationships between structures and functions in living cells.

- a. Explain the role of cell organelles for both prokaryotic and eukaryotic cells, including the cell membrane, in maintaining homeostasis and cell reproduction.*

SB2. Students will analyze how biological traits are passed on to successive generations.

- c. Using Mendel's laws, explain the role of meiosis in reproductive variability.*
- e. Compare the advantages of sexual reproduction and asexual reproduction in different situations.*

AG-ASB-14 The student describes the physiological processes involved in prenatal and postnatal growth and development of agricultural animals.

- a. Measures the growth process in an animal.
- b. Analyzes the circumstances of growth that affect production enterprises.
- c. Distinguishes between prenatal and postnatal growth and illustrates the phases of each.
- d. Explains the layers of the blastula and the organs that are derived from each layer.
- e. Describes the functions of the placenta.
- f. Identifies characteristics of twenty-four, forty-eight, and seventy-two hour old chick embryos.
- g. Differentiates between body cells and explains the functions of each type cell.
- h. Sequences fat deposition in an animal's body.
- i. Investigates and explains why selection for muscling in animals is important.
- j. Compares and contrasts the growth and reproductive phases in an animal's life.
- k. Describes the effects of hormones in the growth process.
- l. Describes the effects castration has on the growth of an animal.
- m. Explains the aging process in animals.
- n. Distinguishes between chronological and physiological age.

Academic Standards:

ELA10RC4 The student establishes a context for information acquired by reading across subject areas. The student

- a. Explores life experiences related to subject area content.*
- b. Discusses in both writing and speaking how certain words and concepts relate to multiple subjects.*

SB1. Students will analyze the nature of the relationships between structures and functions in living cells.

- a. Explain the role of cell organelles for both prokaryotic and eukaryotic cells, including the cell membrane, in maintaining homeostasis and cell reproduction.*

SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

- c. Relate important structural changes to key functional transitions.*
- d. Dissect representative taxa and describe their internal anatomy and the function of major organ systems and organs and relate to cell specializations.*

AG-ASB-15 The student describes nutrient sources and functions as they relate to monogastric and ruminant agricultural animals.

- a. Explain the role of essential nutrients in the growth and development of animals.
- b. Describes the role water plays in supporting animal growth and development.
- c. Discusses the relationship between proteins and amino acids.
- d. Identifies protein feed sources.
- e. Distinguishes between carnivores, omnivores, and herbivores and gives examples.
- f. Explains the role and importance of protein, carbohydrates, and fats in the diets of animals.
- g. Identifies types of common sugars and their role in animal nutrition.
- h. Identifies the common grains that are used as a source of carbohydrates.
- i. Distinguishes between concentrates and roughages and gives examples of each.
- j. Infers the appropriate use of animal rations based on their fat, mineral, vitamin, roughages, starches, and protein content.
- k. Discusses the role that minerals play in animal growth and development.
- l. Demonstrates the use of chemical tests to indicate the presence of nutrients.
- m. Distinguishes between a monogastric and a ruminant digestive system.
- n. Compares and contrast the function of the organs of monogastric and ruminant digestive systems.
- o. Classifies agricultural animals as monogastrics or ruminants and describes the type of feed used for each one.

Academic Standards:

SB1. Students will analyze the nature of the relationships between structures and functions in living cells.

- c. Identify the function of the four major macromolecules (i.e., carbohydrates, proteins, lipids, nucleic acids)*
- d. Explain the impact of water on life processes (i.e., osmosis, diffusion).*

SES6. Students will explain how life on Earth responds to and shapes Earth systems.

- a. Relate the nature and distribution of life on Earth, including humans, to the chemistry and availability of water.*

AG-ASB-16 The student investigates the physiological and chemical properties of meat products and preservation.

- a. Describes the physiological processes that take place in the animal's body at death.
- b. Explains the steps in the slaughter of meat animals.
- c. Describes the biological process of ossification.
- d. Estimates the marbling of beef.
- e. Explains the value of high versus low yield grades.
- f. Calculates the quality and yield grades for beef.
- g. Identifies the wholesale and retail cuts of beef, pork, and lamb.
- h. Explains the different types of tissues that compose muscles.
- i. Describes the factors that affect the palatability of meats and the sensation of taste.
- j. Describes the importance of meat to the human diet.
- k. Evaluates the value of nutrients provided by meat.
- l. Relates factors that favor the growth of microbes with the types of microbes that cause spoilage of meat products.
- m. Researches the scientific principles involved in meat preservation.
- n. Demonstrates the preservation of meat products using various curing methods.

Academic Standards:

SSEMI2 The student will explain how the Law of Demand, the Law of Supply, prices, and profits work to determine production and distribution in a market economy.

- a. Define the Law of Supply and the Law of Demand.*

AG-ASB-17 The student describes the effects, development, and control of parasites in agricultural animals.

- a. Explains symbiotic relationships.
- b. Distinguishes between mutualism, commensalism, and parasitism.
- c. Discusses how parasitism causes harm to the host animal.
- d. Identifies parasites of agricultural animals and matches the parasite to the host.
- e. Estimates production losses due to parasites of agricultural animals.
- f. Diagrams the phases of a parasite's life cycle and identifies how knowledge of life cycle can be used to control the parasite.
- g. Differentiates between internal and external parasites.
- h. Explains the conventional means of controlling parasites of agricultural animals.

Academic Standards:

SB4. Students will assess the dependence of all organisms on one another and the flow of energy and matter within their ecosystems.

- a. Investigate the relationships among organisms, populations, communities, ecosystems, and biomes.*

SEV3. Students will describe stability and change in ecosystems.

- e. Describe interactions between individuals (i.e. mutualism, commensalisms, parasitism, predation, and competition).*

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

- c. Explain various life cycles found among animals (e.g., polyp and medusa in cnidarians; multiple hosts and stages in the platyhelminthe life cycle; arthropod metamorphosis; egg, tadpole, adult stages in the amphibian life cycle).*

AG-ASB-18 The student identifies and describes animal diseases, animal immune systems, and disease prevention and control programs.

- a. Relates disease causing organisms to the type of diseases they cause.
- b. Identifies signs and symptoms that are used to recognize and quarantine sick animals.
- c. Determines sources of disease-causing organisms in the environment.
- d. Describes how an animal's immune system works.
- e. Describes how disease vaccines are developed and the success of their uses.
- f. Distinguishes between active and passive immunity.
- g. Differentiates between naturally acquired immunity and artificially acquired immunity.
- h. Differentiates between infectious and noninfectious diseases.
- i. Describes how diseases are spread and prescribes methods to limit infection.
- j. Explains the effects of improper nutrition in the animal's health.
- k. Researches plants that are poisonous to agricultural animals.
- l. Provides examples of government disease-eradication programs.
- m. Describes the effects of zoonotic diseases and steps for their prevention.

Academic Standards:

ELA10RL4 The student employs a variety of writing genres to demonstrate a comprehensive grasp of significant ideas in selected literary works. The student composes essays, narratives, poems, or technical documents. The student

- d. Includes a formal works cited or bibliography when applicable.*

ELA10RL1 The student understands and acquires new vocabulary and uses it correctly in reading and writing. The student

- b. Uses general dictionaries, specialized dictionaries, thesauruses, or related references as need to increase learning.*

SB3. Students will derive the relationship between single-celled and multi-celled organisms and the increasing complexity of systems.

- c. Compare how structures and function vary between the six kingdoms (archaebacteria, eubacteria, protists, fungi, plants, and animals).*
- d. Compare and contrast viruses with living organisms.*

AG-ASB-19 The student becomes oriented to the comprehensive program of agricultural education, learns to work safely in the agriculture lab and work sites, demonstrates selected competencies in leadership through the FFA and agricultural industry organizations, and develops plans for a supervised agricultural experience program.

- a. Explains the role of the Agriculture Education program and the FFA in personal development.
- b. Demonstrates knowledge learned through a Supervised Agricultural Experience Program (SAEP).
- c. Develops leadership and personal development skills through participation in the FFA.
- d. Explores career opportunities in animal science through the FFA and Agriculture Education Program.
- e. Explores the professional agricultural organizations associated with the course content.

Academic Standards:

ELA10CI The student demonstrates understanding and control of the rules of the English language, realizing that usage involves the appropriate application of conventions and grammar in both written and spoken formats. The student

- a. Demonstrates an understanding of proper English usage and control of grammar, sentence and paragraph structure, diction, and syntax.*
- b. Correctly uses clauses (i.e., main and subordinate), phrases (i.e., gerund, infinitive, and participial), and mechanics of punctuation (i.e., end marks, commas, semicolons, quotation marks, colons, ellipses, hyphens).*
- c. Demonstrates an understanding of sentence construction (e.g., subordination, proper placement of modifiers, parallel structure) and proper English usage (i.e., consistency of verb tenses, agreement).*

ELA10LSV1 The student participates in student-to-teacher, student-to-student, and group verbal interactions. The student

- d. Actively solicits another person's comments or opinion.*

- e. Offers own opinion forcefully without domineering.*
- f. Contributes voluntarily and responds directly when solicited by teacher or discussion leader.*
- g. Gives reasons in support of opinions expressed.*
- i. Employs group decision-making techniques such as brainstorming or a problem-solving sequence (i.e., recognizes problem, defines problem, identifies possible solutions, selects optimal solution, implements solution, evaluates solution).*

Co-Requisite – Characteristics of Science

Habits of Mind

SCSh2. Students will use standard safety practices for all classroom laboratory and field investigations.

- a. Follow correct procedures for use of scientific apparatus.
- b. Demonstrate appropriate technique in all laboratory situations.
- c. Follow correct protocol for identifying and reporting safety problems and violations.

SCSh3. Students will identify and investigate problems scientifically.

- a. Suggest reasonable hypotheses for identified problems.
- b. Develop procedures for solving scientific problems.
- c. Collect, organize and record appropriate data.
- e. Develop reasonable conclusions based on data collected.
- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

SCSh4. Students use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

- a. Develop and use systematic procedures for recording and organizing information.
- b. Use technology to produce tables and graphs.
- c. Use technology to develop, test, and revise experimental or mathematical models.

SCSh5. Students will demonstrate the computation and estimation skills necessary for analyzing data and developing reasonable scientific explanations.

- a. Trace the source on any large disparity between estimated and calculated answers to problems.
- b. Consider possible effects of measurement errors on calculations.

SCSh6. Students will communicate scientific investigations and information clearly.

- a. Write clear, coherent laboratory reports related to scientific investigations.
- b. Write clear, coherent accounts of current scientific issues, including possible alternative interpretations of the data.
- c. Use data as evidence to support scientific arguments and claims in written or oral presentations.

- d. Participate in group discussions of scientific investigation and current scientific issues.

The Nature of Science

SCSh7. Students analyze how scientific knowledge is developed.

Students recognize that:

- a. The universe is a vast single system in which the basic principles are the same everywhere.
- b. Universal principles are discovered through observation and experimental verification.
- c. From time to time, major shifts occur in the scientific view of how the world works.
- d. More often, however, the changes that take place in the body of scientific knowledge are small modifications of prior knowledge. Major shifts in scientific views typically occur after the observation of a new phenomenon or an insightful interpretation of existing data by an individual or research group.
- e. Hypotheses often cause scientists to develop new experiments that produce additional data.
- f. Testing, revising, and occasionally rejecting new and old theories never ends.

SCSh8. Students will understand important features of the process of scientific inquiry.

Students will apply the following to inquiry learning practices:

- a. Scientific investigators control the conditions of their experiments in order to produce valuable data.
- b. Scientific researchers are expected to critically assess the quality of data including possible sources of bias in their investigations' hypotheses, observations, data analyses, and interpretations.
- c. Scientists use practices such as peer review and publication to reinforce the integrity of scientific activity and reporting.
- d. The merit of a new theory is judged by how well scientific data are explained by the new theory.
- e. The ultimate goal of science is to develop an understanding of the natural universe which is free of biases.
- f. Science disciplines and traditions differ from one another in what is studied, techniques used, and outcomes sought.

Reading Across the Curriculum

Reading Standard Comment

After the elementary years, students engage in reading for learning. This process sweeps across all disciplinary domains, extending even to the area of personal they experience text in all genres and modes of discourse. In the study of various disciplines of learning (language arts, mathematics, science, social studies), students must learn through reading the communities of discourse of each of those disciplines. Each subject has its own specific vocabulary, and for students to excel in all subjects, they must learn the specific vocabulary of those subject areas in context.

Beginning with the middle grades years, students begin to self-select reading materials based on personal interests established through classroom learning. Students become curious about science, mathematics, history, and literature as they form contexts for those subjects related to their personal and classroom experiences. As students explore academic areas through reading, they develop favorite subjects and become confident in their verbal discourse about those subjects.

Reading across curriculum content develops both academic and personal interests in students. As students read, they develop both content and contextual vocabulary. They also build good habits for reading, researching, and learning. The Reading Across the Curriculum standard focuses on the academic and personal skills students acquire as they read in all areas of learning.

Students will enhance reading in all curriculum areas by:

- a. Reading in all curriculum areas
 - Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas.
 - Read both informational and fictional texts in a variety of genres and modes of discourse.
 - Read technical texts related to various subject areas.
- b. Discussing books
 - Discuss messages and themes from books in all subject areas.
 - Respond to a variety of texts in multiple modes of discourse.
 - Relate messages and themes from one subject area to messages and themes in another area.
 - Evaluate the merit of texts in every subject discipline.
 - Examine author's purpose in writing.
 - Recognize the features of disciplinary texts.
- c. Building vocabulary knowledge
 - Demonstrate an understanding of contextual vocabulary in various subjects.
 - Use content vocabulary in writing and speaking.
 - Explore understanding of new words found in subject area texts.
- d. Establishing context
 - Explore life experiences related to subject area content.
 - Discuss in both writing and speaking how certain words are subject area related.
 - Determine strategies for finding content and contextual meaning for unknown words.

CTAE Foundation Skills

The Foundation Skills for Career, Technical and Agricultural Education (CTAE) are critical competencies that students pursuing any career pathway should exhibit to be successful. As core standards for all career pathways in all program concentrations, these skills link career, technical and agricultural education to the state's academic performance standards.

The CTAE Foundation Skills are aligned to the foundation of the U. S. Department of Education's 16 Career Clusters. Endorsed by the National Career Technical Education Foundation (NCTEF) and the National Association of State Directors of Career Technical Education Consortium (NASDCTEc), the foundation skills were developed from an analysis of all pathways in the sixteen occupational areas. These standards were identified and validated by a national advisory group of employers, secondary and postsecondary educators, labor associations, and other stakeholders. The Knowledge and Skills provide learners a broad foundation for managing lifelong learning and career transitions in a rapidly changing economy.

CTAE-FS-1 Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.

CTAE-FS-2 Academic Foundations: Learners achieve state academic standards at or above grade level.

CTAE-FS-3 Communications: Learners use various communication skills in expressing and interpreting information.

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

CTAE-FS-5 Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.

CTAE-FS-6 Systems: Learners understand a variety of organizational structures and functions.

CTAE-FS-7 Safety, Health and Environment: Learners employ safety, health and environmental management systems in corporations and comprehend their importance to organizational performance and regulatory compliance.

CTAE-FS-8 Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

CTAE-FS-9 Ethics and Legal Responsibilities: Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

CTAE-FS-10 Career Development: Learners plan and manage academic-career plans and employment relations.

CTAE-FS-11 Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.