Escondido Union High School District

Animal Biological Science

EUHSD Board Approval Date: 3/9/2021
(Updated Instructional Materials and Name change 4/1/22)
The EUHSD Animal Biological Science curriculum document identifies what students should be able to know and do in a comprehensive standards-based agricultural science course of study. The curriculum document is updated annually based on student academic achievement data, research and best practices, and input from stakeholders. The EUHSD curriculum document contains the following documents and/or information:

A. Course Description
B. Course Guidelines/Requirements - graduation credit information, transcript information, adopted materials, adopted technology, assessment outline
C. Instructional Materials References
D. Scope and Sequence Map with Essential Standards outlined by Unit
E. References to key essential design and implementation documents

The EUHSD Agriculture program is designed to meet both the California Content Standards for specific disciplines and to address key California Career Technical Education standards for specific industry sector pathways. The Animal Biological Science course was designed as a key course within the Agriculture and Natural Resources pathway, but also serves as a foundational “D” laboratory science course in the agriculture program. The curriculum document was written to address both pathway and overarching anchor standards as well as key Next Generation Science Standards.

Escondido Union High School District – Mission
Empowering every student to graduate prepared for college, career, and life through excellence in learning.

Escondido Union High School District – Vision
We relentlessly pursue, with optimism, equitable support for all students to navigate a changing world by providing rigorous and relevant learning experiences that strengthen their capacity as:

• Open-minded and invested collaborators;
• Effective and thoughtful communicators;
• Resourceful and creative problem solvers;
• Curious and analytical critical thinkers;
• Informed and compassionate community members.

Curriculum Design Resources
The curriculum document is aligned to the California Next Generation Science Standards and serves to support outcomes evidenced in the College and Career Readiness Standards for students in grades 9-12. A detailed list of resources around which the EUHSD curriculum is designed is as follows:

5. CTE Online: [https://www.cteonline.org/outlines/qq5dxj/animal-science-cte-online-model](https://www.cteonline.org/outlines/qq5dxj/animal-science-cte-online-model)
6. California Agricultural Education: [https://www.calaged.org/](https://www.calaged.org/)

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Office: (760) 291-3281, Email: cgoode@euhsd.org
Animal Biological Science Course Description

Animal Biological Science is a project-based course designed to prepare students for postsecondary education and/or employment in the Animal Science industry. Students will be introduced to the basic concepts and principles that govern animal nutrition, growth, health, reproduction, and genetics, as well as practical commercial applications, such as ration formulation, disease prevention, and artificial insemination. An essential part of this course will be leadership activities and the Supervised Agriculture Experience project. The appropriate use of technology and industry-standard equipment is an integral part of this course. Competencies in this course are aligned with the California Science Framework, the Common Core State Standards, and the California Career Technical Education Model Curriculum Standards. This is the first course in a pathway of courses designed to engage students and develop college and career readiness skills within the Agriculture and Natural Resources industry sector.

The EUHSD agricultural education program is made up of three integrated parts: classroom instruction, FFA and a supervised agricultural experience (SAE). In this course students are provided opportunities for leadership development, personal growth and career success. Agricultural education instruction is delivered through three major components: Classroom/Laboratory instruction (contextual learning), Supervised Agricultural Experience programs (work-based learning), and student leadership organizations. The SAE is a required component of our agricultural education program and intended for every student. Through their involvement in the SAE program, students consider multiple careers and occupations, learn expected workplace behavior, develop specific skills within an industry, and are given opportunities to apply academic and occupational skills in the workplace or a simulated workplace environment. As part of students' agricultural coursework, they build and maintain a Record Book and Coursework Portfolio in which they will store artifacts and industry-related certificates, awards, etc. related to FFA leadership and Supervised Agricultural Experiences.

Course Requirements

<table>
<thead>
<tr>
<th>Course Length: Year Long</th>
<th>Grade Level: 9-12</th>
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<tbody>
<tr>
<td>UC/CSU Requirement:</td>
<td>Meets UC/CSU “D” lab science (biological science) requirements</td>
</tr>
<tr>
<td>Graduation Requirement:</td>
<td>Meets EUHSD Biological Science Requirement or CTE Requirement or Elective Credit</td>
</tr>
<tr>
<td>Course Numbers (Semester A):</td>
<td>5715 5717 (updated 2/7/22)</td>
</tr>
<tr>
<td>Transcript Abbreviations (Semester A):</td>
<td>ANIMAL BIO SCI A (P) (updated 2/7/22)</td>
</tr>
<tr>
<td>Course Numbers (Semester B):</td>
<td>5716 5718 (updated 2/7/22)</td>
</tr>
<tr>
<td>Transcript Abbreviations (Semester B):</td>
<td>ANIMAL BIO SCI B (P) (updated 2/7/22)</td>
</tr>
<tr>
<td>Credits (Semester A): 5 Biological Science</td>
<td>Credits (Semester B): 5 Biological Science</td>
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<tr>
<td>Required Prerequisite/s:</td>
<td>None</td>
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<tr>
<td>Board Approval Date (Curriculum): 3/9/2021</td>
<td>Board Approval Date (Materials):</td>
</tr>
<tr>
<td>Core Instructional Materials: This course uses Open Educational Resources (OERs) in order to access current digital libraries that are pivoting rapidly to industry needs.</td>
<td>Supplemental Instructional Materials:</td>
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<td></td>
<td><a href="https://www.calaged.org">https://www.calaged.org</a></td>
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<td><a href="https://www.cteonline.org/">https://www.cteonline.org/</a></td>
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<tr>
<td>Technology Resource/s:</td>
<td>Class set of chrome books and/or access to a computer lab when applicable (see specific units of study)</td>
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<td>Probeware</td>
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<tr>
<td>Assessment/s: Completion of required unit assessments as outlined in the Scope and Sequence Guide</td>
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Meeting the Needs of ELs:

- Utilize the student information system to acquire the language levels of EUHSD English Learners.
- In 2012, the CA Department of Education adopted new language level proficiency descriptors and new EL state standards. Visit the following website to learn more about those new descriptors and corresponding standards: [http://www.cde.ca.gov/sp/el/er/documents/eldstdspublication14.pdf](http://www.cde.ca.gov/sp/el/er/documents/eldstdspublication14.pdf)
- In 2014, the CA Department of Education adopted new ELA-ELD Framework, with specific strategies designed to meet the needs of EL students. Visit the following URL to learn more about the new frameworks: [http://www.cde.ca.gov/ci/rl/ef/documents/elaeldfwchapter11.pdf](http://www.cde.ca.gov/ci/rl/ef/documents/elaeldfwchapter11.pdf)

Animal Biological Science Scope and Sequence Guide

The Scope and Sequence Guide is a California standards-based document that delineates the standards-based skills students are expected to know and do in order to meet College and Career Readiness expectations outlined within the California Next Generation Science Standards. Each unit of study in the Scope and Sequence document is designed to build upon the previous unit and/or prerequisite coursework in support of student mastery of specific standards-based skills. The Scope and Sequence document provides the framework of understanding for key assignments, key assessments, and instructional resources and strategies that serve to assist students in meeting unit learning objectives. EUHSD teachers will meet annually to review and refine the curriculum. The Scope and Sequence document provides references to timeframes for unit implementation.
Animal Biological Science Scope and Sequence
Pre-Unit – Introduction to Agriculture Program /FFA/SAE Projects

Unit Description: All students enrolled in the EUHSD’s Agriculture pathway sequence of courses will be expected to participate in the FFA organization and activities as a vital part of the EUHSD agriculture program. This pre-unit of study is designed to take approximately one to two weeks and covers the following essential topics; Introduction to Class, Introduction to Agriculture/FFA, Laboratory Safety and Use of Facilities. Students should be familiar with the concepts and requirements of the FFA organization from their experience in the year-1 course.

Transfer Goals:
- CTE
  - Work effectively in teams by committing to producing a quality product, taking responsibility for individual roles and timelines, and examining the overall result.
  - Explore various career options and prepare to compete in a marketplace through ongoing training, experience, and certification.
  - Demonstrate knowledge of safety rules and practices to prevent harm.
- Science
  - Obtain and evaluate relevant, valid, and reliable sources of information in order to effectively communicate through various methods.

Understandings:
- Future Farmers of America (FFA) is a dynamic organization that aims to change lives and prepare members for premier leadership, personal growth and career success through agricultural education.
- Laboratory investigations can be used to inform decisions in agricultural fields.

Essential Questions:
- What is the Future Farmers of America (FFA)?
- How will Supervised Agricultural Experiences (SAE) help me identify future careers?

Unit Standards:
California CTE Anchor Standards:
- Communications - Language Standard: Acquire and accurately use general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the (career and college) readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. (LS 9-10, 11-12.6)
- Problem Solving and Critical Thinking - Writing Standard: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem, narrow or broaden the inquiry when appropriate, and synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (WS 11-12.7)
- Demonstration and Application - Demonstrate and apply the knowledge and skills contained in the industry-sector anchor standards, pathway standards, and performance

Learning Objectives:
Knowledge and Skills:
- Identify key safety features within the lab setting and utilize key safety equipment when participating in lab activities.
- State the requirements of participation in the FFA program and the location of key resources such as the FFA Handbook.
- Apply technology appropriately to conduct online research.
- Synthesize ideas and present to others.
- Practice time management skills and demonstrate an effective time management strategy.
- Identify key classroom expectations for learning and participating in individual, small group, and large group activities.

Performance Tasks:
- History of FFA: Students will participate in an introductory exploration of the historical background of the FFA organization and share their understanding with their peers. Students in Year 2 of the FFA program will be able to complete this task in a shorter period of time. Students will utilize the FFA online website to conduct research on all of the requirements of participation in the FFA program, including a comprehensive review of the FFA Handbook Requirements. Students will set up their handbook electronically. Regardless of year 1 or 2, all students will need to complete this assignment.
- Laboratory Safety: Students will review all the lab spaces within the classroom and outside spaces and identify key equipment and the safety features for operation. Students will identify the key lab safety requirements and be able to articulate the required safety features for participating in any lab or use of equipment. The lab safety test is required each year for students to participate in the indoor and outdoor lab
• **Supervised Agricultural Experience (SAE):** In this task, students will plan and conduct an agricultural experiment using the scientific process. The purpose of the experiment is to provide students “hands-on” experience in verifying, learning, or demonstrating scientific principles in agriculture, discovering new knowledge, and using the scientific process. Students will begin by developing a 1-2-page proposal outlining their plans for their SAE. Students will be required to spend a minimum of 10 hours outside of class and keep record of hours spent on the project. Students will communicate their results in a formal lab format that presents their results in text and graphic form, an explanation of their results, and a conclusion.
Unit Description: Animal agriculture is present throughout the United States and provides humans with a variety of uses and products. People depend upon animals as a source of protein for a variety of diets, to provide fiber for clothing, as entertainment and recreation, and more.

Transfer Goals:
- CTE
  - Evaluate how business choices impact economic, cultural, and environmental factors to guide decision-making.
  - Understand a problem and work to solve it by asking questions, researching information, and testing out ideas until resolved.
- Science
  - Develop, use, and refine models that represent ideas and communicate relationships to make predictions towards understanding phenomena.
  - Construct and revise explanations about relevant phenomena supported by multiple sources of evidence.

Understandings:
- Humans depend on the living world for the resources and other benefits provided by biodiversity.
- Evaluating solutions for production animals requires taking into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts.

Essential Questions:
- How does using an organized notebook improve agricultural practices?
- What are the roles of the different industries within agriculture?

Learning Objectives:
Knowledge and Skills:
- Explain the relationships of organisms within ecosystems (food webs and food chains) by using or making a model.
- Identify the transfer of energy and matter between trophic levels (ecological pyramids) by using mathematical representation of the food web.
- Explain how different factors affect biodiversity and populations by using graphical models.

Performance Tasks:
- Production Animal Management Guide: After an introduction to the animal industry, students will identify a production animal to research throughout the course in the development of a Producer's Management Guide. In this project, students will be creating a management plan for an animal-related enterprise. The management plan will cover topics from the designing of facilities to nutrition and health management using data and research gathered through literature review and inquiry projects over the duration of the course. The project is designed to encourage organization, critical thinking, and synthesis of Animal Biological Science course content using a variety of assessments for students to develop a comprehensive management guide.

Animal Behavior: Observation is a key skill set for those working in the animal care field. In this lab activity, students will design an experiment focusing on observing and comparing traits of animal behavior in domesticated animals. Preliminary work will include an exploration of the difference between an instinct and a learned behavior. Students will then list behaviors observed and comment on whether that behavior was instinctual or learned.
options for agricultural products and services.

**CA Animal Science Pathway Standards:**

- D3.2 Develop efficient procedures to produce consistently high-quality animals that are well suited for their intended purposes.
- D3.3 Relate the importance of animal organs to the health, growth, and reproduction of animals.

Examples of research projects include comparing mothering abilities between species or observing pecking order in chickens. Students will use readily available live cameras in production agriculture facilities online to collect their data. Their results and findings will be submitted in a formal lab report that presents their results in text and graphic form, an explanation of their results, and a conclusion.
# Animal Biological Science
## Unit 2.1 – History and Domestication

**Unit Description:** The interaction between animals and people has been essential to human survival. As people moved from a culture of hunter-gatherers to a more agrarian society, taming animals to work was an adaptation that provided benefits to humans. The domestication of animals and plants led to structured civilizations, growing populations, and the advent of production agriculture. There are six characteristics an animal must have that allow a species to be domesticated: diet, growth rate, ability to breed in captivity, disposition, temperament, and social hierarchy. Taming an animal is different than domesticating it. Often individuals of a species can be tamed but their offspring will retain wild traits and taming does not involve the entire species. Domestication involves all the characteristics and the entire species. In this lesson, students explore the characteristics that allow a species to be domesticated as well as trace the history of a specific domesticated animal. The domestication and continued development of farm animals allows livestock producers of today to feed a growing world population.

**Transfer Goals:**
- **CTE**
  - Demonstrate knowledge of safety rules and practices to prevent harm.
  - Explore and refine techniques, skills, methods, and processes to create and innovate in an industry.
- **Science**
  - Analyze and interpret data by identifying significant patterns and trends that support valid scientific claims.

**Understandings:**
- The domestication of animals and plants led to structured civilizations, growing populations, and the advent of production agriculture.
- Six characteristics of animals (i.e., diet, growth rate, ability to breed in captivity, disposition, temperament, and social hierarchy) all determine whether a species can be domesticated.
- There are numerous mechanisms that cause evolution within a population that affect the survival or extinction of a species.

**Essential Questions:**
- Why are animals domesticated?
- What are the causes and evidence of evolution?
- Why is evolution important to living things?
- How have human lives changed through the domestication of animals?

**Unit Standards:**
- **California CTE Anchor Standards:**
  - **Communications - Language Standard:** Acquire and accurately use general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the (career and college) readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. (LS 9-10, 11-12.6)
  - **Ethics and Legal Responsibilities - Speaking and Listening Standard:** Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the work. (SLS 11-12.1d)

**Learning Objectives:**
- **Knowledge and Skills:**
  - Define terms such as domestication, ruminant, animal husbandry, and animal science.
  - Create a simple timeline illustrating the domestication of basic livestock species.
  - Identify four main sciences involved in animal sciences.
  - Describe three to four important events in U.S. animal agriculture history.
  - Identify five contributions that animal agriculture makes to society.
  - Identify the top producing countries for beef, sheep, swine, poultry, and horses in the world.

**Performance Tasks:**
- **Livestock Species Research:** Students will complete a research based on a species of livestock. They will research domestication of the animal, economic impact, and common production practices of this species. They will then design a facility for optimal production of this species in the school farm setting. Students will present their work in a multimedia format for peer review.
### NGSS Performance Expectations:
- **HS-ETS1-2**: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
- **HS-LS4-1**: Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
- **HS-LS4-4**: Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
Unit Description: Plants and animals typically have both a common and scientific name. Common names vary across regions and languages of the world. These variations caused a need for a standard classification system and led to a hierarchical organizational system developed by Carolos Linnaeus. This system assisted in the development of a standard naming system called binomial nomenclature. While scientific classification is useful in species identification and provides a standard naming system, other classification systems are used to sort and identify animals based on their use, purpose, anatomy, physiology, and breed. Another way to identify living organisms is using dichotomous keys. A dichotomous key is a series of yes or no questions leading you to an organism by identifying physical characteristics. In this unit, students will use classification systems to identify and sort objects. Students will determine how living organisms are separated. Students will research the classification of the animal chosen their Producer’s Management Guide and learn about dichotomous keys while researching livestock breeds.

Transfer Goals:
- CTE
  - Communicate effectively based on who you are talking to, what message you need to share, and what method (e.g., phone call, email, written report) using industry-standard vocabulary.
- Science
  - Obtain and evaluate relevant, valid, and reliable sources of information in order to effectively communicate through various methods.

Understandings:
- Naming systems and classification tools support the organization and production of breeds.
- The development of livestock breeds is a different process than the mechanism of natural selection, which results in the natural evolution of species in nature.

Essential Questions:
- What is taxonomy?
- How was binomial nomenclature developed?
- Why were breeds developed?

Unit Standards:

California CTE Anchor Standards:
- Communications - Language Standard: Acquire and accurately use general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the (career and college) readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. (LS 9-10, 11-12.6)
- Technical Knowledge and Skills - Writing Standard: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. (WS 11-12.6)

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

Learning Objectives:
- Identify the different breeds of livestock based upon their physical characteristics.
- Classify the species of the animals into the different taxonomy.
- Identify the history of where the breeds were developed and how they have stayed true to their characteristics.
- Compare and contrast the different breeds and their meat, dairy, or fiber production.

Performance Tasks:
- Dichotomous Key: In addition to defining and illustrating the classification of the animal for the student's Producer's Management Guide, students will develop a dichotomous key for 5 breeds of an animal species. A dichotomous key is a systematic approach to identification that asks a series of yes or no questions that become increasingly more specific. After synthesizing information from a presentation about dichotomous keys and animal breed classification, students will work with a partner to develop a dichotomous key. Each group will research 5 common breeds for their assigned production animal, classify them using a dichotomous key system, and create a poster portraying the classification of the breeds. The process of question-making to classify similar breeds encourages student critical thinking and scientific observation skills for model creation.
### Agriculture and Natural Resources Pathway Standards:

### CA Animal Science Pathway Standards:
- D5.1 Evaluate a group of animals for desired qualities and discern among them for breeding selection.
- D5.2 Select animals, based on quantitative breeding values, for specific characteristics.
Unit Description: The care, handling, and use of animals are contentious issues in the United States today. Individuals have solid beliefs and values based on animal welfare and animal rights. Two main philosophies about the care of animals are prevalent in our society. Animal welfare is the belief that animals deserve to be well cared for but should be used for the benefit of humans. Animal rights is the belief that animals have the same rights as human beings and should not be used to benefit humans. In this unit, students discuss animal welfare and research animal handling issues related to the care and production of animals. Students are encouraged to reflect upon their personal beliefs and the values of others, relate those beliefs and values to their own thinking, and learn to express their views in a non-confrontational manner. Students involved in any facet of animal production must be aware of animal welfare issues.

Transfer Goals:
- CTE
  - Understand a problem and work to solve it by asking questions, researching information, and testing out ideas until resolved.
  - Explore and refine techniques, skills, methods, and processes to create and innovate in an industry.
- Science
  - Engage in productive argumentation using evidence to explain phenomena, challenge ideas, and propose solutions to problems.

Understandings:
- Animal welfare is the belief that animals deserve to be well cared for in their use to benefit humans.
- Animal rights is the belief that animals have the same rights as humans.

Essential Questions:
- How do personal beliefs and values affect an individual’s perception of animal use?
- Who decides what is the proper standard of care for an animal?
- Why are there dilemmas for producers and consumers concerning the use of animals?

Unit Standards:
California CTE Anchor Standards:
- Career Planning and Management - Speaking and Listening Standard: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. (SLS 11-12.2)
- Problem Solving and Critical Thinking - Writing Standard: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem, narrow or broaden the inquiry when appropriate, and synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (WS 11-12.7)
- Ethics and Legal Responsibilities - Speaking and Listening Standard: Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine

Learning Objectives:
Knowledge and Skills:
- Communicate information to the public about animal agricultural practices.
- Identify relevant regulations and laws that govern the humane use of animals.
- Create a code of care guide for animal agriculture producers.

Performance Tasks:
- Key Animal Issues: When using animals in agriculture, issues sometimes arise. Key issues in animal agriculture include animal research, antibiotics and growth hormones, genetic modifications, confinement operations, manure and odor, meat consumption, and slaughter practices. All of these issues have positive effects or producers would not use them. Due to misconceptions in agriculture, producers need to provide correct information to the public in order for people to make educated decisions on animal issues. One key assignment of this unit is the production of an informative flyer about a key issue in animal agriculture. Students will work with a partner to research an assigned issue, including positive and negative effects of the issue, misconceptions about the issue, reports of abuse/cruelty related to the issue, and predictions of what might happen if the practice is stopped. In addition to gaining a worldview about animal issues, students will synthesize research techniques and develop digital design techniques by creating a flyer using graphic design.
- Animal Welfare: Another key project from this unit addresses
what additional information or research is required to deepen the investigation or complete the work. (SLS 11-12.1d)

**NGSS Performance Expectations:**
- **HS-ETS1-3:** Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
- **HS-LS2-6:** Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions but changing conditions may result in a new ecosystem.

**Agriculture and Natural Resources Pathway Standards:**

**CA Animal Science Pathway Standards:**
- **D1.2** Select habitat and housing conditions and materials, such as indoor and outdoor housing, fencing materials, air flow/ventilation, and shelters, to meet the needs of various animal species.
- **D1.3** Interpret animal behaviors and execute protocols for safe handling of animals.
- **D1.4** Defend the purpose and the safe and humane use of animal husbandry tools, such as hoof trimmers, electric shears, elastrators, dehorning tools, and scales.
- **D9.3** Summarize federal and state animal welfare laws and regulations, such as those dealing with abandoned and neglected animals, animal fighting, euthanasia, and medical research.

animal welfare regulations. There are federal regulations, state laws, ethical guidelines, and personal beliefs that define and govern the humane and correct use of animals. These regulations and guidelines are there to protect animals from being subjected to cruel and harmful treatment. For this project, students will review an article of possible animal abuse and critique the story using proper annotation. Further, the student will create a "Code of Care" for their Producers Management Guide animal. This document, using proper APA format, will address: provisions for feed, water, and habitat; health care and expectations; handling procedures or expectations; transportation and harvesting practices; use in education and research; demonstrating and promoting a positive perception of animal agriculture.

- **Animal Regulations and Guidelines:** Regulations, state laws, ethical guidelines, and personal beliefs that define and govern the humane and correct use of animals. These regulations and guidelines are there to protect animals from being subjected to cruel and harmful treatment. For this project, students will review an article of possible animal abuse and critique the story using proper annotation. Further, the student will create a "Code of Care" for their Producers Management Guide animal. This document, using proper APA format, will address: provisions for feed, water, and habitat; health care and expectations; handling procedures or expectations; transportation and harvesting practices; use in education and research; demonstrating and promoting a positive perception of animal agriculture.
Animal Biological Science
Unit 3.2 Animal Behavior

Unit Description: The study of animal behavior allows producers to learn how to predict and modify the reactions of animals to a stimulus or their environment. Animals should always be handled with care and caution. Consideration of the safety of both the handler and the animal is important. Understanding the natural tendencies of animals is useful in training and handling. Instinct is the most basic animal behavior. When an animal is exposed to a stimulus they do not recognize, they will react automatically whether it is to fight the stimulus or to turn and run. Instinctive reactions are genetic, and animals do not need to learn to react to danger or a perceived threat. Training will overcome some instinctive behaviors as animals are tamed. When an animal is taught to behave in a particular manner that is a learned behavior. Learned behaviors are taught by people or other animals and assist in safer handling of animals. In this unit, students will study the ways in which animals respond to differences in their environment and the typical behaviors of specific species of animals.

Transfer Goals:
- CTE
  - Understand a problem and work to solve it by asking questions, researching information, and testing out ideas until resolved.
  - Demonstrate knowledge of safety rules and practices to prevent harm.
- Science
  - Engage in productive argumentation using evidence to explain phenomena, challenge ideas, and propose solutions to problems.

Understandings:
- The study of animal behavior allows producers to learn how to predict and modify the reactions of animals to a stimulus or their environment.
- Instinctive reactions are genetic, and animals do not need to learn to react to danger or a perceived threat.

Essential Questions:
- Why do we study animal behavior?
- What are instinctive and learned behaviors?

Unit Standards: California CTE Anchor Standards:
- Communications - Language Standard: Acquire and accurately use general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the (career and college) readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. (LS 9-10, 11-12.6)
- Demonstration and Application - Demonstrate and apply the knowledge and skills contained in the industry-sector anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and the career technical student organization.

NGSS Performance Expectations:
- HS-LS4-4: Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

Learning Objectives:
Knowledge and Skills:
- Identify the various techniques in training domesticated animals.
- Explain the theories behind the behavior by looking at the history of animal behavior.
- Demonstrate proper restraint methods used for restraining livestock.
- Design an environmental facility, that evaluates the animal’s behavior and environmental conditions.

Performance Tasks:
- Response to Stimuli: Students conduct an inquiry lab which investigates the behavior of pillbugs in response to stimuli. Behavior is an observable response to a stimulus from the environment. Behavior is classified into two categories: innate or learned. Innate behavior is inherited and instinctive (inborn) and develops independently of experience with other animals. Learned behavior changes an animal’s behavior because of the animal’s experience with different environments and other organisms. Orientation is one type of behavior and is the ability of an animal to place itself in a favorable environment. Orientation occurs in two ways, taxis and kinesis. Taxis is a deliberate movement toward (positive) or away from (negative) a stimulus. Alternatively, kinesis is a random movement that is not oriented toward or away from a stimulus. These two types of responses are common among animals when reacting to light,
• HS-LS4-3: Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.

Agriculture and Natural Resources Pathway Standards:

CA Animal Science Pathway Standards:
• D1.3 Interpret animal behaviors and execute protocols for safe handling of animals.
• D9.1 Evaluate the early warning signs of animal distress and how to rectify the problem.

sound, touch, heat, or chemicals. Students will collect both qualitative and quantitative data from the development of their own experiment to test the taxis and kinesis of live pillbugs. After creating and executing their own procedure, students will write a formal lab report (typed) that addresses all phases of the scientific process.

• Animal Facilities Brief: As an application of content learned about animal response to stimuli, students will additionally complete an educational brief to be used as a safety and handling guide for individuals visiting animal facilities. This project, done in pairs, will require students to thoroughly research the instinctual and learned behaviors of an assigned animal as well as safe handling and restraint procedures. In addition to creating an informative brief, students will create an annotated reference guide of the resources they used in their project. They will include at least 5 credible resources in APA format as well as a comprehensive paragraph summarizing the reference or article.
Animal Biological Science
Unit 3.3 Environment and Biosecurity

Unit Description: Providing livestock and companion animals with adequate food, shelter, and water is the responsibility of every animal owner. Over the years, the facilities that producers use to fulfill these needs have increased in design and technology to provide carefully controlled environments for animals that maximize production efficiency. Animal housing ranges from a simple windbreak planted alongside a feedlot to computer regulated barns where temperature, humidity, and light are all carefully managed. Producers must take into consideration the optimal production conditions for their animals, balance that with budget constraints, and return on investment. Facility design is similar to creating a floor plan for a house. There should be provisions for feeding, watering, sheltering, bedding, and providing health care in animal housing. A current issue in animal facilities is providing adequate biosecurity measures. While many people think of bio-terrorism in relation to security on farms, there is much more to biosecurity than just that. Many facilities utilize confinement systems where large numbers of animals are kept in close quarters and diseases are easily transmitted. Biosecurity plans include the isolation of new and returning animals to the farm, disease transmission preventative measures for visitors, vaccination and parasite control, and sanitary practices to reduce pathogen spread within groups of animals. In this unit, students will explore livestock needs and how those needs affect facilities and biosecurity measures. This unit builds on previously learned content relating to animal behavior, as animal producers must understand behavior to create the most appropriate animal housing and environment.

Transfer Goals:
• CTE
  o Understand a problem and work to solve it by asking questions, researching information, and testing out ideas until resolved.
  o Demonstrate knowledge of safety rules and practices to prevent harm.
  o Explore and refine techniques, skills, methods, and processes to create and innovate in an industry.
• Science
  o Develop, use, and refine models that represent ideas and communicate relationships to make predictions towards understanding phenomena.
  o Plan and conduct investigations that contribute evidence to explanatory models or support proposals to solutions.

Understandings:
• Producing livestock and companion animals must take into account the optimal production conditions for the animals.
• Farms and natural ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support.

Essential Questions:
• What are the basic needs of animals?
• How does environment influence the design of animal facilities?
• Where does the energy and matter come from that sustains natural ecosystems and farms?

Unit Standards:
California CTE Anchor Standards:
• Leadership and Teamwork - Speaking and Listening Standard: Work with peers to promote civil, democratic discussions and decision making; set clear goals and deadlines; and establish individual roles as needed. (SLS 11-12.1b)

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

Learning Objectives: Knowledge and Skills:
• Research the animals needs and address the environment it lives in.
• Evaluate current facilities and make recommendations to keep the facilities sustainable.
• Design an ideal animal facility and address: manure, disease control, dead animals, and environmental conditions.
• Compare and contrast large operations vs. smaller operations and the livestock needs.

Performance Tasks:
• Controlling Pathogens: Students conduct a lab that simulates various biosecurity risks in animal production facilities. In lab groups, students will be assigned a scenario to test the presence of pathogens in a specific animal operation. They will test various methods of controlling pathogen populations using common methods of HACCP (Hazard Analysis Critical Control Point) in that specific animal production system (i.e. disinfecting shoes before entering confinement facility). Students will collect swabs for prepared petri dish sampling and observe the growth of bacterial populations over a 5-day period. After identifying bacterial colonies based on form, elevation, and margin, students
- **HS-LS2-1**: Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
- **HS-LS2-2**: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

**Agriculture and Natural Resources Pathway Standards:**

**CA Animal Science Pathway Standards:**
- D1.1 Design an animal facility focusing on appropriate space and location requirements for habitat, housing, feed, and water.
- D1.2 Select habitat and housing conditions and materials, such as indoor and outdoor housing, fencing materials, air flow/ventilation, and shelters, to meet the needs of various animal species.
- D7.2 Summarize how rangeland management practices affect pasture production, erosion control, and the general balance of the ecosystem.

| | will develop a written lab report on their findings. They will summarize effective methods of pathogen control for their specific biosecurity scenario. | **Production Facility Model**: Students develop a model animal production facility. Using proper scaling and drafting techniques, students will develop a detailed and accurate plan of an animal production facility for their Producers Management Guide. This facility design will take into consideration the animal's needs for living, shelter, feeding, and health care based on previous student research. Students will create a rough draft of their facility, a final blueprint floor plan, then a 3-D scale model of their facility using any supplies they see fit. |
Animal Biological Science
Unit 4.1 - Cellular Functions

Unit Description: In this lesson, students will review cell organelles and structure introduced in their previously taught biology course. Students will review each cell part and determine the contribution a cell makes to the function of an animal. Students will explore the transfer of molecules in and out of the cell by diffusion and osmosis, as well as how food sources affect cellular respiration. By the conclusion of the unit, students will understand the function of cell parts and the means by which cells produce energy.

Transfer Goals:
- CTE
  - Explore and refine techniques, skills, methods, and processes to create and innovate in an industry.
- Science
  - Develop, use, and refine models that represent ideas and communicate relationships to make predictions towards understanding phenomena.
  - Analyze and interpret data by identifying significant patterns and trends that support valid scientific claims.
  - Obtain and evaluate relevant, valid, and reliable sources of information in order to effectively communicate through various methods.

Understanding:
- Systems of specialized cells within organisms help them perform the essential functions of life.
- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes.

Essential Questions:
- How are cells foundational to life systems?
- What factors affect the correct functioning of the cellular system?
- How and why does an organism maintain homeostasis?

Unit Standards:

<table>
<thead>
<tr>
<th>California CTE Anchor Standards:</th>
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<tbody>
<tr>
<td><strong>Health and Safety</strong> - Reading Standards for Science and Technical Subjects: Determine the meaning of symbols, key words, and other domain-specific words and phrases as they are used in a specific scientific or technical context. (RSTS 9-10, 11-12.4)</td>
</tr>
<tr>
<td><strong>Technical Knowledge and Skills</strong> - Writing Standard: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. (WS 11-12.6)</td>
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<tr>
<th>NGSS Performance Expectations:</th>
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<tbody>
<tr>
<td>HS-LS1-1: Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.</td>
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<tr>
<td>HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific function within multicellular organisms.</td>
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Learning Objectives:

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<thead>
<tr>
<th>Knowledge and Skills:</th>
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<tbody>
<tr>
<td>Identify and explain the basic characteristics of a living things (e.g., cells, homeostasis, evolve, energy, reproduce, respond to the environment, genetics, growth).</td>
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<tr>
<td>Explain and describe the basic structure and function of cells in single (prokaryote) and multicellular organisms (eukaryote).</td>
</tr>
<tr>
<td>Explain that multicellular organisms have a structural organization that has a critical function for the organism (e.g., cells, tissues, organs, organ systems) by using a model.</td>
</tr>
<tr>
<td>Design and perform an experiment to look at the role of homeostasis in multicellular organisms with a focus on basic feedback mechanisms.</td>
</tr>
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</table>

Performance Tasks:

| Metabolic Lab: Students study of metabolic activity of yeast through data collection of cellular respiration. Using LabQuest data collection software and Vernier lab equipment, students will work in pairs to measure the rate of CO2 production of yeast. Students will develop and test different sugar solutions to compare the respiration rate of yeast in various sugar concentrations using a CO2 sensor. Students will produce a lab report of their findings and discuss applications of their findings with regards to cellular activity in animal cells. |
| Simulated Osmosis in Animal Cells: Another lab activity from this unit involves the simulated study of osmosis in animal cells. As a review of diffusion and osmosis, students will work in pairs to simulate the passage of molecules in and out of an animal cell membrane. This experiment involves the use of sugar and starch solutions and their respective indicators (glucose strips and Lugol's solution) to test the movement of these solutes through a semi permeable membrane (dialysis tubing). After setting up the experiment, students will use a Vernier gas pressure sensor to collect osmotic pressure data on the concentration gradient of water over the semi permeable membrane. |
• HS-LS2-3: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
• PE LS1-7: Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

Agriculture and Natural Resources Pathway Standards:

CA Animal Science Pathway Standards:
• D3.1 Compare and contrast animal cells, tissues, organs, and body systems.
• D3.3 Relate the importance of animal organs to the health, growth, and reproduction of animals.

| Plan and carry out investigations that relate to aerobic and anaerobic respiration. |
| Create a model to show how consumers use cellular respiration to: |
| • break down food molecules to transfer energy. (not steps of cellular respiration) |
| • cycle carbon within the biosphere, atmosphere, hydrosphere, geosphere |
| Compare and contrast aerobic vs anaerobic respiration, with a focus on purpose of the process and environmental conditions that lead to the process. |

after a period of time. Lab groups will produce a summary of findings from the experiment.
Animal Biological Science
Unit 4.2 - Animal Anatomy Overview

Unit Description: Animal anatomy is broken into two categories; external parts and internal organs. Knowledge of external parts provides common terminology for animal producers, scientists, and veterinarians to communicate about animal features. Internal organs and the various parts that comprise internal organs share the same importance as external parts; however, unlike external parts that primarily define animal structure and mobility, internal organs of animals have specific life functions as part of physiological systems. Animal systems are responsible for all of the life processes including circulation, digestion, endocrine secretion, excretion, nervous function, reproduction, and respiration. The understanding of internal parts and their functions are relevant for students to piece together how each system completes essential life sustaining processes. In this unit, students will examine common external parts and complete a series of dissections of internal systems found in animals.

Transfer Goals:
- CTE
  - Explore and refine techniques, skills, methods, and processes to create and innovate in an industry.
- Science
  - Develop, use, and refine models that represent ideas and communicate relationships to make predictions towards understanding phenomena.
  - Analyze and interpret data by identifying significant patterns and trends that support valid scientific claims.
  - Obtain and evaluate relevant, valid, and reliable sources of information in order to effectively communicate through various methods.

Understandings:
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and its itself a component of the next level.
- The internal parts of an animal and their functions are essential for life sustaining processes.

Essential Questions:
- How are animal systems organized?
- How would someone in medicine describe location/parts of animals?
- Why does an animal need to maintain homeostasis?

Unit Standards:

California CTE Anchor Standards:
- Problem Solving and Critical Thinking - Writing Standard: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem, narrow or broaden the inquiry when appropriate, and synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (WS 11-12.7)
- Technical Knowledge and Skills - Writing Standard: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. (WS 11-12.6)

NGSS Performance Expectations:
- HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular populations. Describe the interaction of these systems in稳态

Learning Objectives:

Knowledge and Skills:
- Define the life span and maturation of animal and how it relates to the living organism.
- List and explain the stages of life.
- Explore the role that humans have in each of the life stages of agriculturally important animals.
- Explain and understand the basic components of each of the major body systems; circulatory, respiratory, immune, digestive, reproductive, etc.
- Identify important muscle groups in livestock, specifically cattle.

Performance Tasks:
- Fetal Pig: Students dissect a fetal pig to review major external and internal features of monogastric mammal anatomy. As a review of previously learned anatomy content from biology classes, this assignment also serves as a foundation for later units on the major physiological activity of animals. Students must work in pairs to carefully and properly dissect the abdominal, thoracic, and mouth regions of the pig. At each part, students will be required to identify the major organs of the major anatomical systems as well as review the function of those organs. Proper dissection safety will be taught at the beginning of the unit to prepare students for the several dissections included in the anatomy overview.
- Lactation: Students investigate how lactation changes...
organisms.
- **HS-LS1-3:** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

### Agriculture and Natural Resources Pathway Standards:

### CA Animal Science Pathway Standards:
- D3.1 Compare and contrast animal cells, tissues, organs, and body systems.
- D3.2 Develop efficient procedures to produce consistently high-quality animals that are well suited for their intended purposes.
- D3.3 Relate the importance of animal organs to the health, growth, and reproduction of animals.

depending on the age of the animal, the time that has passed since parturition, climate, and other factors. Students will hypothesize the impact these factors have on milk production and then investigate lactation records of a local dairy farm to test their hypothesis. Students will communicate their results in a written lab format that presents their results in text and graphic form, an explanation of their results, and a conclusion.
Animal Biological Science  
Unit 4.3 Circulatory and Respiratory Physiology

**Unit Description:** The respiratory and circulatory systems are two of the most basic systems of life. Without the flow of blood and intake of oxygen, mammals and other vertebrates cannot survive for long. The functions of the respiratory and circulatory systems are closely related in the body. Other body systems that are closely tied to these are the nervous, renal, and endocrine systems. The nervous system is like a mission control center, constantly collecting internal and external information throughout the body and transmitting appropriate bodily responses. The endocrine system is comprised of many glands that secrete chemical messages to organs within the body. These messages aid in maintaining homeostasis and regulating the growth, development, and metabolism of animals. Hormones act on target organs to produce a desired result. The renal or urinary system is the waste management system of cells. The renal system filters wastes produced in the cells out of blood and excretes it from the body. All of these systems work in harmony to maintain the essential processes needed to sustain life. In this unit, students will study the relationships of the nervous, renal, and endocrine systems as well as their connection to the respiratory and circulatory systems.

**Transfer Goals:**
- CTE
  - Explore and refine techniques, skills, methods, and processes to create and innovate in an industry.
- Science
  - Develop, use, and refine models that represent ideas and communicate relationships to make predictions towards understanding phenomena.
  - Analyze and interpret data by identifying significant patterns and trends that support valid scientific claims.
  - Obtain and evaluate relevant, valid, and reliable sources of information in order to effectively communicate through various methods.

**Understandings:**
- The flow of blood and intake of oxygen within respiratory and circulatory systems is essential for animals to survive.

**Essential Questions:**
- How do the respiratory and circulatory systems work together?
- What is the path of flow of blood throughout the body?
- How do the nervous, endocrine, and renal systems relate to other systems and reactions within an animal?

**Unit Standards:**
**California CTE Anchor Standards:**
- **Problem Solving and Critical Thinking** - Writing Standard: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem, narrow or broaden the inquiry when appropriate, and synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (WS 11-12.7)
- **Technical Knowledge and Skills** - Writing Standard: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. (WS 11-12.6)

**NGSS Performance Expectations:**
- HS-LS1-2: Develop and use a model to illustrate the hierarchical

**Learning Objectives:**
**Knowledge and Skills:**
- Identify the part that blood flows through the body.
- Understand the relationship of the CO2 and O2 exchange in the lungs.
- Evaluate the appropriate heart rates and respiratory rates of various common species.
- Understand the role of the kidneys and how they function in the body.

**Performance Tasks:**
- **Response to External Stimuli:** In order to understand the relationships between respiratory, circulatory, renal, and endocrine systems, students will conduct an inquiry lab of their body's response to external activity. Conducting these studies on animals is challenging, so students will test respiration and heart rate on themselves but should realize many domestic animal systems are quite similar to their own. In a team of 3, students will identify a variable to test and outline procedures for testing the effects of that variable change on heart rate, respiratory rate, and blood pressure. Students will use a stethoscope and sphygmomanometer to test these vitals. Upon completion of 3 repetitive trials, students will synthesize and discuss data by producing a formal lab report.
- **Concept Maps:** After conducting their inquiry experiment with
organization of interacting systems that provide specific functions within multicellular organisms.

- HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

**Agriculture and Natural Resources Pathway Standards:**

**CA Animal Science Pathway Standards:**

- D3.1 Compare and contrast animal cells, tissues, organs, and body systems.
- D3.2 Develop efficient procedures to produce consistently high-quality animals that are well suited for their intended purposes.
- D3.3 Relate the importance of animal organs to the health, growth, and reproduction of animals.
- D6.1 Evaluate the signs of normal health in contrast to illness and disease.

human body systems responses, students will design a concept map to depict the processes that occur in the body and how they are connected. This assignment will require students to use concept mapping software to identify the relationship between the different body systems and responses given an animal scenario. The concept maps that students produce will be compared and discussed as a review of physiological connections between the renal, circulatory, nervous, and endocrine systems.
Animal Biological Science
Unit 5.1: Digestive Anatomy

Unit Description: The digestive system is of particular importance to animal producers. Understanding digestion aids in the selection of correct feeds, the efficient use of those feeds, and maintaining healthy animals. The digestive system, or alimentary canal, consists of the parts of the body beginning at the mouth and winding through the body to the anus. As food is digested, nutrients are absorbed in the body to produce energy and carry out essential life functions. Within the system are several organs that differ slightly between species of animals. Ruminant animals, such as cattle, sheep, and goats, have a multi-chambered stomach that allows them to digest high fiber feeds with the bacterial and microbial action in their rumen. After eating, ruminants store food in their reticulum and regurgitate the food to chew it again. Monogastric animals, including pigs, dogs, cats, and humans, have a simple stomach and are not capable of digesting high fiber feeds, such as grass and hay. Horses and rabbits have an enlarged cecum that enables them to digest forages. In this unit, 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.

Transfer Goals:
- CTE: Explore and refine techniques, skills, methods, and processes to create and innovate in an industry.
- Science: Develop, use, and refine models that represent ideas and communicate relationships to make predictions towards understanding phenomena.
  - Analyze and interpret data by identifying significant patterns and trends that support valid scientific claims.
  - Obtain and evaluate relevant, valid, and reliable sources of information in order to effectively communicate through various methods.

Understandings:
- The structure and function of the digestive system supports selection of correct feeds and maintaining healthy animals.

Essential Questions:
- What is the function of the digestive system?
- What is the difference between a monogastric, ruminant, and avian digestive system?

Unit Standards:

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<td><strong>Knowledge and Skills:</strong></td>
</tr>
<tr>
<td><strong>NGSS Performance Expectations:</strong></td>
<td>- Describe the components and functions of the digestive system.</td>
</tr>
<tr>
<td><strong>HS-LS1-2:</strong> Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.</td>
<td>- Plan and conduct an experiment to study how chemicals and/or physical components of the system aid in digestion.</td>
</tr>
<tr>
<td><strong>HS-LS1-3:</strong> Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.</td>
<td>- Develop a model of the digestive system.</td>
</tr>
<tr>
<td><strong>Agriculture and Natural Resources Pathway Standards:</strong></td>
<td>- Explain how the organs of the digestive system help to maintain homeostasis.</td>
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<td></td>
<td>- Research and communicate information on diseases and disorders of the digestive system.</td>
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Performance Tasks:
- **Digestive System Dissection:** As a continuation of the study of animal anatomy and physiology, this unit will expose students to various digestive systems of animals through dissection. Based on availability of dissection specimen, students will dissect a monogastric, avian, and/or ruminant system using proper dissection techniques. The dissection will be inquiry-based, with students guiding each other through the dissection in order to identify and summarize the major anatomical structures of the specimen. They will conclude the dissection with a class discussion of the anatomy of the system and where/how each mechanical, biological, and chemical digestion would occur in the animal.
- **Digestive System Model:** In addition to a written test on major animal digestive systems, students will complete a final project for this unit by creating a model digestive system. Using research and dissection knowledge of different animal digestive systems, students will independently create a model of their assigned
<table>
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<td>• D2.1 Assess the flow of nutrients from the soil, through the animal, and back to the soil.</td>
</tr>
<tr>
<td>• D2.2 Explore the principles for providing proper, balanced rations for a variety of production stages in ruminants and monogastrics.</td>
</tr>
<tr>
<td>• D2.3 Compare the digestive processes of the ruminant, monogastric, avian, and equine digestive systems.</td>
</tr>
<tr>
<td>• D2.4 Distinguish how animal nutrition is affected by the digestive, endocrine, and circulatory systems.</td>
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system. The creativity of the model should depict the unique characteristics of that digestive system as compared to the other systems. Students will label their produced model and compare it to their peers at the completion of the project.
Animal Biological Science
Unit 5.2 Animal Nutrition, Feeding and Nutrition Disorders

Unit Description: When nutritional requirements are not met, animals may become weak, unhealthy, and can eventually die. Digestion is the process by which animals digest and absorb various feedstuffs to provide the body with essential nutrients. Proper nutrition promotes health, growth, production, and resistance against disease. Nutritional needs vary based upon the age of an animal, environmental conditions, and genetic make-up. All animal feeds contain varying concentrations of the six nutrient groups: water, carbohydrates, fats, proteins, minerals, and vitamins. In the wild, animals are constantly searching for food to sustain their needs. However, agricultural animals depend upon their human caretakers for all of their nutritional requirements. In an effort to meet animal needs, rations are balanced according to the specific requirements of an animal. Feeds and the feeding of animals is an important aspect of livestock production. The foundation for properly feeding and caring for animals lies in nutrition. Animals of differing ages and species have different feed requirements. Disorders are caused by improper or inadequate feeding programs and can be managed by providing quality feeds in balanced rations and ensuring access to clean, plentiful water. In livestock production, it is important to meet the nutritional requirements of animals while using the most economical feedstuffs available in order to keep the cost of rations down. Providing animals with correctly balanced rations is important to an animal producer because the effects of overfeeding or underfeeding are harmful to the animals and costly to the producer. Feeding nutrients in excess decreases the profitability of the enterprise. Underfeeding nutrients can lead to weight loss, decreases in weight gain, and an overall decline in health.

Transfer Goals:
• CTE
  o Explore and refine techniques, skills, methods, and processes to create and innovate in an industry.
  o Understand a problem and work to solve it by asking questions, researching information, and testing out ideas until resolved.
  o Demonstrate knowledge of safety rules and practices to prevent harm.
• Science
  o Ask or evaluate testable questions that lead to valid explanations of phenomena and solutions to problems.
  o Analyze and interpret data by identifying significant patterns and trends that support valid scientific claims.

Understandings:
• Digestion is the process by which animals digest and absorb various feedstuffs to provide the body with essential nutrients.
• Proper nutrition promotes health, growth, production, and resistance against disease.
• Nutritional needs vary based upon the age of an animal, environmental conditions, and genetic make-up.

Essential Questions:
• What is nutrition and why is it important to animals?
• How does correct nutrition and rationing of food benefit animals at different stages of production?
• How are animals affected by poor nutrition?

Unit Standards:
California CTE Anchor Standards:
• Problem Solving and Critical Thinking - Writing Standard: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem, narrow or broaden the inquiry when appropriate, and synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (WS 11-12.7)
• Leadership and Teamwork - Speaking and Listening Standard: Work with peers to promote civil, democratic discussions and

Learning Objectives:
Knowledge and Skills:
• Understand how to balance rations and feeds for animals using the computer and Pearson Square methods for their nutritional requirement.
• Develop a “human” feed that meets the lifecycle and needs of the human diet.
• Create a presentation on a species of animals and identify the life stage and the

Performance Tasks:
• Nutritional Needs: After conducting research on major nutritional needs of their Producers Management Guide animal, students will work individually to create a nutritional needs chart for their animal in a specific stage of growth. Students will use an Excel spreadsheet and collect data from the National Academies Press, as well as other text and web resources, to develop a chart with the appropriate nutrient categories for their animal. Minimum Requirements for their specific chart include: animal weight, energy intake, protein intake, minerals, vitamins, and dry matter. Students must produce this chart using proper
decision making; set clear goals and deadlines; and establish individual roles as needed. (SLS 11-12.1b)

- **Technical Knowledge and Skills - Writing Standard**: Use technology, including the Internet, to produce, publish, and update individual or shared written products in response to ongoing feedback, including new arguments or information. (WS 11-12.6)

- **Demonstration and Application - Demonstrate and apply the knowledge and skills contained in the industry-sector anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and the career technical student organization.**

**NGSS Performance Expectations:**

- HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
- HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

**Agriculture and Natural Resources Pathway Standards:**

**CA Animal Science Pathway Standards:**

- D2.1 Assess the flow of nutrients from the soil, through the animal, and back to the soil.
- D2.2 Explore the principles for providing proper, balanced rations for a variety of production stages in ruminants and monogastrics.
- D7.4 Evaluate a plan to balance rangeland use for animal grazing and for wildlife habitat.
- D10.1 Formulate and implement optimum requirements for diet, genetics, habitat, and behavior in the production of large and small animals.

**CA Agribusiness Pathway Standards:**

- A5.4 Maintain appropriate evidence (e.g., Point of Origin, pick/pack dates, production records) to support and defend risk management.
- A5.5 Identify best practices and include in farm planning to reduce risk.

- Understand the nutritional requirements for that animal.
- Understand the differences between monogastric and ruminants' animals and recommend feeding rations.
- Describe how supplements and hormones affect animal production and how to use them properly.
- Understand what the common roughages and how to ‘feed’ them into the season that they are grown.
- Develop a feed that meets the guidelines of a show animal.
- Identify the foods and plants that are toxic to the animals.
- Evaluate and treat accidental poisoning of animals from eating toxic plants or food.
- Evaluate animals based upon their composition and recommend a diet.
- Determine the correct nutritional requirement for the feed by using the math equations.
- Examine the different feeds and determine what feeds are the best for livestock and animals.

- Formulating a Diet: In this assignment, students will work in small groups to design a nutrition regimen for a flock of 120 ewes in poor health in an effort to raise their Body Condition Score (BCS) from 2.75 to 3.5 in two months. Students will use the Pearson Square technique to formulate a supplement diet suitable for this group of sheep to contain 3.12 Metabolizable Energy (ME) and 16% Crude Protein (CP), using 20% brewer’s grain, oat grain, corn, and soybeans. Constraint: Given that supplement feed cannot exceed 30% of daily Dry Matter (DM) intake and daily DM intake is about 3% of Body Weight (BW) on DM basis for each ewe, students will be required to determine how many pounds of each feedstuff will be needed to feed the sheep for the two-month period. Students will communicate their results in a written lab format that presents their results in text and graphic form, an explanation of their results, and a conclusion.

- Net Energy: In this lab, students will explore the net energy produced from feed through the burning of different feedstuffs. Food and feed in the US is commonly measured in calories - the process of burning a portion of feed and capturing the heat released (in a known amount of water) is known as calorimetry. Students will work in pairs to set up a simple calorimetry apparatus and burn an assigned feed sample using proper lab safety. After collecting temperature data, they will calculate the energy content of the food using various algebraic conversions. Students will produce a report which they will share with their classmates to discuss the most efficient feed.

- Feedlot Investigation: In this assignment, students will choose a feedlot and research the layout of the various chutes available. Students will create a detailed list explaining the pros and cons of the specific layout and describe the direct effects to cattle and possible stressors caused by the layout. Finally, students will produce a detailed drawing of the layout along with a sheet documenting the sources used.

- Nutritional Requirements: Students will identify nutritional requirements for maintenance of their mature species, feeds commonly fed to their animal, and three common nutritional disorders with detailed descriptions of the symptoms, causes, effects, and best practices to use in avoiding the disorder. After collecting all information, students will produce a PowerPoint presentation to share their findings with their classmates.

- Computer Based Ration Based Balancing: As a capstone project in this unit, students will use a computer-based ration-balancing program...
to determine a precise ration formulation for the animal in their Producers Management Guide. Based on previous knowledge of feedstuffs and nutritional needs, students will create a palatable, digestible, and economical feed for their animal. This project will also require students to research and include locally available feedstuffs (i.e. local agricultural commodity by products) to be included in their ration. This research will require them to communicate with local feed stores, crop producers, and agricultural resources to identify current commodity and supplement prices.
Unit Description: The reproductive success of breeding stock often determines the profitability of a livestock enterprise. If the livestock are not reproductively sound, they will not produce healthy offspring, and the producer is without a product to market. To begin to understand the reproductive process in any livestock species, it is essential to learn the many intricate parts of the reproductive systems, both male and female, as well as the physiology of these systems. The exploration of the male and female reproductive systems will provide students with foundational information on which to build more in-depth knowledge of livestock reproduction in order to optimize profitability of a livestock operation. By the observing and participating in dissections of reproductive tracts, students will understand the function of the reproductive organs of the female and male.

Transfer Goals:
- CTE
  - Explore and refine techniques, skills, methods, and processes to create and innovate in an industry.
- Science
  - Ask or evaluate testable questions that lead to valid explanations of phenomena and solutions to problems.
  - Obtain and evaluate relevant, valid, and reliable sources of information in order to effectively communicate through various methods.

Understandings:
- The structure and function of reproductive systems in animals impacts the breeding of stock.
- The organs of the endocrine and reproductive systems help maintain homeostasis for animals.

Essential Questions:
- What is the relationship between the reproductive and endocrine systems?
- What are the reproductive stages of animals?
- How can changing the breeding season be beneficial to producers?

Unit Standards:
California CTE Anchor Standards:
- Technical Knowledge and Skills - Writing Standard: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. (WS 11-12.6)

NGSS Performance Expectations:
- HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
- HS-LS1-4: Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
- HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Learning Objectives:
Knowledge and Skills:
- Describe the production of sex cells.
- Describe the structures and functions of the reproductive system.
- Understand the hormones that control the reproductive system and how they play a role in the different techniques used in reproduction (AI).
- Identify the different stages of the estrous cycle and when females come into heat.
- Determine “standing heat” by using different heat detection methods.
- Explain the purpose of mitosis and meiosis in organisms.

Performance Tasks:
- Dissecting Reproductive Tracts: After reviewing the major components of the male and female reproductive systems, as well as the process of sperm maturation and egg movement, students will dissect various animal reproductive tracts to observe the reproductive differences between major livestock species. Students will work in lab groups to create charts that include observational differences of internal and external reproductive anatomy. These dissections (cow, sheep, pig) will provide additional review for the unit test (multiple choice and short answer) on animal reproductive systems.
- Breeding Timeline: In addition to researching the major reproductive facts of their animal for their Producer's Management Guide, students will be given a real-world problem to solve with regards to their animal industry. This problem addresses the need for estrus synchronization in livestock - students must research, in pairs, whether or not it is profitable to utilize hormone-induced herd synchronization for breeding management. Student groups will produce a breeding timeline for their species and herd management of estrus.
### Agriculture and Natural Resources Pathway Standards:

#### CA Animal Science Pathway Standards:
- D3.1 Compare and contrast animal cells, tissues, organs, and body systems.
- D3.3 Relate the importance of animal organs to the health, growth, and reproduction of animals.
- D4.1 Illustrate animal conception, including estrus cycles, ovulation, and insemination.
- D4.2 Research the gestation process and basic fetal development.
- D4.3 Explain the parturition process, including the identification of potential problems and their solutions.
**Animal Biological Science**  
**Unit 6.2 – Breeding Technologies**

**Unit Description:** Producers breed animals using a variety of methods while differing genetic systems to meet their goals of reproduction. Producers of breeding livestock typically choose purebred operations and may utilize some forms of inbreeding or line breeding. Commercial producers, or those producing market animals, tend to choose crossbreeding where hybrid vigor improves the performance of the animals. Methods used in breeding livestock include natural breeding, artificial insemination, embryo transfer, and cloning. Natural breeding is the most common breeding method utilized throughout the world. Natural breeding consists of a male mounting a female and depositing semen. Artificial insemination is used when it is desirable to collect semen from a superior male and utilize that collection to service multiple females. In this case, the male is never exposed to the female. Embryo transfer, like artificial insemination, takes advantage of superior males, but embryo transfer also takes advantage of superior females. Producers collect semen from the male and once insemination has occurred, embryos are collected from the female as well. These embryos are then transferred to recipient females that provide no genetic contribution to the offspring. Cloning has not yet been widely utilized in the livestock industry, but the potential for future use merits it being in this lesson. Students will identify the breeding systems as well as discuss the advantages and disadvantages of each.

**Transfer Goals:**
- **CTE**
  - Explore and refine techniques, skills, methods, and processes to create and innovate in an industry.
- **Science**
  - Ask or evaluate testable questions that lead to valid explanations of phenomena and solutions to problems.
  - Obtain and evaluate relevant, valid, and reliable sources of information in order to effectively communicate through various methods.
  - Plan and conduct investigations that contribute evidence to explanatory models or support proposals to solutions.

**Understandings:**
- Producers breed animals using a variety of methods to support their goals for reproduction.

**Essential Questions:**
- What are the advantages and disadvantages of various breeding methods?
- What is cloning and how is it used in the livestock industry?

**Unit Standards:**

**California CTE Anchor Standards:**
- **Demonstration and Application** - Demonstrate and apply the knowledge and skills contained in the industry-sector anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and the career technical student organization.

**NGSS Performance Expectations:**
- **HS-ETS1-3:** Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
- **HS-LS1-3:** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

**Learning Objectives:**

**Knowledge and Skills:**
- Identify and label Female and Male Reproductive Parts.
- Understand how the structure of the female and male reproductive system leads to its functions.
- Identify differences in female anatomy in a bovine animal and a chicken.
- Identify differences in the male reproductive anatomy in farm mammals and poultry.
- Define the hormones of male and female reproduction and explain how they work through the system as a whole.
- Identify mechanisms involved in

**Performance Tasks:**
- **Breeding Methods:** After being introduced to the major breeding methods in the animal industry, students will conduct a scientific article review of two techniques and develop a report on the effectiveness of each.
- **Morphology and Motility:** This unit will conclude with a sperm morphology and motility lab. Using live sperm from various livestock species, students will prepare microscope slides with sperm-sustaining buffer and cell morphology stain to observe sperm activity. In groups of two, students will evaluate the motility, mortality, morphology, and concentration of sperm in several semen samples. They will collect qualitative and quantitative data to undergo calculations that measure sperm health and develop a summary lab report of their findings.
• HS-LS1-4: Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
• HS - LS3-2: Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

**Agriculture and Natural Resources Pathway Standards:**

**CA Animal Science Pathway Standards:**

- D4.1 Illustrate animal conception, including estrus cycles, ovulation, and insemination.
- D4.2 Research the gestation process and basic fetal development.
- D4.3 Explain the parturition process, including the identification of potential problems and their solutions.
- D4.4 Select animal breeding methods based on reproductive and economic efficiency.
- D4.5 Select a breeding system based on the principles of genetics, homeostasis, such as negative feedback in the endocrine system.
- Understand the drugs that alter the estrus cycle and why they work.
- Understand how synchronization programs work by studying several different programs.
- List the benefits of estrus synchronization.
- Describe what heat is as well as ways of detecting heat in different species.
- List different types of heat detection aids.
- Describe when an animal should be inseminated upon observing standing heat
- Identify concentration, motility and sperm abnormalities.
### Unit Description:
Animals inherit their genetic code from their parents. Predicting the exact genes that come from a specific parent and how those genes will be expressed in the next generation is a difficult task. Through hard work by animal geneticists, livestock producers have a variety of tools to assist in the selection of breeding stock with preferred genes. Tools utilized in the livestock industry include Punnett Squares, Expected Progeny Differences, ratios, indexes, and pedigrees. Quantitative traits are controlled by many gene pairs and may be affected by the environment. To predict quantitative traits, animal breeders use ratios, indexes and Expected Progeny Differences to separate genetic influence from environmental influence. Pedigrees provide a visual method for tracking animal ancestry. They assist geneticists and producers in tracing the inheritance of genes. In this unit, students will use Expected Progeny Differences, ratios, and pedigrees to predict inheritance for quantitative and qualitative traits that are economically important to livestock producers and animal breeders.

### Transfer Goals:
- **CTE**
  - Understand a problem and work to solve it by asking questions, researching information, and testing out ideas until resolved.
  - Explore and refine techniques, skills, methods, and processes to create and innovate in an industry.
- **Science**
  - Develop, use, and refine models that represent ideas and communicate relationships to make predictions towards understanding phenomena.
  - Use mathematical and computational thinking to analyze data to support explanations of phenomena or design solutions to problems.

### Understandings:
- The genetics and heredity of animals are used by producers to make decisions about their breeding technologies.
- The sequence of DNA bases controls the formation of proteins and changes to the sequence may result in a variety of consequences.
- Although each cell has the same genetic information, each cell can vary in structure and function because different genes are expressed.
- Genetic variation can result from mutations caused by environmental factors or errors in DNA replication.

### Essential Questions:
- How does the structure of DNA relate to its function?
- How do organisms get their DNA?
- How would you utilize economic indexes in genetic selection?

### Unit Standards:
**California CTE Anchor Standards:**
- **Technical Knowledge and Skills - Writing Standard:** Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. (WS 11-12.6)
- **Demonstration and Application:** Demonstrate and apply the knowledge and skills contained in the industry-sector anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and the career technical student organization.

### Learning Objectives:
**Knowledge and Skills:**
- Describe how the structure of DNA determines the structure of proteins.
- Explain the purpose of DNA and proteins for living organisms.
- Construct an explanation on the idea that regions of DNA called genes can be regulated in multiple ways, which carry out the essential functions of life through systems of specialized cells.
- Understand the phases of Mitosis and Meiosis and explain the differences between the two.

### Performance Tasks:
- **Mendelian Genetics:** After reviewing major phenotypic and genotypic relationships between various breeding scenarios, students will be assessed with a formative genetics quiz on introductory and Mendelian genetics terminology and concepts. This quiz will involve multiple choice, true/false, and completion problems to allow students to show competency in using simple (single cross) Punnett Squares.
- **Punnett Squares:** After reviewing use of Punnett Squares for dihybrid crosses in animal production, students will be introduced to the use of Expected Progeny Differences (EPD) values, as used in animal genetics and breeding. A major assignment of this unit will be an individual activity where students will research the definitions of several important EPDs in animal agriculture. They will need this information to "read" several EPD scenarios in order to determine which animals would be
**NGSS Performance Expectations:**

- **HS-LS1-1:** Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
- **HS-LS1-4:** Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
- **HS-LS3-1:** Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
- **HS-LS3-2:** Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
- **HS-LS3-3:** Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

**Agriculture and Natural Resources Pathway Standards:**

**CA Animal Science Pathway Standards:**

- **D5.1** Evaluate a group of animals for desired qualities and discern among them for breeding selection.
- **D5.2** Select animals, based on quantitative breeding values, for specific characteristics.
- **D5.3** Research and discuss current technology used to measure desirable traits.
- **D5.4** Predict phenotypic and genotypic results of a dominant and recessive gene pair.
- **D5.5** Research the role of mutations, both naturally occurring and artificially induced, and hybrids in animal genetics.

- Design a simulated breeding experiment of breeding out a defective gene in livestock.
- Explain how genes are passed down from each generation and how recessive genes can be given in the species.
- Understand the Punnett Square and how the chances of genetic diseases or faults are passed on from one offspring to the next.
- Identify animals based upon their genes and their desirable traits.
- Evaluate the EPD’s and cull the right animals from the offspring before they are breed.

- best - for both reproductive and economic purposes - for an animal agriculturalist to select in a breeding plan. Students will produce a report that summarizes their EPD decisions given several sires and dams to compare in a breeding scenario.
Animal Biological Science
Unit 8.1: Animal Health and Disease

Unit Description: Pathogens are anything that causes disease. Students studied the prevention of some pathogens in Unit 3.3 while discussing biosecurity. In this unit of study on animal health, students will study pathogens and the types of pathogens that cause livestock producer’s significant concern in greater depth. Producers strive to limit diseases and exposure to disease causing agents to maintain the health of their animals and to maximize profits. Becoming a good diagnostician requires practice, knowledge of animals, and knowledge of diseases. An animal infected with parasites may lose its appetite and become more susceptible to other diseases and infections. Parasites can be found internally and externally. If parasites remain untreated, they will harm the ability of an animal to eat, breathe, sleep, and carry out life sustaining functions. The prevention of diseases and parasites is a widely studied and practiced management tool. Treatment of diseases leads not only to expenses but also to production losses. Providing proper health care for animals is also a component of the humane treatment of animals.

Transfer Goals:
- CTE
  - Understand a problem and work to solve it by asking questions, researching information, and testing out ideas until resolved.
  - Explore and refine techniques, skills, methods, and processes to create and innovate in an industry.

- Science
  - Analyze and interpret data by identifying significant patterns and trends that support valid scientific claims.
  - Construct and revise explanations about relevant phenomena supported by multiple sources of evidence.

Understandings:
- Diagnosing diseases is a complex process that involves recognizing the animal is ill, recognizing the symptoms of the illness, and determining possible treatments for the disease.
- Prevention of diseases is often more economical than treating diseases.

Essential Questions:
- How do you distinguish between an infectious disease, a contagious disease, and a noninfectious disease?
- How do we define “health” and “disease”?
- How can parasites be prevented or controlled in animals?
- How have vaccinations changed our relationship with disease?

Learning Objectives:
Knowledge and Skills:
- Understand the classes of diseases and how to treat each class of disease.
- Write a parasite guide for consumers regarding proper treatment of diseases.
- Setup a mock farm and review the disease control protocol that has to go with livestock.
- Evaluate Animals based on their conditions and make a recommendation on care.
- Perform physical exams and be able to write a physical exam recommendation.
- Identify the average temps of animals and be able to take their temperatures.

Performance Tasks:
- Infectious Disease: After simulating the transmission of infectious disease and identifying major pathogens on prepared microscope slides, students will finish this sub-unit with a research project. In groups of 2-3, students will select a regulatory agency to "represent" as they handle a case study outbreak of Foot-and-mouth disease in a new US territory. As they identify the source of the problem in the outbreak, they must develop a list of questions about the key events of the case study and tie regulatory/preventative measures to their assigned agency. After collecting data on both the case study and their organization, they will produce an argument as to why their organization should be in charge of the situation over other regulatory groups. They will then present their case to their classmates and be evaluated by rubric.
individual or shared writing products in response to ongoing feedback, including new arguments or information. (WS 11-12.6)

- Demonstration and Application - Demonstrate and apply the knowledge and skills contained in the industry-sector anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and the career technical student organization.

**NGSS Performance Expectations:**

| HS-LS1-1: | Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. |
| HS-LS1-2: | Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. |
| HS-ETS1-2: | Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. |
| HS-ETS1-3: | Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts. |

**Agriculture and Natural Resources Pathway Standards:**

**CA Animal Science Pathway Standards:**

- D6.1 Evaluate the signs of normal health in contrast to illness and disease.
- D6.2 Analyze the importance of animal behavior in diagnosing animal sickness and disease.
- D6.3 Research common pathogens, vectors, and hosts that cause disease in animals.
- D6.4 Evaluate preventative measures for controlling and limiting the spread of diseases, parasites, and disorders among animals.
- D6.5 Discuss procedures used at the local, state, and national levels to ensure biosecurity of the animal industry.
- D6.6 Explain the health risk of zoonotic diseases to humans, their historical influence, and future implications.
- D6.7 Discuss the impacts on local, national, and global economies, health, and the environment.
- D6.8 Analyze the importance of animal husbandry in diagnosing animal sickness and disease.
- D6.9 Evaluate the signs of normal health in contrast to illness and disease.
- D6.10 Analyze the importance of animal behavior in diagnosing animal sickness and disease.
- D6.11 Research common pathogens, vectors, and hosts that cause disease in animals.
- D6.12 Evaluate preventative measures for controlling and limiting the spread of diseases, parasites, and disorders among animals.
- D6.13 Discuss procedures used at the local, state, and national levels to ensure biosecurity of the animal industry.
- D6.14 Explain the health risk of zoonotic diseases to humans, their historical influence, and future implications.
- D6.15 Discuss the impacts on local, national, and global economies, health, and the environment.

| Prepare a guide for homeowners for recommendations of dealing with parasites. |
| Identify the kind of parasite while doing a fecal float analysis. |
| Identify medications that can control the different parasites. |
| Administer a vaccine to animals and record the vaccines in the record book. |
| Describe the viruses and the ones that can be vaccinated in animals. |

**Health Management Plan:** In this assignment, students will create a health management plan for a livestock species in a particular production scenario. The plan will include all required vaccinations, good production practices for that species, and the cost effectiveness of the plan. Students will then administer vaccinations and practice good management practice for each species as prescribed by adopted protocols and may include weighing the animals and medications, and handling animals in the appropriate manner. The formal write-up will include all information on procedures, equipment, and the importance of good management practices.

**Animal Vital Signs:** Building on a previous unit (4.3) which introduced students to vital signs, students will determine vital signs of an animal and compare those signs to their personal vital signs. This assignment will require them to use proper animal handling and work in groups to take the vital signs of small animals that can be brought to class. A veterinarian or vet technician will be present to assist with student activities as they assess vital signs including rectal temperature, pulse rate, and respiration rate. This lab activity engages students in discussion about how to diagnose a healthy or sick animal.

**Animal Diseases:** As a collaborative review of major animal diseases, students will complete an assignment that involves them researching two common diseases and producing handheld diagnostic cards based of print and web resources that include: disease name, description, symptoms, species affected, transmission routes, and treatment. Their findings will be collected and disseminated to the entire class to use in preparing their Producer's Management Guide.

**TPRs:** Performing TPRs (Temperature, Pulse and Respiration) is a common practice in veterinary clinics and hospitals, and livestock farms. In this lab activity, students will perform a TPR lab on animals in the school farm. TPRs are a definitive indicator of animal illness. Students will compare the TPR rates of their animals to the standards for that species and hypothesize about any variations. Students will communicate their results in a written lab format that presents their results in text and graphic form, an explanation of their results, and a conclusion.

**Parasite Testing:** The laboratory for this unit involves the testing of parasite populations in a fresh animal fecal sample. Students will learn to produce a fecal smear, a common veterinary technique used to detect internal parasites. In their groups, they will also conduct a fecal float, where they separate any parasitic eggs out of their sample using the specific gravity differences of the sample of a water solvent.
as well as on consumers and producers, when animal diseases are not appropriately contained and eradicated.

| Students will use proper protective equipment to conduct this lab and produce a final report on their findings to share with the class.  
| **Producer Management Guide:** After learning to properly prepare and administer subcutaneous and intramuscular shots, students will research the diseases and parasites of their animal to develop a preventative care plan for their Producer's Management Guide. This project will involve both text and web resources, as well as resources created in previous units, to develop a record keeping tool that will assist in proper health management of their animal. The student will produce a pamphlet with all components of understanding and maintaining proper animal health of their PMG species. |
**Unit Description:** The purpose of production agriculture, including raising livestock and poultry, is to have a salable product. However, because these products are derived from living, growing individuals, complete uniformity of the products is not possible. Throughout this course, many conditions and factors that influence animal growth, health, and development have been discussed, however, consumers expect and demand a consistent product. To establish greater consistency among agricultural products, the USDA implemented grading systems. Grading is classifying a product by standards of uniformity, such as size, trueness to type, freedom from blemish or disease, fineness, or quality. Certain grading qualities evaluate meat, milk, eggs, fiber, and crops. Students will study the types of products consumers receive from animals, the methods used to provide consumers a consistent product, and how processing improves, lower quality goods and adds value to them. Students will be faced with decisions and can prioritize decision-making, using criterion-based selection. While criterion-based selection is not completely objective, it does provide a consistent means of evaluating and selecting animals. Using criteria to select animals consistently requires an understanding of the economically and aesthetically desirable traits.

**Transfer Goals:**
- **CTE**
  - Communicate effectively based on who you are talking to, what message you need to share, and what method (e.g., phone call, email, written report) using industry-standard vocabulary.
  - Explore various career options and prepare to compete in a marketplace through ongoing training, experience, and certification.
- **Science**
  - Construct and revise explanations about relevant phenomena supported by multiple sources of evidence.
  - Plan and conduct investigations that contribute evidence to explanatory models or support proposals to solutions.
  - Analyze and interpret data by identifying significant patterns and trends that support valid scientific claims.

**Understanding:**
- Criterion-based selection is a process to evaluate decisions with producing products for consumption.

**Essential Questions:**
- What major product do consumers receive from each type of agricultural animal?
- What are food safety concerns in animal products?
- How does criterion-based selection support decision-making with producing animal products?

**Learning Objectives:**
- Explain the different animal products and their use in the market.
- Evaluate milk and dairy products to determine the taste of the desired consumer.
- Identify the retail and wholesale cuts of beef, swine, lamb, goat, and poultry.
- Apply genetic indicators to pair certain animals up for breeding.
- Evaluate animals' traits and make recommendations on improving those traits.
- Judge a class of four animals of the same class of four animals of the same

**Performance Tasks:**
- **Food Science:** In addition to preparing a presentation about the usage of an assigned species, students will use sensory evaluation to compare various animal products. Common food science evaluation techniques will be taught and used as students sample milk and cheese products and different cuts/types/grades of meat. Student pairs will complete tasting charts and discuss results on their findings with these taste tests.
- **Storybook:** As a summary of several previous units, students will study the ideal conformation of an assigned animal and write a children’s storybook to be used as a guide in selecting animals. This project will require them to synthesize and re-orient complex information in order to make it available and understandable to a child with little to no animal science experience. Creativity skills as well as critical thinking are required as students produce the storybook.
of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
- HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
- HS-ETS1-4: Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

### Agriculture and Natural Resources Pathway Standards:

#### CA Animal Science Pathway Standards:
- D12.1 Research animal harvest, carcass inspection and grading, and meat processing safety regulations and practices and the removal and disposal of nonedible by-products, such as those outlined in Hazard Analysis and Critical Control Point, Sanitation Standard Operating Procedures, and good manufacturing practices documents.
- D12.2 Compare the relative importance of the major meat, dairy, and egg classifications, including the per-capita consumption and nutritive value of those classifications.
- D12.3 Discuss how meat-based, dairy, and egg retail products are produced.
- D12.4 Describe how nonmeat products, such as wool, pelts, hides, and by-products, are harvested and processed.
- D12.5 Evaluate how meat products and nonmeat products are marketed.
- D12.6 Compare the value of animal by-products to nonagricultural industries.
- D12.7 Apply point-of-origin safety and sanitation procedures in the production, harvest, handling, processing, and storing of meat products.
### Transfer Goals:
- **CTE**
  - Explore and refine techniques, skills, methods, and processes to create and innovate in an industry.
  - Evaluate how business choices impact economic, cultural, and environmental factors to guide decision-making.
- **Science**
  - Engage in productive argumentation using evidence to explain phenomena, challenge ideas, and propose solutions to problems.
  - Obtain and evaluate relevant, valid, and reliable sources of information in order to effectively communicate through various methods.

### Understandings:
- Marketing activities influence the pricing of consumer goods and impacts the distribution of products.

### Essential Questions:
- Why is marketing beneficial in agriculture?
- How are products developed and marketed?

### Unit Standards:
**California CTE Anchor Standards:**
- **Career Planning and Management** - Speaking and Listening Standard: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. (SLS 11-12.2)

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

### Learning Objectives:
**Knowledge and Skills:**
- Describe how animals are taken to the market and how the meat and eggs are graded.
- Understand the health benefits of meat and be able to write an advertisement on meat benefits.
- Promote nontraditional meats and foods and make a marketing presentation on them.

### Performance Tasks:
- **Producer Management Guide:** As the final component of their Producer's Management Guide, students will develop a marketing plan for the product/service resulting from their chosen PMG animal. They will first determine the product they will sell by identifying a target market and related needs of consumers. Secondly, they will create a plan to market their product to the target market using effective marketing techniques which will include: product features, pricing, service, distribution, promotion, and competitor analysis. The results of their research will be in the form of a product and marketing plan to include in their PMG.
### Agriculture and Natural Resources Pathway Standards:

**CA Animal Science Pathway Standards:**
- D12.5 Evaluate how meat products and nonmeat products are marketed.
- D12.6 Compare the value of animal by-products to nonagricultural industries.

**CA Agribusiness Pathway Standards:**
- A7.1 Explain how marketing functions in a free-market society.
- A7.2 Compare the advantages and disadvantages of the various marketing options for agricultural products and services.
- A7.3 Analyze how the law of comparative advantage affects agricultural production.
- A7.4 Explore the impact of advertising, promotion, and data analysis on the marketing of agricultural products and services.
- A7.5 Assess how promotion trends for agricultural products influence individuals.
- A7.6 Develop a marketing plan for an agricultural product or service.