2022 Diversified Agriculture Animals Core

Program CIP: 01.0000 – Agriculture, General

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The Research and Curriculum Unit (RCU), located in Starkville, as part of Mississippi State University (MSU), was established to foster educational enhancements and innovations. In keeping with the land-grant mission of MSU, the RCU is dedicated to improving the quality of life for Mississippians. The RCU enhances intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the contexts of curriculum development and revision, research, assessment, professional development, and industrial training.

Table of Contents

Acknowledgments

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Dr. Carey M. Wright, state superintendent of education
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Standards

Standards and alignment crosswalks are referenced in the appendix. Depending on the curriculum, these crosswalks should identify alignment to the standards mentioned below, as well as possible related academic topics as required in the Subject Area Testing Program in Algebra I, Biology I, English II, and U.S. History from 1877, which could be integrated into the content of the units. Mississippi's CTE diversified agriculture animals core curriculum is aligned to the following standards:

National Agriculture, Food, and Natural Resources (AFNR) Career Cluster Content Standards

The National AFNR Career Cluster Content Standards were developed by the National Council on Agricultural Education to serve as a guide for what students should know or be able to do through a study of agriculture in Grades 9-12 and two-year postsecondary programs. The standards were extensively researched and reviewed by leaders in the agricultural industry, secondary and postsecondary instructors, and university specialists. The standards consist of a pathway content standard for each of the eight career pathways. For each content standard, performance elements representing major topic areas with accompanying performance indicators were developed. Measurements of assessment of the performance elements and performance indicators were developed at the basic, intermediate, and advanced levels. The National AFNR Career Cluster Content Standards are copyrighted by the National Council for Agricultural Education and are used with permission.
thecouncil.ffa.org/afnr

International Society for Technology in Education Standards (ISTE)

Reprinted with permission from *ISTE Standards for Students* (2016). All rights reserved. Permission does not constitute an endorsement by ISTE.
iste.org

College- and Career-Ready Standards

College- and career-readiness standards emphasize critical thinking, teamwork, and problem-solving skills. Students will learn the skills and abilities demanded by the workforce of today and the future. Mississippi adopted Mississippi College- and Career-Readiness Standards (MCCRS) to provide a consistent, clear understanding of what students are expected to learn and so teachers and parents know what they need to do to help them.
mdek12.org/oae/college-and-career-readiness-standards

Framework for 21st Century Learning

In defining 21st-century learning, the Partnership for 21st Century Skills has embraced key themes and skill areas that represent the essential knowledge for the 21st century: global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; health literacy; environmental literacy; learning and innovation skills; information, media, and technology skills; and life and career skills. 21 *Framework Definitions* (2019).
battelleforkids.org/networks/p21/frameworks-resources

Preface

Secondary CTE programs in Mississippi face many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing applied learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments. This document provides information, tools, and solutions that will aid students, teachers, and schools in creating and implementing applied, interactive, and innovative lessons. Through best practices, alignment with national standards and certifications, community partnerships, and a hands-on, student-centered concept, educators will be able to truly engage students in meaningful and collaborative learning opportunities.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, *Mississippi Code of 1972*, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, Ch. 487, §14; Laws, 1991, Ch. 423, §1; Laws, 1992, Ch. 519, §4 eff. from and after July 1, 1992; Strengthening Career and Technical Education for the 21st Century Act, 2019 [Perkins V]; and Every Student Succeeds Act, 2015).

Mississippi Teacher Professional Resources

The following are resources for Mississippi teachers:

- Curriculum, Assessment, Professional Learning
  - Program resources can be found at the RCU's website, rcu.msstate.edu.
- Learning Management System: An Online Resource
  - Learning management system information can be found at the RCU's website, under Professional Learning.

Should you need additional instructions, call the RCU at 662.325.2510.

Executive Summary

Pathway Description

The diversified agriculture animals core curriculum is a one-Carnegie unit course within the four-credit diversified agriculture program. All students must complete the principles of agriscience course before being allowed to enroll in the diversified agriculture animals core course. The course is a culmination of in-depth study in the production, management, and evaluation of livestock based upon intended use. The course also addresses livestock facilities and management and guides students to research current issues in animal agriculture. Emphasis is on an active learning environment enriched with technology and hands-on, science-based applications.

College, Career, and Certifications

Beef Quality Assurance (BQA) is a national certification that has been cross walked to this curriculum. This certification is optional and can be taught and tested according to local district policies. Competencies and suggested performance indicators in this course have also been correlated to the AFNR Career Cluster Content Standards that have been reviewed and endorsed at the national level by the National Council on Agricultural Education.

Grade Level and Class Size Recommendations

It is recommended that students enter this program as 10th graders. Exceptions to this are a district-level decision based on class size, enrollment numbers, and student maturity. A maximum of 25 students is recommended for classroom-based courses, while a maximum of 15 students is recommended for lab-based courses.

Student Prerequisites

For students to experience success in the program, the following student prerequisites are suggested:

1. C or higher in English (the previous year)
2. C or higher in high school level math (last course taken or the instructor can specify the level of math instruction needed)
3. Instructor approval and TABE reading score (eighth grade or higher)

or

1. TABE reading and math score (eighth grade or higher)
2. Instructor approval

or

1. Instructor approval

Assessment

The latest assessment blueprint for the curriculum can be found at rcu.msstate.edu/curriculum/curriculumdownload.

Applied Academic Credit

The latest academic credit information can be found at mdek12.org/ese/approved-course-for-the-secondary-schools.

~~Teacher Licensure~~

~~The latest teacher licensure information can be found at mdek12.org/oel/apply-for-an-educator-license.~~

~~Professional Learning~~

~~If you have specific questions about the content of any of the training sessions provided, please contact the RCU at 662.325.2510.~~

Course Outlines

This curriculum consists of one 1-credit course.

Diversified Agriculture Animals Core – Course Code: 993423

Unit	Title	Hours
1	Leadership and SAE for All	5
2	Introduction to Animal Agriculture	15
3	Worker Safety, Biosecurity, and Emergency Management	10
4	Application of Feed and Feeding to Animal Growth and Production	15
5	Genetics	15
6	Animal Reproduction	20
7	Livestock Evaluation and Selection	20
8	Animal Production Management	15
9	Facility and Equipment Management in Animal Agriculture	10
10	Issues in Animal Agriculture	5
11	Business Management in Animal Agriculture	10
Total		**140**

Career Pathway Outlook

The agricultural sciences career cluster covers the broad field of occupations related to the production and use of plants and animals for food, fiber, aesthetic, and environmental purposes. According to the U.S. Department of Agriculture, during the next five years (2020-2025) 59,400 jobs are expected to open in food, agriculture, renewable natural resources, or the environment for graduates with bachelor's or higher degrees in those areas. Almost half of those jobs will be in management and business at 42%; 31% in science, technology, engineering, and math in agriculture; 13% in sustainable food and biomaterials production; and 14% in education, communication, and government services. According to USDA, agriculture, food, and related industries contributed $1.109 trillion to the U.S. gross domestic product (GDP) in 2019. The Mississippi Department of Agriculture and Commerce reports that agriculture is Mississippi's number one industry at $7.35 billion and employing approximately 17.4% of the state's workforce.

Diversified agriculture will target careers at the professional and technical levels in agriculture. Students enrolled in these courses should be better prepared to pursue degrees at the community college and four-year college levels.

Needs of the Future Workforce

Data for this synopsis were compiled from the Mississippi Department of Employment Security (2016). Employment opportunities for each of the occupations are listed below:

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2016	Projected Jobs, 2026	Change (Number)	Change (Percent)	Average Yearly Earnings, 2020
Agricultural and Food Science Technicians	260	270	10	3.9%	$39,270
Agricultural Sciences Teachers, Postsecondary	150	160	10	6.7%	$93,260
Animal Trainers	100	110	10	10%	$23,120
Career/Technical Education Teachers, Middle School	320	350	30	9.4%	$47,270
Career/Technical Education Teachers, Secondary School	1220	1310	90	7.4%	$50,370
Conservation Scientists	700	730	30	4.3%	$54,950
Environmental Engineers	410	420	10	2.4%	$75,940
Environmental Engineering Technicians	160	170	10	6.3%	$46,790
Environmental Scientists and Specialists, Including Health	620	670	50	8.1%	$64,460

Environmental Science and Protection Technicians, Including Health	420	460	40	9.5%	$38,780
Farm and Home Management Advisors	290	300	10	3.2%	$38,650
Logging Equipment Operators	1,680	1,740	60	3.6%	$41,840
Landscaping and Groundskeeping Workers	6,000	6,620	620	10.3%	$25,630
Nonfarm Animal Caretakers	1,520	1,780	260	17.1%	$24,030
Soil and Plant Scientists	110	110	0	0%	$92,250
Farmers, Ranchers, and Other Agricultural Managers	1,790	1,840	20	2.8%	$55,830
First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers	980	1,090	110	11.2%	$40,270
First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	940	990	50	5.3%	$54,550
Fish and Game Wardens	40	40	0	0%	$46,610
Foresters	190	200	10	5.3%	$52,660
Surveyors	450	470	20	4.4%	$48,600
Surveying and Mapping Technicians	530	550	20	3.8%	$39,840
Tree Trimmers and Pruners	270	300	30	11.1%	$44,920
Veterinarians	490	540	50	10.2%	$81,950
Veterinary Assistants and Laboratory Animal Caretakers	970	1,090	120	12.4%	$26,150
Veterinary Technologists and Technicians	570	630	60	10.5%	$35,890
Zoologists and Wildlife Biologists	260	270	10	3.9%	$70,200

Source: Mississippi Department of Employment Security; mdes.ms.gov (2021).

Perkins V Requirements and Academic Infusion

The diversified agriculture animals core curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in agricultural fields. It also offers students a program of study, including secondary, postsecondary, and institutions of higher learning courses, that will further prepare them for careers in agriculture. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, it focuses on ongoing and meaningful professional development for teachers as well as relationships with industry.

Transition to Postsecondary Education

The latest articulation information for secondary to postsecondary can be found at the Mississippi Community College Board website, mccb.edu.

Best Practices

Innovative Instructional Technologies

Classrooms should be equipped with tools that will teach today's digital learners through applicable and modern practices. The diversified agriculture educator's goal should be to include teaching strategies that incorporate current technology. To make use of the latest online communication tools—wikis, blogs, podcasts, and social media platforms, for example—the classroom teacher is encouraged to use a learning management system that introduces students to education in an online environment and places more of the responsibility of learning on the student.

Differentiated Instruction

Students learn in a variety of ways, and numerous factors—students' background, emotional health, and circumstances, for example—create unique learners. By providing various teaching and assessment strategies, students with various learning preferences can have more opportunity to succeed.

CTE Student Organizations

Teachers should investigate opportunities to sponsor a student organization. The National FFA Organization is the student organization for this pathway and will foster the types of learning expected from the diversified agriculture curriculum. FFA provides students with growth opportunities and competitive events and opens the doors to the world of agriculture and scholarship opportunities.

Cooperative Learning

Cooperative learning can help students understand topics when independent learning cannot. Therefore, you will see several opportunities in the curriculum for group work. To function in today's workforce, students need to be able to work collaboratively with others and solve problems without excessive conflict. The diversified agriculture curriculum provides opportunities for students to work together and help each other complete complex tasks. There are many field experiences within the curriculum that will allow and encourage collaboration with professionals currently in the agriscience field.

Work-Based Learning

Work-based learning is an extension of understanding competencies taught in the diversified agriculture classroom. This curriculum is designed in a way that necessitates active involvement by the students in the community around them and the global environment. These real-world connections and applications link to all types of students to knowledge, skills, and professional dispositions. Work-based learning should encompass ongoing and increasingly more complex involvement with local companies and agriscience professionals. Thus, supervised collaboration and immersion into the agriculture industry around the students are keys to students' success, knowledge, and skills development.

Professional Organizations

American Association for Agricultural Education (AAAE)
aaaeonline.org

Association for Career and Technical Education (ACTE)
acteonline.org

Mississippi ACTE
mississippiacte.com

Mississippi FFA/ Mississippi Association of Vocational Agriculture Teachers (MAVAT)
mississippiffa.org

National FFA Organization
ffa.org

National Association of Agricultural Educators (NAAE)
naae.org

Using This Document

Competencies and Suggested Objectives

A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies. The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.

Teacher Resources

Teacher resources for this curriculum may be found in multiple places. Many program areas have teacher resource documents that accompany the curriculum and can be downloaded from the same site as the curriculum. The teacher resource document contains references, lesson ideas, websites, teaching and assessment strategies, scenarios, skills to master, and other resources divided by unit. This document could be updated periodically by RCU staff. Please check the entire document, including the entries for each unit, regularly for new information. If you have something you would like to add or have a question about the document, call or email the RCU's instructional design specialist for your program. The teacher resource document can be downloaded at rcu.msstate.edu/curriculum/curriculumdownload.aspx. All teachers should request to be added to the Canvas Resource Guide for their course. This is where all resources will be housed in the future if they are not already. To be added to the guide, send a Help Desk ticket to the RCU by emailing helpdesk@rcu.msstate.edu.

Perkins V Quality Indicators and Enrichment Material

Some of the units may include an enrichment section at the end. If the diversified agriculture animals core program is currently using the Mississippi Career Planning and Assessment System (MS-CPAS) as a measure of accountability, the enrichment section of material will not be tested. If this is the case, it is suggested to use the enrichment material when needed or desired by the teacher and if time allows in the class. This material will greatly enhance the learning experiences for students. If, however, the diversified agriculture animals core program is using a national certification, work-based learning, or other measure of accountability that aligns with Perkins V as a quality indicator, this material could very well be tested on that quality indicator. It is the responsibility of the teacher to ensure all competencies for the selected quality indicator are covered throughout the year.

Unit 1: Leadership and SAE for All

Competencies and Suggested Objectives

1. Participate in local, state, and/or national FFA activities that provide opportunities for leadership development and career exploration. DOK3
   a. Actively participate in FFA activities.
      - Leadership Development Events (LDE)
      - Career Development Events (CDE)
        - Dairy Cattle Evaluation and Management
        - Dairy Cattle Handlers Activity
        - Horse Evaluation
        - Livestock Evaluation
        - Meats Evaluation and Technology
        - Poultry Evaluation
        - Veterinary Science
      - Livestock shows
      - Premier exhibitor event
      - Leadership retreats or conferences
      - Industry-related seminars, workshops, or conferences
      - Other related FFA activities

2. Identify potential college and career opportunities in animal agriculture. DOK2
   a. Research postsecondary institutions that offer studies in animal agriculture or a related field and prepare a two- to three-minute speech on their programs and potential career choices.
   b. Complete applications for college admission and scholarships.
   c. Revise a personal résumé for the purpose of applying for a specific job.
   d. Complete a job application for employment.
   e. Participate in a mock or real interview.

3. Review the types of programs under Supervised Agricultural Experience (SAE) for All. DOK1
   a. Explore concepts of a Foundational SAE.
      - Career exploration and planning
      - Employability skills for college and career readiness
      - Personal financial management and planning
      - Workplace safety
      - Agricultural literacy
   b. Explore concepts of an Immersion SAE.
      - Placement/internship
      - Ownership/entrepreneurship
      - Research
        - Experimental

- Analytical
- Invention
- School-based enterprise
- Service learning

4. Review individual plans for student Foundational SAE programs. DOK2
   a. Assess goal attainment in SAE from the previous year.
   b. Review and update short- and long-range goals pertaining to the SAE program.

5. Develop an Immersion SAE and maintain agricultural records. DOK2
   a. Redefine and adjust requirements of agreements between the student, parents, supervisor, and/or employer.
   b. Utilize an electronic/computer-based system of record keeping.
   c. Update SAE records.
      - SAE program goals
      - Student inventory related to the SAE program
      - Expense records
      - Income/gift and scholarship records
      - Skill attainment records
      - Leadership activity records and participation in FFA activities
      - Community service hours
   d. Complete degree and proficiency award applications as they apply to the SAE.

Unit 2: Introduction to Animal Agriculture

Competencies and Suggested Objectives
1. Investigate the nature of animal agriculture and its associated enterprises. DOK1 a. Describe the importance of agricultural animals to people. b. Identify the major animal enterprises. • Beef cattle • Dairy cattle • Horses • Swine • Poultry • Aquaculture • Goats and sheep • Companion animals c. Identify careers in the agriculture industry and the skills required by employers. • Livestock producer • Veterinarian • Reproductive specialist • Nutritionist • Animal health sales/marketing • Rodeo stock contractor
2. Discuss the beef cattle industry. DOK1 a. Identify products produced from beef cattle. • Meat • By-products (edible/nonedible) b. Discuss beef cattle enterprises. • Cow-calf operation • Purebred herd • Stocker cattle • Feedlot c. Identify beef cattle breeds. • Angus • Hereford • Brahman • Brangus • Charolais • Simmental • Limousin • Santa Gertrudis • Texas Longhorn

3. Discuss the dairy cattle industry. DOK1
   a. Identify products produced from dairy cattle.
      - Milk
      - Milk by-products (e.g., butter, cheese, yogurt, ice cream, etc.)
      - Meat
   b. Discuss dairy cattle enterprises.
      - Milk production
      - Heifer development
   c. Identify dairy cattle breeds.
      - Jersey
      - Holstein
      - Guernsey
      - Brown Swiss
      - Ayrshire

4. Discuss the equine industry. DOK1
   a. Identify uses for horses.
      - Work
      - Pleasure
      - Companion
      - Recreation
   b. Discuss equine enterprises.
      - Breeders
      - Trainers
      - Boarding
   c. Identify horse breeds.
      - Quarter horse
      - Appaloosa
      - Thoroughbred
      - Clydesdale
      - Arabian
      - Shetland ponies

5. Discuss the swine industry. DOK1
   a. Identify products produced from swine.
      - Meat
      - By-products (edible/nonedible)
   b. Discuss swine enterprises.
      - Farrowing
      - Nursery
      - Feeder pig
      - Breeding
      - Finishing
   c. Identify swine breeds.
      - Duroc

- ~~Yorkshire~~
- ~~Hampshire~~
- ~~Chester White~~
- ~~Spot~~

~~6. Discuss the poultry industry.~~ ~~DOK1~~

~~a. Identify products produced from poultry.~~

- ~~Meat~~
- ~~Eggs~~
- ~~By-products~~

~~b. Discuss poultry enterprises.~~

- ~~Layers~~
- ~~Broiler production~~
- ~~Backyard flocks~~
- ~~Turkey production~~
- ~~Game bird production~~

~~c. Identify breeds of poultry.~~

- ~~Leghorns~~
- ~~Plymouth Rock~~
- ~~Rhode Island Red~~

~~7. Discuss the aquaculture industry.~~ ~~DOK1~~

~~a. Identify products produced from aquaculture.~~

- ~~Meat~~
- ~~By-products~~

~~b. Discuss aquaculture enterprises.~~

- ~~Fish~~
- ~~Shellfish~~
- ~~Alligators~~
- ~~Frogs~~

~~c. Identify aquaculture species.~~

- ~~Catfish~~
- ~~Crawfish~~
- ~~Tilapia~~
- ~~Shrimp/prawn~~

~~8. Discuss the goat industry.~~ ~~DOK1~~

~~a. Identify products produced from goats.~~

- ~~Meat~~
- ~~Milk~~
- ~~Fiber~~
- ~~By-products~~

~~b. Discuss goat enterprises.~~

- ~~Market goats~~
- ~~Dairy goats~~
- ~~Companion goats~~

~~c. Identify goat breeds.~~ ~~• Boer~~ ~~• Kiko~~ ~~• Nubian~~ ~~• Lamancha~~ ~~• Pygmy~~
~~9. Discuss the sheep industry.~~ ~~DOK1~~ ~~a. Identify products produced from sheep.~~ ~~• Meat~~ ~~• Fiber~~ ~~• By-products~~ ~~b. Discuss sheep enterprises.~~ ~~• Farm flocks~~ ~~• Purebred operations~~ ~~c. Identify sheep breeds.~~ ~~• Dorper~~ ~~• Katahdin~~ ~~• Suffolk~~ ~~• Dorset~~ ~~• Hampshire~~ ~~• Rambouillet~~
~~10. Conduct an in-depth investigation of an animal industry in your area that provides opportunities for hands-on experience while developing workplace skills.~~ ~~DOK3~~

Unit 3: Worker Safety, Biosecurity, and Emergency Management

Competencies and Suggested Objectives
1. Investigate workplace safety and the use of personal protective equipment (PPE). DOK1 a. Describe safe practices when using equipment, handling livestock, handling animal health products, and working around potentially hazardous areas. b. Explore safety scenarios within the animal industry. • Manure pits • Fumes in areas with poor or no ventilation • Health product and pesticide handling/storage • Injuries from handling animals
2. Develop and maintain an emergency action plan (EAP) for working in animal agriculture. DOK3 a. Develop an EAP with the necessary information in the event of an emergency. Name of site • Premise identification number (PIN) • Owner/operator name • Farm Services Agency (FSA) number • Global Positioning System (GPS) coordinates • Physical address of the site (911 address) • Directions to the nearest town • Important telephone numbers and contact information ○ Veterinarian ○ Police ○ Fire ○ Doctor ○ Poison control ○ Utilities ○ Local emergency management agency
3. Evaluate biosecurity risks in animal agriculture and understand how to mitigate risk. DOK2 a. Define the term biosecurity and its effect on animal agriculture. b. Investigate biosecurity practices for animal agriculture: • Disease containment • Sanitation • Livestock management • Preventing infectious disease from entering operations • Controlling microbial contamination • Water contamination • Pest control
Note: Safety is to be taught as an ongoing part of the program. Students are required to complete a written safety test with 100% accuracy before entering the shop for lab simulations and projects. This test should be documented in each student's file.

Unit 4: Application of Feed and Feeding to Animal Growth and Production

Competencies and Suggested Objectives

1. Investigate the role of the animal digestive system in growth and nutrition. DOK1
   a. Describe a monogastric digestive system.
   b. Describe a ruminant digestive system.
      - Rumen
      - Reticulum
      - Omasum
      - Abomasum
   c. Describe a pseudoruminant digestive system (i.e., cecum).
   d. Describe an avian digestive system (i.e., crop, gizzard).
   e. Describe a fish's digestive system (i.e., stomach, intestines).

2. Examine the role of nutrition in animal growth and health at different life stages. DOK2
   a. Explain metabolism.
   b. List six nutrients essential to life and how they are used to meet the nutritional requirements of animals.
      - Proteins
      - Carbohydrates
      - Fats
      - Vitamins
        - Fat-soluble (e.g., A, D, E, K)
        - Water-soluble (e.g., B, C)
      - Minerals
        - Macro (e.g., Ca P, Na, Cl)
        - Micro
      - Water (source and quality)
   c. Define common terms associated with feed and feeding.
      - Feedstuffs
      - Concentrates
      - Roughages
      - Rations
      - Total Digestible Nutrients (TDN)
      - Crude protein
      - Dry matter
   d. Distinguish between different sources of nutrients found in concentrates and roughages associated with various animal rations.
      - Plant sources (e.g., corn, soybean meal, cotton seed meal, hay)
      - Animal sources (e.g., bone meal, fish meal, feather meal)
      - Synthetic sources (e.g., urea)
   e. Explain the role of microorganisms in ruminants in increasing feed utilization.

3. Explain the role of nutrition in agricultural animal production. DOK3
   a. Determine the available/appropriate feedstuffs that meet the nutrient requirements of various types of livestock.
      - Beef cattle
      - Dairy cattle
      - Horses
      - Sheep
      - Goats
      - Swine
      - Poultry
      - Aquaculture crops
   b. Determine the nutritional requirements of a class of livestock based on production purposes.
      - Growth
      - Maintenance
      - Reproduction
      - Production
      - Lactation
      - Work

4. Explain how animals are fed. DOK3
   a. Describe how a feed ration is formulated.
   b. Calculate feed rations using the Pearson square.
   c. Interpret an ingredient label from a bag of livestock feed.
   d. Distinguish between feed additives and feed supplements.
   e. Calculate a least-cost formulation for feeding livestock.
   f. Interpret a hay sample report.

5. Describe the various types of feeding systems used in livestock production (e.g., hand-fed, free choice/ad libidum, creep feed). DOK1

6. Discuss forage management systems that emphasize production and utilization by ruminants and pseudoruminants. DOK2
   a. Compare cool-season and warm-season grasses.
   b. Describe grazing systems (e.g., continuous, rotational, intense).
   c. Determine carrying capacity.
   d. Discuss the utilization and management of harvested forages (e.g., hay, haylage, silage).

Unit 5: Genetics

Competencies and Suggested Objectives
1. Discuss the application of heredity and genetics in animal production. DOK1 a. Investigate the importance of heredity and genetics. b. Define terms related to genetics and heredity. • Genes • Chromosomes • Mutations • Inherited traits • Dominant • Recessive • Codominant • Heterozygous • Homozygous • Alleles • Gametes • Genotypes • Phenotypes
2. Predict the transmission of a trait from parents to offspring using a Punnett square to complete a monohybrid and dihybrid cross. DOK2

Unit 6: Animal Reproduction

Competencies and Suggested Objectives

1. Examine the process of reproduction in animal production. DOK1
   a. Define common terms associated with animal reproduction.
      - Copulation
      - Estrus/heat
      - Conception
      - Gestation
      - Fertilization
      - Ovulation
      - Lactation
      - Parturition
      - Incubation
   b. Describe the importance of reproduction and reproductive efficiency to animal enterprises.
   c. Describe the process of fertilization.

2. Examine the reproduction process. DOK2
   a. Identify the parts of the male and female reproductive systems and discuss the function of each part.
      - Male (i.e., penis, testicle, scrotum, epididymis, accessory glands)
      - Female (i.e., uterus, cervix, ovary, Fallopian tubes, vagina, vulva, infundibulum)
   b. Discuss the male and female reproductive hormones.
      - Estrogen
      - Progesterone
      - Testosterone
   c. Identify signs of estrus in various female agricultural animals.
      - Cattle
      - Horses
      - Sheep
      - Goats
      - Swine
   d. Calculate the expected birth date for a given species based on conception date.
      - Cattle
      - Sheep
      - Goats
      - Swine
      - Horses
   e. Identify and describe the function of the reproductive system in poultry.
      - Male (i.e., cloaca, vas deferens, testes)
      - Female (i.e., ovary, infundibulum, magnum, isthmus, uterus, vagina, cloaca, vent)

f. Describe the reproductive process in poultry.
g. Indicate incubation and hatching conditions, including humidity and temperature required by various species.
- Turkey
- Chicken
- Quail

h. Describe brooding for newly hatched chicks and poults.
i. Describe the general process of spawning and incubation of Mississippi farm-raised catfish.

3. Investigate the use of breeding systems and genetic improvement techniques. DOK1
a. Describe various types of breeding systems.
- Purebred breeding system
- Crossbreeding system
- Maternal vs. terminal cross

4. Determine which breeding system works best for specific animal enterprises. DOK2
a. Compare and contrast the types of mating systems.
- Natural
- Hand-mated
- Artificial insemination
- Embryo transfer

b. Describe the application of estrus synchronization in breeding systems.
c. Observe and describe the artificial insemination method of breeding.
d. Observe and describe the procedure for collecting and processing semen.
e. Observe and describe the procedure for conducting a breeding soundness exam.
f. Observe and describe the process of embryo transfer.
g. Discuss the male-to-female ratio (e.g., bull to cow) in a natural or hand-mated breeding program.

5. Discuss new scientific technology that will be of benefit to livestock producers. DOK1
a. Investigate technology and issues related to genetic engineering.
b. Investigate research and technology as it applies to cloning in animal production.
c. Discuss the pros and cons of using new technologies in animal production.

Unit 7: Livestock Evaluation and Selection

Competencies and Suggested Objectives
1. Evaluate the external parts of an agricultural animal as they relate to selecting quality animals for meat production or breeding purposes. DOK1 a. Describe the external parts of beef, dairy, horse, swine, goat, chicken, and lamb as they relate to selection and evaluation. • Neck • Shoulder • Back • Loin • Hip/rump • Hock • Foot • Flank • Barrel b. Identify the wholesale meat cuts on a market animal. • Beef: (e.g., chuck, rib, loin, round) • Lamb/goat: (e.g., shoulder, rack, loin, leg) • Swine: (e.g., picnic shoulder, Boston butt, loin, ham) • Chicken: (e.g., breast, thigh, wing, leg)
2. Investigate the selection of market animals. DOK3 a. Critique the main points to consider when visually evaluating a market animal. • Type • Muscle • Finish • Carcass merit • Yield grade (i.e., 1, 2, 3, 4, 5) • Quality grade (i.e., prime, choice, select, standard) • Balance • Style • Structural correctness b. Evaluate classes of market animals and discuss placings for each class. c. Develop logical reasoning for the selection of market, breeding, or performance livestock. d. Explain how to improve livestock quality through selection.
3. Describe the process of selecting breeding animals. DOK2 a. Define characteristics used in selecting various species of animals for breeding purposes. • Structural soundness • Growth • Capacity

- Breed characteristics
- Sex characteristics
- Body condition
- Muscle

b. Explain the types of performance data used in selecting breeding animals.
- Birth weight (BW)
- Calving ease (CE)
- Weaning weight (WW)
- Yearling weight (YW)
- Milk (M)
- Back fat (BF)
- Loin eye area (LEA) and ribeye area (REA)
- Number born alive – sheep and swine
- 21-day litter weight – swine
- Days to 250 lbs. – swine
- Expected progeny differences
- Estimated breeding value
- Term indexes
  - Sow productivity index – swine
  - Terminal sire index – swine
  - Maternal line index – swine

c. Evaluate various species of breeding animals and identify favorable characteristics for breeding in each animal.

4. Evaluate market livestock. DOK3

a. Apply concepts in selecting high-quality market animals.
- Swine
- Goats
- Sheep
- Beef cattle
- Dairy cattle
- Chickens

b. Evaluate classes of market animals, placing them from highest quality to lowest quality, and present sound reasoning for placing the animals in their respective positions within the class.

5. Evaluate performance livestock. DOK3

a. Apply concepts in selecting high-quality performance animals.

b. Evaluate classes of performance animals, placing them from highest quality to lowest quality, and present sound reasoning for placing the animals in their respective positions within the class.

6. Evaluate breeding livestock. DOK3
    a. Apply concepts in selecting high-quality animals for breeding.
    b. Evaluate breeding animals based upon high-quality breeding characteristics and performance data that is distinctive to each species of agricultural breeding animals and present sound reasoning for placing animals in their respective positions within their class.
    c. Evaluate the classes of breeding animals and discuss the reasons for placing the animals in each class.

Unit 8: Animal Production Management

Competencies and Suggested Objectives

1. Examine basic concepts of animal health, including disease prevention, control, and treatment. DOK1
   a. Describe the signs of good health in animals.
   b. Define disease and describe the major causes of diseases and their impact on animal health.
      - Infectious
        - Pathogens
          - Bacteria (contagious and noncontagious)
          - Viruses (contagious and noncontagious)
          - Protozoa
      - Noninfectious
        - Genetics
        - Poor nutrition
        - Toxins
        - Parasites (internal and external)
        - Injury
   c. Discuss methods for delivering medicines to animals.
      - Injection (e.g., intramuscular, subcutaneous, IV)
      - Drenching
      - Pills/bolus/paste
      - Topical (e.g., powders, liquids, etc.)
      - Intramammary infusion

2. Investigate how factors such as age, genetic background, stocking density, and natural immunity affect animal health and resistance to diseases. DOK2
   a. Examine the effects of environmental conditions on animal health.
      - Temperature
      - Humidity
      - Air quality
      - Water source and quality
      - Light
   b. Discuss the role and functions of white blood cells in the development of natural immunity.
   c. Investigate the thermal neutral zone of beef cattle and how it affects animal performance (e.g., growth, reproduction, milk production).
   d. Describe how vaccinations prevent disease.
   e. Discuss practices that promote animal health.
      - Proper nutrition
      - Sanitation

- ~~Vaccination~~
- ~~Observation~~
- ~~Isolation~~
- ~~Biosecurity~~

f. ~~Demonstrate methods for delivering medicines to animals.~~

- ~~Injection (e.g., intramuscular, subcutaneous, IV)~~
- ~~Drenching~~
- ~~Pills/bolus/paste~~
- ~~Topical (e.g., powders, liquids, etc.)~~
- ~~Intramammary infusion~~

3. ~~Observe and describe management and marketing practices for various animal enterprises.~~ ~~DOK3~~

a. ~~Observe and assess critical practices in managing an animal enterprise.~~

- ~~Castration~~
- ~~Dehorning/disbudding~~
- ~~Semen testing~~
- ~~Identification (e.g., tagging, branding, ear notching)~~
- ~~Animal health practices (e.g., injections, tubing, etc.)~~
- ~~Breeding soundness exams~~
- ~~Pregnancy examination~~

b. ~~Analyze marketing practices for meat animals (e.g., cattle, swine, sheep).~~

- ~~On-farm sale~~
- ~~Public auction (e.g., sale barn, breeding sale, online)~~
- ~~Order buyer~~
- ~~Retained ownership~~

Unit 9: Facility and Equipment Management in Animal Agriculture

Competencies and Suggested Objectives
1. Explore facility, equipment, sales, and management needs for various animal enterprises. DOK3 a. Research and discuss general facility needs for different classes of animals (e.g., shelter, feeding, birthing, watering, examining, etc.). b. Participate in (and understand the concept of) a marketing practice for meat or breeding animals, such as a farm sale, a public auction, or with an order buyer. c. Discuss biosecurity practices, animal welfare, humane treatment of animals, animal behavior, and proper restraint techniques to protect the health and safety of animals. d. Demonstrate skills in building, repairing, and maintaining a safe, secure fenced area for agricultural animals. e. Design and build a cage or hutch for small animals, such as chickens, rabbits, or quail, including a watering source and containers.
2. Develop a production management plan, including facilities, equipment, production records, and maintaining and protecting animal health for a herd or flock. DOK3
3. Explore concepts of animal transportation. DOK1 a. Review trailer safety practices and describe the process of verifying if a trailer is suitable for hauling livestock. b. Investigate precautionary procedures in the event of accidents or rollovers. c. Discuss appropriate handling practices when loading and unloading livestock.

Unit 10: Issues in Animal Agriculture

Competencies and Suggested Objectives
1. Explore concepts of animal welfare and animal rights. DOK1 a. Define the concepts of animal welfare and animal rights. b. Discuss the practice of animal welfare and the implications of animal rights in animal production.
2. Examine consumer concerns and their effect on animal production. DOK1 a. Examine how consumer concerns and preferences about food and nutrition have affected animal production enterprises. b. Describe the role of quality assurance and safety in meat production today. c. Investigate concerns about animal waste and its effect on the environment. d. Identify and describe the role and function of government agencies in assisting animal producers in producing safe food products and protecting the environment.
3. Compare bioterrorism to biosecurity and discuss the effect each have on animal agriculture. DOK2
4. Analyze public perceptions of animal production for human food consumption and complete a project on the findings. DOK3

Unit 11: Business Management in Animal Agriculture

Competencies and Suggested Objectives
1. Explore banking services for personal and business accounts. DOK2 a. Identify common types of personal savings and checking options. b. Create and maintain a transaction register. c. Demonstrate how to write a check. d. Demonstrate how to write a deposit slip. e. Reconcile a bank statement. f. Investigate online banking services, including online security, identity theft, and fraud-prevention procedures.
2. Explore concepts of credit. DOK2 a. Identify and compare sources of credit (e.g., credit card, bank, finance company, credit union, government agency). b. Describe factors that indicate a good credit rating (e.g., returns, repayment capacity, risk). c. Discuss guidelines for wise use of credit. d. Describe procedures for obtaining credit. e. Explain how credit is used in the decision-making process.
3. Compare loan options. DOK2 a. Discuss the different uses of loan funds (e.g., business and personal loans). b. Describe procedures for obtaining agribusiness loans. c. Identify the types of collateral that can be used to obtain a loan. d. Calculate the cost of a loan. e. Explain the process of filling out a loan application.
4. Describe basic record-keeping principles. DOK3 a. Discuss the purpose of keeping records. b. Define terms associated with keeping financial records. • Accounting • Bookkeeping • Cash accounting • Accrual accounting • Whole-business records • Enterprise records • Income • Expenses • Inventory • Capital • Assets • Liabilities • Depreciation

c. Compare types of accounting and bookkeeping systems used in agribusiness.
d. Differentiate between accounting and bookkeeping.
e. Explain why financial records are necessary.
f. Describe the accounting cycle (i.e., calendar and fiscal year).
g. Differentiate between bookkeeping and journals.
h. Differentiate between the cash and accrual accounting systems.
i. Differentiate between whole business records and enterprise records.

5. Apply basic inventory principles. DOK2
   a. Describe the uses of an inventory.
   b. Distinguish between liquid assets, consumable supplies, capital, and noncapital assets.
   c. Determine when to inventory (calendar or fiscal year).
   d. Determine the inventory values of non-depreciable and depreciable assets.
   e. Explain depreciation on capital goods.
   f. Define terms associated with depreciation.
      - Write-off
      - Capital goods
      - Salvage value
      - Useful life
   g. Compare methods of depreciation (i.e., straight line vs. accelerated).
   h. Calculate inventory values of depreciable assets using the straight-line depreciation method.

6. Examine a balance sheet (i.e., net worth statement). DOK2
   a. Differentiate between current and noncurrent assets and liabilities.
   b. Use a balance sheet to calculate the net worth of a business.
   c. Analyze a statement of owner equity for an agribusiness.
   d. Associate the concepts of liquidity, solvency, and equity and their relationship to assets, liabilities, and net worth.
   e. Evaluate the financial standing of a given agribusiness using various financial-analysis ratios.
      - Solvency (debt-asset ratio)
      - Liquidity (current ratio)
      - Profitability (return on assets ratio)
      - Repayment capacity
      - Financial efficiency (asset turnover ratio)

7. Examine an income statement. DOK2
   a. Differentiate between operating expenses, operating income, and revenue.
   b. Summarize income and expenses.
   c. Use an income statement to calculate profit or loss.
   d. Determine gross revenue.

8. Manage personal income taxes. DOK2
   a. Prepare a W-4 to authorize withholding of income taxes from a paycheck.
   b. Calculate take-home pay for a given period.
   c. Complete a federal and state itemized and non-itemized tax form (e.g., 1040).

9. Manage business taxes. DOK1
   a. Identify types of business taxes (e.g., sales taxes, property taxes, licenses and permits, income taxes, etc.).
   b. Describe forms used to report and pay business taxes (e.g., Schedule F, Schedule C, etc.).

Student Competency Profile

Student's Name: _____

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student, and it can serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

Unit 1: Leadership and SAE for All		
	1.	Participate in local, state, and/or national FFA activities that provide opportunities for leadership development and career exploration.
	2.	Identify potential college and career opportunities in animal agriculture.
	3.	Review the types of programs under SAE for All.
	4.	Review individual plans for student Foundational SAE programs.
	5.	Develop an Immersion SAE and maintain agricultural records.
Unit 2: Introduction to Animal Agriculture		
	1.	Investigate the nature of animal agriculture and its associated enterprises.
	2.	Discuss the beef cattle industry.
	3.	Discuss the dairy cattle industry.
	4.	Discuss the equine industry.
	5.	Discuss the swine industry.
	6.	Discuss the poultry industry.
	7.	Discuss the aquaculture industry.
	8.	Discuss the goat industry.
	9.	Discuss the sheep industry.
	10.	Conduct an in-depth investigation of an animal industry in your area that provides opportunities for hands-on experience while developing workplace skills.
Unit 3: Worker Safety, Biosecurity, and Emergency Management		
	1.	Investigate workplace safety and the use of personal protective equipment (PPE).
	2.	Develop and maintain an emergency action plan (EAP) for working in animal agriculture.
	3.	Evaluate biosecurity risks in animal agriculture and understand how to mitigate risk.

Unit 4: Application of Feed and Feeding to Animal Growth and Production		
	1.	Investigate the role of the animal digestive system in growth and nutrition.
	2.	Examine the role of nutrition in animal growth and health at different life stages.
	3.	Explain the role of nutrition in agricultural animal production.
	4.	Explain how animals are fed.
	5.	Describe the various types of feeding systems used in livestock production, (e.g., hand-fed, free choice/ad libidum, creep feed).
	6.	Discuss forage management systems that emphasize production and utilization by ruminants and pseudoruminants.
Unit 5: Genetics		
	1.	Discuss the application of heredity and genetics in animal production.
	2.	Predict the transmission of a trait from parents to offspring using a Punnett square to complete a monohybrid and dihybrid cross.
Unit 6: Animal Reproduction		
	1.	Examine the process of reproduction in animal production.
	2.	Examine the reproduction process.
	3.	Investigate the use of breeding systems and genetic improvement techniques.
	4.	Determine which breeding system works best for specific animal enterprises.
	5.	Discuss new scientific technology that will be of benefit to livestock producers.
Unit 7: Livestock Evaluation and Selection		
	1.	Evaluate the external parts of an agricultural animal as they relate to selecting quality animals for meat production or breeding purposes.
	2.	Investigate the selection of market animals.
	3.	Describe the process of selecting breeding animals.
	4.	Evaluate market livestock.
	5.	Evaluate performance livestock.
	6.	Evaluate breeding livestock.
Unit 8: Animal Production Management		
	1.	Examine basic concepts of animal health, including disease prevention, control, and treatment.
	2.	Investigate how factors such as age, genetic background, stocking density, and natural immunity affect animal health and resistance to diseases.
	3.	Observe and describe management and marketing practices for various animal enterprises.

~~Unit 9: Facility and Equipment Management in Animal Agriculture~~		
	~~1.~~	~~Explore facility, equipment, sales, and management needs for various animal enterprises.~~
	~~2.~~	~~Develop a production management plan, including facilities, equipment, production records, and maintaining and protecting animal health for a herd or flock.~~
	~~3.~~	~~Explore concepts of animal transportation.~~
~~Unit 10: Issues in Animal Agriculture~~		
	~~1.~~	~~Explore concepts of animal welfare and animal rights.~~
	~~2.~~	~~Examine consumer concerns and their effect on animal production.~~
	~~3.~~	~~Compare bioterrorism to biosecurity and discuss the effect each have on animal agriculture.~~
	~~4.~~	~~Analyze public perceptions of animal production for human food consumption and complete a project on the findings.~~
~~Unit 11: Business Management in Animal Agriculture~~		
	~~1.~~	~~Explore banking services for personal and business accounts.~~
	~~2.~~	~~Explore concepts of credit.~~
	~~3.~~	~~Compare loan options.~~
	~~4.~~	~~Describe basic record-keeping principles.~~
	~~5.~~	~~Apply basic inventory principles.~~
	~~6.~~	~~Examine a balance sheet (i.e., net worth statement).~~
	~~7.~~	~~Examine an income statement.~~
	~~8.~~	~~Manage personal income taxes.~~
	~~9.~~	~~Manage business taxes.~~

Appendix A: Industry Standards

Framework for AFNR Content Standards and Performance Elements Crosswalk for Diversified Agriculture Animals Core

-	Unit	1	2	3	4	5	6	7	8	9	10	11
AFNR	-	-	-		-	-	-	-	-	-	-	-
ABS- Agribusiness Systems	-	X	X	X	-	-	-	-	X	X	-	X
AS- Animal Systems	-	X	X	X	X	X	X	X	X	X	X	X
BS- Biotechnology	-	-	-		-	X	X	-	-	X	-	-
CRP- Career Ready Practices	-	X	X	X	X	X	X	X	X	X	X	X
CS- AFNR Cluster Skill	-	X	X	X	X	X	X	X	X	X	X	X
ES- Environmental Service Systems	-	-	-		-	-	-	-	-	-	X	-
FPP- Food Products and Processing Systems	-	-	X		X	-	-	X	-	-	X	-
NRS- Natural Resource Systems	-	-	-		-	-	-	-	-	-	X	-
PS- Plant Systems	-	-	-		-	-	-	-	-	-	-	-
PST- Power, Structural, and Technical Systems	-	-	-		-	-	-	-	-	-	-	-

AFNR Pathway
Content Standards and Performance Elements

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ABS – AGRIBUSINESS SYSTEMS
AS – ANIMAL SYSTEMS
BS – BIOTECHNOLOGY
CRP – CAREER READY PRACTICES
CS – AGRICULTURE FOOD AND NATURAL RESOURCES CLUSTER SKILL
ES – ENVIRONMENTAL SERVICE SYSTEMS
FPP – FOOD PRODUCTS AND PROCESSING SYSTEMS
NRS – NATURAL RESOURCE SYSTEMS
PS – PLANT SYSTEMS
PST – POWER, STRUCTURAL, AND TECHNICAL SYSTEMS

Agribusiness Systems Career Pathway Content Standards

The Agribusiness Systems (ABS) Career Pathway encompasses the study of agribusinesses and their management including, but not limited to, record keeping, budget management (cash and credit), and business planning, and sales and marketing. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the planning, development, application and management of agribusiness systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- ***Common Career Technical Core (CCTC) Standards*** – These are the standards for Agribusiness Systems (AG-ABS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- ***Performance Indicators*** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

ABS.01. CCTC Standard: Apply management planning principles in AFNR businesses.

ABS.01.01. Performance Indicator: Apply micro- and macroeconomic principles to plan and manage inputs and outputs in an AFNR business.

ABS.01.02. Performance Indicator: Read, interpret, evaluate and write statements of purpose to guide business goals, objectives and resource allocation.

ABS.01.03. Performance Indicator: Devise and apply management skills to organize and run an AFNR business in an efficient, legal and ethical manner.

ABS.01.04. Performance Indicator: Evaluate, develop and implement procedures used to recruit, train and retain productive human resources for AFNR businesses.

ABS.02. CCTC Standard: Use record keeping to accomplish AFNR business objectives, manage budgets and comply with laws and regulations.

ABS.02.01. Performance Indicator: Apply fundamental accounting principles, systems, tools and applicable laws and regulations to record, track and audit AFNR business transactions (e.g., accounts, debits, credits, assets, liabilities, equity, etc.).

ABS.02.02. Performance Indicator: Assemble, interpret and analyze financial information and reports to monitor AFNR business performance and support decision-making (e.g., income statements, balance sheets, cash flow analysis, inventory reports, break-even analysis, return on investment, taxes, etc.).

ABS.03. CCTC Standard: Manage cash budgets, credit budgets and credit for an AFNR business using generally accepted accounting principles.

ABS.03.01. Performance Indicator: Develop, assess and manage cash budgets to achieve AFNR business goals.

ABS.03.02. Performance Indicator: Analyze credit needs and manage credit budgets to achieve AFNR business goals.

ABS.04. CCTC Standard: Develop a business plan for an AFNR business.

ABS.04.01. Performance Indicator: Analyze characteristics and planning requirements associated with developing business plans for different types of AFNR businesses.

ABS.04.02. Performance Indicator: Develop production and operational plans for an AFNR business.

ABS.04.03. Performance Indicator: Identify and apply strategies to manage or mitigate risk.

ABS.05. CCTC Standard: Use sales and marketing principles to accomplish AFNR business objectives.

ABS.05.01. Performance Indicator: Analyze the role of markets, trade, competition and price in relation to an AFNR business sales and marketing plans.

ABS.05.02. Performance Indicator: Assess and apply sales principles and skills to accomplish AFNR business objectives.

ABS.05.03. Performance Indicator: Assess marketing principles and develop marketing plans to accomplish AFNR business objectives.

Animal Systems Career Pathway Content Standards

The Animal Systems (AS) Career Pathway encompasses the study of animal systems, including content areas such as life processes, health, nutrition, genetics, and management and processing, as applied to small animals, aquaculture, exotic animals, livestock, dairy, horses and/or poultry. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of animal systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- ***Common Career Technical Core (CCTC) Standards*** – These are the standards for Animal Systems (AG-AS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- ***Performance Indicators*** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

AS.01. CCTC Standard: Analyze historic and current trends impacting the animal systems industry.

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

AS.01.02. Performance Indicator: Assess and select animal production methods for use in animal systems based upon their effectiveness and impacts.

AS.01.03. Performance Indicator: Analyze and apply laws and sustainable practices to animal agriculture from a global perspective.

AS.02. CCTC Standard: Utilize best-practice protocols based upon animal behaviors for animal husbandry and welfare.

AS.02.01. Performance Indicator: Demonstrate management techniques that ensure animal welfare.

AS.02.02. Performance Indicator: Analyze procedures to ensure that animal products are safe for consumption (e.g., use in food system, etc.).

AS.03. CCTC Standard: Design and provide proper animal nutrition to achieve desired outcomes for performance, development, reproduction and/or economic production.

AS.03.01. Performance Indicator: Analyze the nutritional needs of animals.

AS.03.02 Performance Indicator: Analyze feed rations and assess if they meet the nutritional needs of animals.

AS.03.03 Performance Indicator: Utilize industry tools to make animal nutrition decisions.

AS.04. CCTC Standard: Apply principles of animal reproduction to achieve desired outcomes for performance, development and/or economic production.

AS.04.01. Performance Indicator: Evaluate animals for breeding readiness and soundness.

AS.04.02. Performance Indicator: Apply scientific principles to select and care for breeding animals.

AS.04.03 Performance Indicator: Apply scientific principles to breed animals.

AS.05. CCTC Standard: Evaluate environmental factors affecting animal performance and implement procedures for enhancing performance and animal health.

AS.05.01. Performance Indicator: Design animal housing, equipment and handling facilities for the major systems of animal production.

AS.05.02. Performance Indicator: Comply with government regulations and safety standards for facilities used in animal production.

AS.06. CCTC Standard: Classify, evaluate and select animals based on anatomical and physiological characteristics.

AS.06.01. Performance Indicator: Classify animals according to taxonomic classification systems and use (e.g. agricultural, companion, etc.).

AS.06.02. Performance Indicator: Apply principles of comparative anatomy and physiology to uses within various animal systems.

AS.06.03. Performance Indicator: Select and train animals for specific purposes and maximum performance based on anatomy and physiology.

AS.07. CCTC Standard: Apply principles of effective animal health care.

AS.07.01. Performance Indicator: Design programs to prevent animal diseases, parasites and other disorders and ensure animal welfare.

AS.07.02. Performance Indicator: Analyze biosecurity measures utilized to protect the welfare of animals on a local, state, national, and global level.

AS.08. CCTC Standard: Analyze environmental factors associated with animal production.

AS.08.01. Performance Indicator: Design and implement methods to reduce the effects of animal production on the environment.

AS.08.02. Performance Indicator: Evaluate the effects of environmental conditions on animals and create plans to ensure favorable environments for animals.

Common Career Technical Core Career Ready Practices Content Standards

The CCTC CRPs encompass fundamental skills and practices that all students should acquire to be career ready such as: responsibility, productivity, healthy choices, maintaining personal finances, communication, decision-making, creativity and innovation, critical thinking, problem solving, integrity, ethical leadership, management, career planning, technology use and cultural/global competency. Students completing a program of study in any AFNR career pathway will demonstrate the knowledge, skills and behaviors that are important to career ready through experiences in a variety of settings (e.g., classroom, CTSO, work-based learning, community etc.).

DEFINITIONS: Within each pathway, the standards are organized as follows:

- ***Common Career Technical Core (CCTC) Standards*** – These are the standards for CRPs from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- ***Performance Indicators*** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a CTE program of study.

CRP.01. CCTC Standard: Act as a responsible and contributing citizen and employee.

CRP.01.01. Performance Indicator: Model personal responsibility in the workplace and community.

CRP.01.02 Performance Indicator: Evaluate and consider the near-term and long-term impacts of personal and professional decisions on employers and community before taking action.

CRP.01.03. Performance Indicator: Identify and act upon opportunities for professional and civic service at work and in the community.

CRP.02. CCTC Standard: Apply appropriate academic and technical skills.

CRP.02.01. Performance Indicator: Use strategic thinking to connect and apply academic learning, knowledge and skills to solve problems in the workplace and community.

CRP.02.02. Performance Indicator: Use strategic thinking to connect and apply technical concepts to solve problems in the workplace and community.

CRP.03. CCTC Standard: Attend to personal health and financial well-being.

CRP.03.01. Performance Indicator: Design and implement a personal wellness plan.

CRP.03.02. Performance Indicator: Design and implement a personal financial management plan.

CRP.04. CCTC Standard: Communicate clearly, effectively and with reason.

CRP.04.01. Performance Indicator: Speak using strategies that ensure clarity, logic, purpose and professionalism in formal and informal settings.

CRP.04.02. Performance Indicator: Produce clear, reasoned and coherent written and visual communication in formal and informal settings.

CRP.04.03. Performance Indicator: Model active listening strategies when interacting with others in formal and informal settings.

CRP.05. CCTC Standard: Consider the environmental, social and economic impacts of decisions.

CRP.05.01. Performance Indicator: Assess, identify and synthesize the information and resources needed to make decisions that positively impact the workplace and community.

CRP.05.02. Performance Indicator: Make, defend and evaluate decisions at work and in the community using information about the potential environmental, social and economic impacts.

CRP.06. CCTC Standard: Demonstrate creativity and innovation.

CRP.06.01. Performance Indicator: Synthesize information, knowledge and experience to generate original ideas and challenge assumptions in the workplace and community.

CRP.06.02. Performance Indicator: Assess a variety of workplace and community situations to identify ways to add value and improve the efficiency of processes and procedures.

CRP.06.03. Performance Indicator: Create and execute a plan of action to act upon new ideas and introduce innovations to workplace and community organizations.

CRP.07. CCTC Standard: Employ valid and reliable research strategies.

CRP.07.01. Performance Indicator: Select and implement reliable research processes and methods to generate data for decision-making in the workplace and community.

CRP.07.02. Performance Indicator: Evaluate the validity of sources and data used when considering the adoption of new technologies, practices and ideas in the workplace and community.

CRP.08. CCTC Standard: Utilize critical thinking to make sense of problems and persevere in solving them.

CRP.08.01. Performance Indicator: Apply reason and logic to evaluate workplace and community situations from multiple perspectives.

CRP.08.02. Performance Indicator: Investigate, prioritize and select solutions to solve problems in the workplace and community.

CRP.08.03. Performance Indicator: Establish plans to solve workplace and community problems and execute them with resiliency.

CRP.09. CCTC Standard: Model integrity, ethical leadership and effective management.

CRP.09.01. Performance Indicator: Model characteristics of ethical and effective leaders in the workplace and community (e.g. integrity, self-awareness, self-regulation, etc.).

CRP.09.02. Performance Indicator: Implement personal management skills to function effectively and efficiently in the workplace (e.g., time management, planning, prioritizing, etc.).

CRP.09.03. Performance Indicator: Demonstrate behaviors that contribute to a positive morale and culture in the workplace and community (e.g., positively influencing others, effectively communicating, etc.).

CRP.10. CCTC Standard: Plan education and career path aligned to personal goals.

CRP.10.01. Performance Indicator: Identify career opportunities within a career cluster that match personal interests, talents, goals and preferences.

CRP.10.02. Performance Indicator: Examine career advancement requirements (e.g., education, certification, training, etc.) and create goals for continuous growth in a chosen career.

CRP.10.03. Performance Indicator: Develop relationships with and assimilate input and/or advice from experts (e.g., counselors, mentors, etc.) to plan career and personal goals in a chosen career area.

CRP.10.04. Performance Indicator: Identify, prepare, update and improve the tools and skills necessary to pursue a chosen career path.

CRP.11. CCTC Standard: Use technology to enhance productivity.

CRP.11.01. Performance Indicator: Research, select and use new technologies, tools and applications to maximize productivity in the workplace and community.

CRP.11.02. Performance Indicator: Evaluate personal and organizational risks of technology use and take actions to prevent or minimize risks in the workplace and community.

CRP.12. CCTC Standard: Work productively in teams while using cultural/global competence.

CRP.12.01. Performance Indicator: Contribute to team-oriented projects and builds consensus to accomplish results using cultural global competence in the workplace and community.

CRP.12.02. Performance Indicator: Create and implement strategies to engage team members to work toward team and organizational goals in a variety of workplace and community situations (e.g., meetings, presentations, etc.).

Agriculture, Food, and Natural Resources Cluster Skill Content Standards

The AFNR Cluster Skills (CS) encompasses the study of fundamental knowledge and skills related to all AFNR professions. Students completing a program of study in any AFNR career

pathway will demonstrate fundamental knowledge of the nature, scope and relationships of AFNR systems and the skills necessary for analysis of current and historical issues and trends; application of technologies; safety, health and environmental practices; stewardship of natural resources; and exploration of career opportunities.

Within each pathway, the standards are organized as follows:

- ***Common Career Technical Core (CCTC) Standards*** – These are the standards for Agriculture, Food and Natural Resources Career Cluster® (AG) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- ***Performance Indicators*** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

CS.01. CCTC Standard: Analyze how issues, trends, technologies and public policies impact systems in the Agriculture, Food & Natural Resources Career Cluster.

- **CS.01.01. Performance Indicator:** Research, examine and discuss issues and trends that impact AFNR systems on local, state, national and global levels.
- **CS.01.02. Performance Indicator:** Examine technologies and analyze their impact on AFNR systems.
- **CS.01.03. Performance Indicator:** Identify public policies and examine their impact on AFNR systems.

CS.02. CCTC Standard: Evaluate the nature and scope of the Agriculture, Food & Natural Resources Career Cluster and the role of agriculture, food and natural resources (AFNR) in society and the economy.

- **CS.02.01. Performance Indicator:** Research and use geographic and economic data to solve problems in AFNR systems.
- **CS.02.02. Performance Indicator:** Examine the components of the AFNR systems and assess their impact on the local, state, national and global society and economy.

CS.03. CCTC Standard: Examine and summarize the importance of health, safety and environmental management systems in AFNR workplaces.

- **CS.03.01. Performance Indicator:** Identify and explain the implications of required regulations to maintain and improve safety, health and environmental management systems.
- **CS.03.02. Performance Indicator:** Develop and implement a plan to maintain and improve health, safety and environmental compliance and performance.
- **CS.03.03. Performance Indicator:** Apply health and safety practices to AFNR workplaces.
- **CS.03.04. Performance Indicator:** Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.

CS.04. CCTC Standard: Demonstrate stewardship of natural resources in AFNR activities.

CS.04.01. Performance Indicator: Identify and implement practices to steward natural resources in different AFNR systems.

CS.04.02. Performance Indicator: Assess and explain the natural resource related trends, technologies and policies that impact AFNR systems.

CS.05. CCTC Standard: Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.

CS.05.01. Performance Indicator: Evaluate and implement the steps and requirements to pursue a career opportunity in each of the AFNR career pathways (e.g., goals, degrees, certifications, resumes, cover letter, portfolios, interviews, etc.).

CS.06. CCTC Standard: Analyze the interaction among AFNR systems in the production, processing and management of food, fiber and fuel and the sustainable use of natural resources.

CS.06.01. Performance Indicator: Examine and explain foundational cycles and systems of AFNR.

CS.06.02. Performance Indicator: Analyze and explain the connection and relationships between different AFNR systems on a national and global level.

Biotechnology Systems Career Pathway Content Standards

The Biotechnology Systems (BS) Career Pathway encompasses the study of using data and scientific techniques to solve problems concerning living organisms with an emphasis on applications to agriculture, food and natural resource systems. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of biotechnology in the context of AFNR.

Within each pathway, the standards are organized as follows:

- ***National Council for Agricultural Education (NCAE) Standard**** – These are the standards set forth by the National Council for Agricultural Education for Biotechnology Systems. They define what students should know and be able to do after completing instruction in a program of study focused on applying biotechnology to AFNR systems.
- ***Performance Indicators*** – These statements distill each performance element into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related performance element at the conclusion of a program of study in this area.

BS.01. NCAE Standard: Assess factors that have influenced the evolution of biotechnology in agriculture (e.g., historical events, societal trends, ethical and legal implications, etc.).

BS.01.01. Performance Indicator: Investigate and explain the relationship between past, current and emerging applications of biotechnology in agriculture (e.g., major innovators, historical developments, potential applications of biotechnology, etc.).

BS.01.02. Performance Indicator: Evaluate the scope and implications of regulatory agencies on applications of biotechnology in agriculture and protection of public interests (e.g., health, safety, environmental issues, etc.).

BS.01.03. Performance Indicator: Analyze the relationship and implications of bioethics, laws and public perceptions on applications of biotechnology in agriculture (e.g., ethical, legal, social, cultural issues).

BS.02. NCAE Standard: Demonstrate proficiency by safely applying appropriate laboratory skills to complete tasks in a biotechnology research and development environment (e.g., standard operating procedures, record keeping, aseptic technique, equipment maintenance, etc.).

BS.02.01. Performance Indicator: Read, document, evaluate and secure accurate laboratory records of experimental protocols, observations and results.

BS.02.02. Performance Indicator: Implement standard operating procedures for the proper maintenance, use and sterilization of equipment in a laboratory.

BS.02.03. Performance Indicator: Apply standard operating procedures for the safe handling of biological and chemical materials in a laboratory.

BS.02.04. Performance Indicator: Safely manage and dispose of biological materials, chemicals and wastes according to standard operating procedures.

BS.02.05. Performance Indicator: Examine and perform scientific procedures using microbes, DNA, RNA and proteins in a laboratory.

BS.03. NCAE Standard: Demonstrate the application of biotechnology to solve problems in Agriculture, Food and Natural Resources (AFNR) systems (e.g., bioengineering, food processing, waste management, horticulture, forestry, livestock, crops, etc.).

BS.03.01. Performance Indicator: Apply biotechnology principles, techniques and processes to create transgenic species through genetic engineering.

BS.03.02. Performance Indicator: Apply biotechnology principles, techniques and processes to enhance the production of food through the use of microorganisms and enzymes.

BS.03.03. Performance Indicator: Apply biotechnology principles, techniques and processes to protect the environment and maximize use of natural resources (e.g., biomass, bioprospecting, industrial biotechnology, etc.).

BS.03.04. Performance Indicator: Apply biotechnology principles, techniques and processes to enhance plant and animal care and production (e.g., selective breeding, pharmaceuticals, biodiversity, etc.).

BS.03.05. Performance Indicator: Apply biotechnology principles, techniques and processes to produce biofuels (e.g., fermentation, transesterification, methanogenesis, etc.).

BS.03.06. Performance Indicator: Apply biotechnology principles, techniques and processes to improve waste management (e.g., genetically modified organisms, bioremediation, etc.).

Environmental Service Systems Career Pathway Content Standards

The Environmental Service Systems (ESS) Career Pathway encompasses the study of systems, instruments and technology used to monitor and minimize the impact of human activity on environmental systems. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of environmental service systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- ***Common Career Technical Core (CCTC) Standards*** – These are the standards for Environmental Service Systems (AG-ESS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- ***Performance Indicators*** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

ESS.01. CCTC Standard: Use analytical procedures and instruments to manage environmental service systems.

ESS.01.01. Performance Indicator: Analyze and interpret laboratory and field samples in environmental service systems.

ESS.01.02. Performance Indicator: Properly utilize scientific instruments in environmental monitoring situations (e.g., laboratory equipment, environmental monitoring instruments, etc.).

ESS.02. CCTC Standard: Evaluate the impact of public policies and regulations on environmental service system operations.

ESS.02.01. Performance Indicator: Interpret and evaluate the impact of laws, agencies, policies and practices affecting environmental service systems.

ESS.02.02. Performance Indicator: Compare and contrast the impact of current trends on regulation of environmental service systems (e.g., climate change, population growth, international trade, etc.).

ESS.02.03. Performance Indicator: Examine and summarize the impact of public perceptions and social movements on the regulation of environmental service systems.

ESS.03. CCTC Standard: Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology.

ESS.03.01. Performance Indicator: Apply meteorology principles to environmental service systems.

ESS.03.02. Performance Indicator: Apply soil science and hydrology principles to environmental service systems.

ESS.03.03. Performance Indicator: Apply chemistry principles to environmental service systems.

ESS.03.04. Performance Indicator: Apply microbiology principles to environmental service systems.

ESS.03.05. Performance Indicator: Apply ecology principles to environmental service systems.

ESS.04. CCTC Standard: Demonstrate the operation of environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management and energy conservation).

ESS.04.01. Performance Indicator: Use pollution control measures to maintain a safe facility and environment.

ESS.04.02. Performance Indicator: Manage safe disposal of all categories of solid waste in environmental service systems.

ESS.04.03. Performance Indicator: Apply techniques to ensure a safe supply of drinking water and adequate treatment of wastewater according to applicable rules and regulations.

ESS.04.04. Performance Indicator: Compare and contrast the impact of conventional and alternative energy sources on the environment and operation of environmental service systems.

ESS.05. CCTC Standard: Use tools, equipment, machinery and technology common to tasks in environmental service systems.

ESS.05.01. Performance Indicator: Use technological and mathematical tools to map land, facilities and infrastructure for environmental service systems.

ESS.05.02. Performance Indicator: Perform assessments of environmental conditions using equipment, machinery and technology.

Food Products and Processing Systems Career Pathway Content Standards

The Food Products and Processing Systems (FPP) Career Pathway encompasses the study of food safety and sanitation; nutrition, biology, microbiology, chemistry and human behavior in local and global food systems; food selection and processing for storage, distribution and consumption; and the historical and current development of the food industry. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of food products and processing systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- ***Common Career Technical Core (CCTC) Standards*** – These are the standards for Food Products and Processing Systems (AG-FPP) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- ***Performance Indicators*** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to

demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

FPP.01. CCTC Standard: Develop and implement procedures to ensure safety, sanitation and quality in food product and processing facilities.

FPP.01.01. Performance Indicator: Analyze and manage operational and safety procedures in food products and processing facilities.

FPP.01.02. Performance Indicator: Apply food safety and sanitation procedures in the handling and processing of food products to ensure food quality.

FPP.01.03. Performance Indicator: Apply food safety procedures when storing food products to ensure food quality.

FPP.02. CCTC Standard: Apply principles of nutrition, biology, microbiology, chemistry and human behavior to the development of food products.

FPP.02.01. Performance Indicator: Apply principles of nutrition and biology to develop food products that provide a safe, wholesome and nutritious food supply for local and global food systems.

FPP.02.02. Performance Indicator: Apply principles of microbiology and chemistry to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

FPP.02.03. Performance Indicator: Apply principles of human behavior to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

FPP.03. CCTC Standard: Select and process food products for storage, distribution and consumption.

FPP.03.01. Performance Indicator: Implement selection, evaluation and inspection techniques to ensure safe and quality food products.

FPP.03.02. Performance Indicator: Design and apply techniques of food processing, preservation, packaging and presentation for distribution and consumption of food products.

FPP.03.03. Performance Indicator: Create food distribution plans and procedures to ensure safe delivery of food products.

FPP.04. CCTC Standard: Explain the scope of the food industry and the historical and current developments of food product and processing.

FPP.04.01. Performance Indicator: Examine the scope of the food industry by evaluating local and global policies, trends and customs for food production.

FPP.04.02. Performance Indicator: Evaluate the significance and implications of changes and trends in the food products and processing industry in the local and global food systems.

FPP.04.03. Performance Indicator: Identify and explain the purpose of industry organizations, groups and regulatory agencies that influence the local and global food systems.

Natural Resource Systems Career Pathway Content Standards

The Natural Resource Systems (NRS) Career Pathway encompasses the study of the management, protection, enhancement and improvement of soil, water, wildlife, forests and air as natural resources. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of natural resource systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- ***Common Career Technical Core (CCTC) Standards*** – These are the standards for Natural Resource Systems (AG-NRS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- ***Performance Indicators*** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

NRS.01. CCTC Standard: Plan and conduct natural resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goals.

NRS.01.01. Performance Indicator: Apply methods of classification to examine natural resource availability and ecosystem function in a particular region.

NRS.01.02. Performance Indicator: Classify different types of natural resources in order to enable protection, conservation, enhancement and management in a particular geographical region.

NRS.01.03. Performance Indicator: Apply ecological concepts and principles to atmospheric natural resource systems.

NRS.01.04. Performance Indicator: Apply ecological concepts and principles to aquatic natural resource systems.

NRS.01.05. Performance Indicator: Apply ecological concepts and principles to terrestrial natural resource systems.

NRS.01.06. Performance Indicator: Apply ecological concepts and principles to living organisms in natural resource systems.

NRS.02. CCTC Standard: Analyze the interrelationships between natural resources and humans.

NRS.02.01. Performance Indicator: Examine and interpret the purpose, enforcement, impact and effectiveness of laws and agencies related to natural resource management, protection, enhancement and improvement (e.g., water regulations, game laws, historic preservation laws, environmental policy, etc.).

NRS.02.02. Performance Indicator: Assess the impact of human activities on the availability of natural resources.

NRS.02.03. Performance Indicator: Analyze how modern perceptions of natural resource management, protection, enhancement and improvement change and develop over time.

NRS.02.04. Performance Indicator: Examine and explain how economics affects the use of natural resources.

NRS.02.05. Performance Indicator: Communicate information to the public regarding topics related to the management, protection, enhancement, and improvement of natural resources.

NRS.03. CCTC Standard: Develop plans to ensure sustainable production and processing of natural resources.

NRS.03.01. Performance Indicator: Sustainably produce, harvest, process and use natural resource products (e.g., forest products, wildlife, minerals, fossil fuels, shale oil, alternative energy, recreation, aquatic species, etc.).

NRS.03.02. Performance Indicator: Demonstrate cartographic skills, tools and technologies to aid in developing, implementing and evaluating natural resource management plans.

NRS.04. CCTC Standard: Demonstrate responsible management procedures and techniques to protect, maintain, enhance, and improve natural resources.

NRS.04.01. Performance Indicator: Demonstrate natural resource protection, maintenance, enhancement and improvement techniques.

NRS.04.02. Performance Indicator: Diagnose plant and wildlife diseases and follow protocols to prevent their spread.

NRS.04.03. Performance Indicator: Prevent or manage introduction of ecologically harmful species in a particular region.

NRS.04.04. Performance Indicator: Manage fires in natural resource systems.

Plant Science Systems Career Pathway Content Standards

The Plant Systems (PS) Career Pathway encompasses the study of plant life cycles, classifications, functions, structures, reproduction, media and nutrients, as wells as growth and cultural practices through the study of crops, turf grass, trees, shrubs and/or ornamental plants. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of plant systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- ***Common Career Technical Core (CCTC) Standards*** – These are the standards for Plant Systems (AG-PS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- ***Performance Indicators*** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

PS.01. CCTC Standard: Develop and implement a crop management plan for a given production goal that accounts for environmental factors.

PS.01.01. Performance Indicator: Determine the influence of environmental factors on plant growth.

PS.01.02. Performance Indicator: Prepare and manage growing media for use in plant systems.

PS.01.03. Performance Indicator: Develop and implement a fertilization plan for specific plants or crops.

PS.02. CCTC Standard: Apply principles of classification, plant anatomy, and plant physiology to plant production and management.

PS.02.01. Performance Indicator: Classify plants according to taxonomic systems.

PS.02.02. Performance Indicator: Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.

PS.02.03. Performance Indicator: Apply knowledge of plant physiology and energy conversion to plant systems.

PS.03. CCTC Standard: Propagate, culture and harvest plants and plant products based on current industry standards.

PS.03.01. Performance Indicator: Demonstrate plant propagation techniques in plant system activities.

PS.03.02. Performance Indicator: Develop and implement a management plan for plant production.

PS.03.03. Performance Indicator: Develop and implement a plan for integrated pest management for plant production.

PS.03.04. Performance Indicator: Apply principles and practices of sustainable agriculture to plant production.

PS.03.05. Performance Indicator: Harvest, handle and store crops according to current industry standards.

PS.04. CCTC Standard: Apply principles of design in plant systems to enhance an environment (e.g. floral, forest landscape, and farm).

PS.04.01. Performance Indicator: Evaluating, identifying and preparing plants to enhance an environment.

PS.04.02. Performance Indicator: Create designs using plants.

Power, Structural and Technical Systems Career Pathway Content Standards

The Power, Structural and Technical Systems (PST) Career Pathway encompasses the study of agricultural equipment, power systems, alternative fuel sources and precision technology, as well as woodworking, metalworking, welding and project planning for agricultural structures. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of power, structural and technical systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- ***Common Career Technical Core (CCTC) Standards*** – These are the standards for Power, Structural and Technical Systems (AG-PST) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- ***Performance Indicators*** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

PST.01. CCTC Standard: Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural and technical systems.

PST.01.01. Performance Indicator: Apply physical science and engineering principles to assess and select energy sources for AFNR power, structural and technical systems.

PST.01.02. Performance Indicator: Apply physical science and engineering principles to design, implement and improve safe and efficient mechanical systems in AFNR situations.

PST.01.03. Performance Indicator: Apply physical science principles to metal fabrication using a variety of welding and cutting processes (e.g., SMAW, GMAW, GTAW, fuel-oxygen and plasma arc torch, etc.).

PST.02. CCTC Standard: Operate and maintain AFNR mechanical equipment and power systems.

PST.02.01. Performance Indicator: Perform preventative maintenance and scheduled service to maintain equipment, machinery and power units used in AFNR settings.

PST.02.02. Performance Indicator: Operate machinery and equipment while observing all safety precautions in AFNR settings.

PST.03. CCTC Standard: Service and repair AFNR mechanical equipment and power systems.

PST.03.01. Performance Indicator: Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.

PST.03.02. Performance Indicator: Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods.

PST.03.03. Performance Indicator: Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment and power source systems (e.g., hydraulic, pneumatic, transmission, steering, suspension, etc.).

PST.04. CCTC Standard: Plan, build and maintain AFNR structures.

PST.04.01. Performance Indicator: Create sketches and plans for AFNR structures.

PST.04.02. Performance Indicator: Determine structural requirements, specifications and estimate costs for AFNR structures

PST.04.03. Performance Indicator: Follow architectural and mechanical plans to construct, maintain and/or repair AFNR structures (e.g., material selection, site preparation and/or layout, plumbing, concrete/masonry, etc.).

PST.04.04. Performance Indicator: Apply electrical wiring principles in AFNR structures.

PST.05. CCTC Standard: Use control, monitoring, geospatial and other technologies in AFNR power, structural and technical systems.

PST.05.01. Performance Indicator: Apply computer and other technologies (e.g., robotics, CNC, UAS, etc.) to solve problems and increase the efficiency of AFNR systems.

PST.05.02. Performance Indicator: Prepare and/or use electrical drawings to design, install and troubleshoot electronic control systems in AFNR settings.

PST.05.03. Performance Indicator: Apply geospatial technologies to solve problems and increase the efficiency of AFNR systems.

Appendix B: Beef Quality Assurance

Framework for AFNR Content Standards and Performance Elements Crosswalk for the Beef Quality Assurance (BQA) national certification

Beef Quality Assurance (BQA)	Unit	1	2	3	4	5	6	7	8	9	10	11
Standard	-	-	-	-	-	-	-	-	-	-	-	-
Chapter 1: BQA	-	X	X	X	X	X	X	X	X	X	X	X
Chapter 2: Cattle Care	-	X	X	X	-	-	-	X	X	X	-	-
Chapter 3: Biosecurity	-	-	-	X	-	-	-	-	X	-	X	-
Chapter 4: Herd Health	-	-	-	X	X	X	X	-	X	X	-	-
Chapter 5: Transporting	-	-	-	-	-	-	-	-	X	X	X	-
Chapter 6: Record Keeping	-	X	X	X	-	-	-	-	X	-	-	X
Chapter 7: Nutrition	-	-	-	X	X	-	-	-	X	-	X	-
Chapter 8: Environmental Stewardship	-	-	-	X	-	-	-	-	X	X	-	-
Chapter 9: Worker Safety	-	X	X	X	-	-	-	-	-	-	X	-
Chapter 10: Emergency Action Planning	-	-	-	X	-	-	-	-	-	-	-	-

Beef Quality Assurance
Content Standards and Performance Elements

Beef Quality Assurance is a nationally coordinated, state implemented program that provides systematic information to U.S. beef producers and beef consumers of how common-sense husbandry techniques can be coupled with accepted scientific knowledge to raise cattle under optimum management and environmental conditions. BQA guidelines are designed to make certain all beef consumers can take pride in what they purchase—and can trust and have confidence in the entire beef industry.

Industry Value

BQA does more than just help beef producers capture more value from their market cattle: BQA also reflects a positive public image and instills consumer confidence in the beef industry. When producers implement the best management practices of a BQA program, they assure their market steers, heifers, cows, and bulls are the best they can be. Today, the stakes are even higher because of increased public attention on animal welfare. BQA is valuable to all beef and dairy producers because it:

- Demonstrates commitment to food safety and quality.
- Safeguards the public image of the dairy industry.
- Upholds consumer confidence in valuable beef products.
- Improves sale value of marketed beef cattle.
- Enhances herd profitability through better management.

Chapter 1: BQA

1.1 Welcome and Principles of BQA
1.2 Background of BQA
- **1.2.1** Rationale for BQA
- **1.2.2** Brief History of BQA

1.3 Goals and Objectives of BQA
1.4 Program Guidelines and Overview
- **1.4.1** Use of Key Practices
- **1.4.2** Training via Sate Coordinators or BQA Online

1.5 Certification and Recertification Requirements
- **1.5.1** Relationship to Farm and VQA Programs

1.6 Beef Quality Audit Overview
1.7 Foundational Models of the BQA Approach
- **1.7.1** Total Quality Management
- **1.7.2** HACCP-like Considerations

1.8 Key Practices
- Provide personnel with training/experience to properly handle and care for cattle. (Code of Cattle Care)
- Make timely observations of cattle to ensure basic needs are being met.
- Provide facilities that allow safe, humane, and efficient movement and/or restraint of cattle. (Code of Cattle Care)
- Use appropriate methods to humanely euthanize terminally sick or injured livestock and properly handle carcasses. (Code of Cattle Care)

Chapter 2: Behavior and Handling

2.1 Introduction
2.2 Key Practices
- Abuse of cattle is not acceptable under any circumstances.
- Provide personnel with training/experience to properly handle and care for cattle.
- Make timely observations of cattle to ensure basic needs are being met.
- Design, provide, and regularly inspect facilities (fences, corrals, load-outs, stations, free stall areas, alleys, etc.) to help ensure safe and easy animal movement and restraint.
- Keep feed and water handling equipment clean.

2.3 Cattle Behavior-Informed Handling
2.4 Cattle Handling Facilities and Equipment

Chapter 3: Biosecurity

3.1 Introduction

3.2 Key Practices

- Evaluate the biosecurity risks on your operation and follow a plan to help mitigate risk.
- Recognize and mitigate the biosecurity risks associated with the introduction of new cattle and inter-herd/-operation traffic.
- Apply basic sanitation practices to equipment, vehicles, and clothing to decrease the chance of microbial contamination.
- Prevent manure contamination of feed and feeding equipment.

3.3 Spread of Diseases

3.4 Biosecurity Practices

Chapter 4: Herd Health Management

4.1 Introduction

4.2 Key Practices

- Develop a herd health plan that conforms to good veterinary and husbandry practices.
- Provide disease prevention practices to protect herd health including access to veterinary medical care.
- Follow all FDA/USDA/EPA guidelines and label directions for each product.
- Use FDA-approved feed additives, including those requiring veterinary feed directives (VFD), in accordance of the FDA use requirements. The FDA requires all VFD records to be retained for two (2) years and available upon FDA request for inspection.
- Keep extra-label drug use (ELDU) to a minimum and only when prescribed by a veterinarian working within a Veterinary/Client/Patient Relationship (VCPR).
- Administer products labeled for subcutaneous (SQ) administration in the neck region ahead of the shoulder slope.
- Use, when available, products cleared for SQ, Intravenous (IV), Intranasal (IN), or oral administration when available rather than products administered Intramuscular (IM) as all products can cause tissue damage when administered IM.
- Always ensure products labeled for IV-only are never given by any other route of administration because of the potential for causing violative residues at the injection site.
- Use, when available, injectable products with low dosage volumes and following the proper spacing of injections.
- Administer products labeled for intramuscular (IM) in the neck region only — no exceptions, regardless of age.
- Do no administer more than 10cc of product per IM injection site.
- Use the proper needle size for injections and never reuse a bent needle.
- Do not market compromised — terminally ill and/or non-ambulatory cattle.
- Humanely euthanize non-ambulatory animals using appropriate methods

4.3 Herd Health Planning

4.4 Vaccinations and Disease Prevention

4.5 Judicious Use of Antimicrobials

4.6 A Beef Producer's Guide for Judicious Use of Antibiotics in Cattle

4.7 Product Handling and Storage

4.8 Processing & Injections

- **4.8.1** Receiving, acclimation, and processing cattle
- **4.8.2** Cattle identification, castration, and dehorning
- **4.8.3** Syringe and needle guidelines
- **4.8.4** Injection sites
- **4.8.5** Pain management

4.9 Feed Additives and Medicated Feeds

4.10 Disease Management

- **4.10.1** Extra-label drug use (ELDU)
- **4.10.2** Compounding

4.11 Euthanasia

Chapter 5: Transportation

5.1 Introduction

5.2 Key Practices

- It is not acceptable to knowingly inflict physical injury or unnecessary pain on cattle when loading, unloading, or transporting animals is not acceptable.
- Handle/transport all cattle in a manner to minimize stress, injury, and bruising.
- Use vehicles to transport cattle that provide for the safety of personnel and cattle during loading, transporting, and unloading.
- Follow guidelines when transporting your own livestock:
    - Do a structural check of trailer/truck and tires prior to loading livestock.
    - Inspect trailer/truck for cleanliness (biosecurity) as well as condition of flooring and broken gates that may injure/bruise cattle.
    - Check weather and route to ensure for a safe and uneventful trip.
    - Verify drug withdrawal times on any animals being sold.
    - Verify that all animals are fit to ship.
    - Back up squarely and evenly to the loading chute.
    - Load using Low Stress Handling Practices.
    - Pull away from the chute slowly and drive smoothly to allow cattle a chance to gain their balance in transit.
    - Minimize time in-transit by limiting stops and using prior preparation to ensure an organized event.
- Follow guidelines when contracting for your livestock to be hauled:
    - Establish good communication/logistics with both the trucking company and the receiver of the livestock.
    - Request that the truck arrive clean for loading to decrease biosecurity risks.
    - Check weather and route to ensure for a safe and uneventful trip.
    - Verify drug withdrawal times on any animals being sold.
    - Verify that all animals are fit to ship.
    - Ensure that the driver backs up squarely and evenly to the loading chute.
    - Load using Low Stress Handling Practices.

- Ensure that the driver pulls away from the chute slowly and drives smoothly to allow cattle a chance to gain their balance in transit.
- Encourage the driver to minimize time in transit by limiting stops and using prior preparation to ensure an organized event.
- Ask hauling contractor/driver for proof of BQA Transportation Certification.

5.3 Loading and Unloading

5.4 Fitness for Transport

5.4.1 Cull cattle

5.4.2 Marketing guidelines

5.5 Travel Considerations/Factors

Chapter 6: Record Keeping

6.1 Introduction

6.2 Key Practices

- Employ strict adherence to withdrawal periods on product labels and to extended withdrawals as determined by a veterinarian within the context of a VCPR.
- Identify all animals with appropriate individual and/or group identification methods.
- When cattle are treated/processed individually, record the following in the treatment records:
  - Individual animal identification
  - Date treated
  - Product administered and manufacturer's lot/serial number
  - Dosage
  - Route and location of administration
  - Earliest date animal will have cleared the withdrawal period
  - Name of individual administering the treatment
- When cattle are treated/processed as a group, identify all cattle within the group as such and record the following information:
  - Group or lot identification
  - Date treated
  - Product administered and manufacturer's lot/serial number
  - Dosage
  - Route and location of administration
  - Earliest date animal will have cleared the withdrawal period
  - Name of individual administering the treatment
- Transfer all processing and treatment records with the cattle to next production level.
- Inform prospective buyers of any cattle that have not met withdrawal times.
- When applicable, keep complete records when formulating or feeding medicated feed rations.
- Maintain records of any pesticide use on pasture or crops that could potentially lead to violative residue in cattle.

- Keep records for a minimum of two (2) years, or longer as required by laws/regulations (e.g., three years for Restricted Use Pesticides).

6.3 Cattle Identification

6.4 Types of Records

6.5 Residue Avoidance

Chapter 7: Nutrition

7.1 Introduction

7.2 Key Practices

- Ensure cattle have access to an adequate water supply and appropriate nutrition (from Code of Cattle Care, modified for sentence structure).
- Avoid feed and water interruption longer than 24 hours.
- Only use feedstuffs and feed ingredients of satisfactory quality.
- Under certain circumstances (e.g., droughts, frosts, and floods), test feedstuffs or other dietary components to determine the presence of substances that can be detrimental to cattle well-being, such as nitrates, prussic acid, mycotoxins, etc.
- Use only USDA, FDA, and EPA approved products for use in cattle; these products must be used in accordance with the approved product use guidelines.
- Analyze suspect feedstuffs prior to use and seek supplier assurance of feed ingredient quality.
- Do not feed ruminant-derived protein sources per FDA regulations.
- Support feeding of by-product/co-product ingredients with sound science.

7.3 Cattle Nutrition

- **7.3.1** Feeding guidelines for cows, stocker cattle, and feeder cattle
- **7.3.2** Weaning nutritional management
- **7.3.3** BSE: ruminant protein ban

7.4 Feed Additives (Non-medicated)

7.5 Feed Safety

- **7.5.1** Feed contaminants guidelines
- **7.5.2** FSMA

Chapter 8: Environmental Quality Control Points

8.1 Introduction

8.2 Key Practices

- Manage forage resources with appropriate principles to optimize production while protecting or enhancing the environment.
- Use, store, and dispose of all pesticides with care and according to label directions.
- Monitor and manage key environmental control points that affect soil and water resources.
- Properly dispose of carcasses.

8.3 Forages and Grazing

8.4 Pesticide Use

8.5 Soil
8.6 Water Quality
8.7 Mortality Disposal

Chapter 9: Worker Safety

9.1 Introduction
9.2 Key Practices

- Maintain a safe workplace and use appropriate personal protective equipment when needed.
- Train employees and others working in your operation on safe practices when using equipment, handling cattle, handling animal health products, and around potentially hazardous areas.

9.3 Safety in Beef Production Situations

Chapter 10: Emergency Action Planning

10.1 Introduction
10.2 Key Practices

- Develop and maintain an emergency action plan.
- Inform everyone involved in your operation what to do in case of an emergency.

10.3 Emergency Action Plans

2026 Diversified Agriculture—Animals Core

Program CIP: 01.0000— Agriculture, General

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The Research and Curriculum Unit (RCU), located in Starkville, as part of Mississippi State University (MSU), was established to foster educational enhancements and innovations. In keeping with the land-grant mission of MSU, the RCU is dedicated to improving the quality of life for Mississippians. The RCU enhances the intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the context of curriculum development and revision, research, assessment, professional development, and industrial training.

Table of Contents

Acknowledgments

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Mr. Matt Miller, Southern Supreme Court District Representative, Chair
Mr. Matt Mayo, Central Supreme Court District Representative, Vice-Chair
Dr. Wendi Barrett, Teacher Representative
Mr. Glen East, Administrator Representative
Mr. Bill Jacobs, At-Large Representative
Dr. Ronnie McGehee, At-Large Representative
Mr. Mike Pruitt, At-Large Representative
Mrs. Billye Jean Stroud, Northern Supreme Court District Representative
Mrs. Mary Werner, At-Large Representative
Mr. Crosby Parker, Senior Student Representative
Ms. Michelle Xie, Junior Student Representative

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Standards

Standards and alignment crosswalks are referenced in the appendices. Depending on the curriculum, these crosswalks should identify alignment to the standards mentioned below, as well as possible related academic topics as required in the Subject Area Testing Program in Algebra I, Biology I, and English II, which could be integrated into the content of the units. Mississippi's CTE Diversified Agriculture—Animals Core curriculum is aligned to the following standards:

National Agriculture, Food, and Natural Resources (AFNR) Career Cluster Content Standards
The National AFNR Career Cluster Content Standards were developed by the National Council on Agricultural Education to serve as a guide for what students should know or be able to do through a study of agriculture in grades 9-12 and two-year postsecondary programs. The standards were extensively researched and reviewed by leaders in the agricultural industry, secondary and postsecondary instructors, and university specialists. The standards consist of a pathway content standard for each of the eight career pathways. For each content standard, performance elements representing major topic areas with accompanying performance indicators were developed. Measurements of assessment of the performance elements and performance indicators were developed at the basic, intermediate, and advanced levels. The National AFNR Career Cluster Content Standards are copyrighted by the National Council for Agricultural Education and are used with permission.
thecouncil.ffa.org/afnr

College- and Career-Readiness Standards
College- and Career-Readiness Standards emphasize critical thinking, teamwork, and problem-solving skills. Students will learn the skills and abilities demanded by the workforce of today and the future. Mississippi adopted Mississippi College- and Career-Readiness Standards (MCCRS) to provide a consistent, clear understanding of what students are expected to learn.
mdek12.org/academiceducation/mississipp-college-and-career-readiness-standards/

Career and Technical Student Organizations (CTSOs)
Mississippi's Career and Technical Education (CTE) curricula are aligned with the programs, activities, and competitive events offered through Career and Technical Student Organizations (CTSOs). These organizations provide students with opportunities to apply classroom knowledge in real-world contexts, develop leadership and employability skills, and connect with industry and community partners. Each pathway includes an appendix identifying the CTSOs most closely connected to the curriculum, ensuring that students' classroom learning is reinforced through co-curricular experiences that prepare them for success in both post-secondary education and the workforce.
mdek12.org/cte/so/

Preface

Secondary CTE programs in Mississippi face many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing applied learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments. This document provides information, tools, and solutions that will aid students, teachers, and schools in creating and implementing applied, interactive, and innovative lessons. Through best practices, alignment with national standards and certifications, community partnerships, and a hands-on, student-centered concept, educators will be able to truly engage students in meaningful and collaborative learning opportunities.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, *Mississippi Code of 1972*, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, Ch. 487, §14; Laws, 1991, Ch. 423, §1; Laws, 1992, Ch. 519, §4 eff. from and after July 1, 1992; Strengthening Career and Technical Education for the 21st Century Act, 2019 [Perkins V]; and Every Student Succeeds Act, 2015).

Mississippi Teacher Professional Resources

The following are resources for Mississippi teachers:

Curriculum, Assessment, Professional Learning

- Program resources can be found at the RCU's website, rcu.msstate.edu.

Learning Management System: An Online Resource

- Learning management system information can be found at the RCU's website, under Professional Learning.

Should you need additional instructions, contact the RCU at 662.325.2510 or helpdesk@rcu.msstate.edu.

Executive Summary

Pathway Description
The Diversified Agriculture—Animals Core curriculum is a one-Carnegie unit course within the four-credit Diversified Agriculture pathway. All students must successfully complete the Principles of Agriscience prerequisite before enrolling in this course. This course focuses on establishing a foundation of knowledge in animal practices, financial management and literacy, and entrepreneurship. Students will attain knowledge and skills in areas such as biosecurity and emergency management, feeding practices, reproduction, livestock evaluation and selection, equipment, and business and marketing concepts.

College, Career, and Certifications
No national industry-recognized certifications are utilized in Mississippi pertaining to the agriculture industry. Competencies and suggested objectives in this course have been correlated, however, to the National AFNR Career Cluster Content Standards that have been reviewed and endorsed at the national level by the National Council on Agricultural Education.

Grade Level and Class Size Recommendations
It is recommended that students enter this program as 10th graders. Exceptions to this are a district-level decision based on class size, enrollment numbers, student maturity, and CTE delivery method. This is a hands-on, lab- or shop-based course. Therefore, a maximum of 15 students is recommended per class, and teachers should only teach one subject per class period.

Student Prerequisites
For students to experience success in the program, the following student prerequisites are suggested:

1. C or higher in English (the previous year)
2. C or higher in high school-level math (last course taken, or the instructor can specify the level of math instruction needed)
3. Instructor approval

or

1. Instructor approval

Assessment
The latest assessment blueprint for the curriculum can be found at rcu.msstate.edu/curriculum/.

Applied Academic Credit
The latest academic credit information can be found at mdek12.org/secondaryeducation/approved-courses/.

Educator Licensure
The latest educator licensure information can be found at mdek12.org/licensure/.

Professional Learning
If you have specific questions about the content of any training sessions provided, please contact the RCU at 662.325.2510 or helpdesk@rcu.msstate.edu.

Course Outlines

This curriculum consists of one 1-credit course.

Diversified Agriculture—Animals Core– Course Code: 993423

Unit	Title	Hours
1	Leadership and SAE for All	10
2	Introduction to Animal Agriculture	15
3	Biosecurity and Emergency Management	10
4	Application of Feed and Feeding to Animal Growth and Production	15
5	Animal Reproduction	20
6	Livestock Evaluation and Selection	20
7	Animal Production Management	20
8	Facility and Equipment Management in Animal Agriculture	10
9	Issues in Animal Agriculture	10
10	Farm to Fork	10
Total		**140**

Career Pathway Outlook

Overview

The Agriculture career cluster encompasses a wide range of occupations focused on the production and use of plants and animals for food, fiber, aesthetic, and environmental purposes. A USDA-funded study (Purdue University, 2024–2025) is producing updated five-year national projections for employment opportunities in food, agriculture, renewable natural resources, and the environment for graduates with bachelor's degrees or higher. According to the U.S. Bureau of Labor Statistics (2023), employment of agricultural and food scientists is projected to grow 8% from 2023 to 2033, with approximately 3,100 annual openings primarily due to retirements and occupational transfers. As in previous USDA reports, nearly half of the employment openings are expected in management and business (approximately 42%), followed by science, technology, engineering, and math (31%), sustainable production and biomaterials (13%), and education, communication, and government services (14%) (Purdue University, 2020).

Agriculture, food, and related industries contributed $1.1 trillion to the U.S. gross domestic product (GDP) in 2019 (USDA Economic Research Service, 2020). Projections through 2033 forecast continued growth in farm income, trade, and sector indicators (USDA Economic Research Service, 2024). In Mississippi, agriculture remains the top industry. The total value of agricultural production increased to approximately $9 billion in 2024 (Mississippi State University Extension, 2024), up from $7.8 billion in 2022. The agriculture, forestry, fishing, and hunting sector contributed $4.156 billion to the state's GDP in Q4 2024 (Federal Reserve Bank of St. Louis, 2024). According to the Mississippi Department of Agriculture and Commerce (2024), agriculture directly or indirectly employs about 11.4% of Mississippi's workforce.

Needs of the Future Workforce

Data for this synopsis were compiled from the Mississippi Department of Employment Security (MDES) (2025). Employment opportunities for each of the occupations are listed below:

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2022	Projected Jobs, 2032	Change (Number)	Change (Percent)	Average Yearly Earnings, 2025
Agricultural and Food Science Technicians	250	270	20	8.0%	$42,081
Agricultural Sciences Teachers, Postsecondary	150	160	10	6.7%	$93,622
Animal Trainers	100	110	10	10%	$29,230
Career/Technical Education Teachers, Middle School	230	240	10	4.3%	$51,425
Career/Technical Education Teachers, Secondary School	1220	1310	90	7.4%	$51,416
Conservation Scientists	1250	1260	10	0.8%	$54,950
Environmental Engineers	410	420	10	2.4%	$75,940

Environmental Engineering Technicians	70	70	—	—	$46,790
Environmental Scientists and Specialists, Including Health	270	280	10	3.7%	$64,460
Environmental Science and Protection Technicians, Including Health	30	30	—	—	$38,780
Farm and Home Management Advisors	290	300	10	3.2%	$38,650
Logging Equipment Operators	1,680	1,740	60	3.6%	$41,840
Landscaping and Groundskeeping Workers	6,000	6,620	620	10.3%	$25,630
Nonfarm Animal Caretakers	1,520	1,780	260	17.1%	$24,030
Soil and Plant Scientists	110	110	—	—	$92,250
Farmers, Ranchers, and Other Agricultural Managers	6730	6930	200	3.0%	$55,830
First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers	980	1090	110	11.2%	$40,270
First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	940	990	50	5.3%	$54,550
Fish and Game Wardens	40	40	—	—	$46,610
Foresters	180	180	—	—	$52,660
Surveyors	380	410	30	7.9%	$48,600
Surveying and Mapping Technicians	670	720	50	7.5%	$39,840
Tree Trimmers and Pruners	270	300	30	11.1%	$44,920
Veterinarians	490	540	50	10.2%	$81,950
Veterinary Assistants and Laboratory Animal Caretakers	970	1090	120	12.4%	$26,150
Veterinary Technologists and Technicians	570	630	60	10.5%	$35,890
Zoologists and Wildlife Biologists	230	250	20	8.7%	$70,200

Source: Mississippi Department of Employment Security; mdes.ms.gov (2025).

Perkins V Requirements and Academic Infusion

The Diversified Agriculture—Animals Core curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in agricultural fields. It also offers students a program of study, including secondary, postsecondary, and higher education courses, that will further prepare them for agricultural careers. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, it focuses on ongoing and meaningful professional development for teachers as well as relationships with industry.

Transition to Postsecondary Education

The latest articulation information for secondary to postsecondary can be found at the Mississippi Community College Board website, mccb.edu.

Best Practices

Innovative Instructional Technologies

Classrooms should be equipped with tools that will teach today's digital learners through applicable and modern practices. The Diversified Agriculture—Animals Core educator's goal should be to include teaching strategies that incorporate current technology. To make use of the latest online communication tools—wikis, blogs, podcasts, and social media platforms, for example—the classroom teacher is encouraged to use a learning management system that introduces students to education in an online environment and places more of the responsibility of learning on the student.

Differentiated Instruction

Students learn in a variety of ways, and numerous factors—students' background, emotional health, and circumstances, for example—create unique learners. By providing various teaching and assessment strategies, students with various learning preferences can have more opportunities to succeed.

CTE Student Organizations

Teachers should investigate opportunities to sponsor a student organization. The National FFA Organization is the student organization for this pathway and will foster the types of learning expected from the Diversified Agriculture—Animals Core curriculum. FFA provides participants and members with growth opportunities and competitive events. They also open the doors to the world of agriculture careers and scholarship opportunities.

Cooperative Learning

Cooperative learning can help students understand topics when independent learning cannot. Therefore, you will see several opportunities in the Diversified Agriculture—Animals Core curriculum for group work. To function in today's workforce, students need to be able to work collaboratively with others and solve problems without excessive conflict. This curriculum provides opportunities for students to work together and help each other complete complex tasks. There are many field experiences within the Diversified Agriculture—Animals Core curriculum that will allow and encourage collaboration with professionals currently in the agriculture field.

Work-Based Learning

Work-based learning is an extension of understanding competencies taught in the Diversified Agriculture—Animals Core classroom. The Diversified Agriculture pathway requires students to obtain clinical-type hours during Capstone, which may include but are not limited to clinicals, worksite field experiences, entrepreneurship, internships, pre-apprenticeships, school-based enterprises, job placements, and simulated worksites. These real-world connections and applications provide a link to all types of students regarding knowledge, skills, and professional dispositions. Thus, supervised collaboration and immersion into the

agricultural industry are keys to students' success, knowledge, and skills development. For more information on embedded WBL, visit the Mississippi Work-Based Learning Manual on the RCU website, rcu.msstate.edu.

Professional Organizations

American Association for Agricultural Education (AAAE)
aaaeonline.org

Association for Career and Technical Education (ACTE)
acteonline.org

Mississippi Association for Career and Technical Education (MSACTE)
mississippiacte.com

Mississippi Association of Agricultural Educators (MSAAE)
mississippiffa.org

National Association of Agricultural Educators (NAAE)
naae.org

National FFA Organization
ffa.org

Using This Document

Competencies and Suggested Objectives
A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies. The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.

Teacher Resources
All teachers should request to be added to the Canvas Resource Guide for their course. For questions or to be added to the guide, send a Help Desk ticket to the RCU by emailing helpdesk@rcu.msstate.edu.

Perkins V Quality Indicators and Enrichment Material
Some of the units may include an enrichment section at the end. This material will greatly enhance the learning experiences of students. If the Diversified Agriculture—Animals Core program is using a national certification, work-based learning, or another measure of accountability that aligns with Perkins V as a quality indicator, this material could very well be assessed on that quality indicator. It is the responsibility of the teacher to ensure all competencies for the selected quality indicator are covered throughout the year.

Unit 1: Leadership and SAE for All

Competencies and Suggested Objectives
1. Participate in local, state, and/or national FFA activities that provide opportunities for leadership development and career exploration. DOK3 a. Actively participate in FFA activities. • Leadership Development Events (LDE) • Career Development Events (CDE) ○ Dairy Cattle Evaluation and Management ○ Dairy Cattle Handlers Activity ○ Horse Evaluation ○ Livestock Evaluation ○ Meats Evaluation and Technology ○ Poultry Evaluation ○ Veterinary Science • Livestock shows • Premier exhibitor event • Leadership retreats or conferences • Industry-related seminars, workshops, or conferences • Other related FFA activities
2. Identify potential college and career opportunities in animal agriculture. DOK2 a. Research post-secondary institutions that offer studies in animal agriculture or a related field and prepare a two- to three-minute speech on their programs and potential career choices (i.e., AgExplorer, O*NET). b. Complete applications for college admission and scholarships. c. Revise a personal résumé for the purpose of applying for a specific job. d. Complete a job application for employment. e. Participate in a mock or real interview.
3. Review the types of programs under Supervised Agricultural Experience (SAE) for All. DOK1 a. Explore concepts of a Foundational SAE. • Career exploration and planning • Employability skills for college and career readiness • Personal financial management and planning • Workplace safety • Agricultural literacy b. Explore concepts of an Immersion SAE. • Placement/internship • Ownership/entrepreneurship • Research ○ Experimental ○ Analytical ○ Invention • School-based enterprise • Service learning c. Update a personal résumé throughout for the purpose of applying for a specific job.

4. Review individual plans for student Foundational SAE programs. DOK2
   a. Assess goal attainment in SAE from the previous year.
   b. Review and update short- and long-range goals pertaining to the SAE program.
5. Develop an Immersion SAE and maintain agricultural records. DOK2
   a. Redefine and adjust requirements of agreements between the student, parents, supervisor, and/or employer.
   b. Utilize the state-approved electronic/computer-based system of record keeping.
   c. Update SAE records.
      - SAE program goals
      - Student inventory related to the SAE program
      - Expense records
      - Income/gift and scholarship records
      - Skill-attainment records
      - Leadership-activity records and participation in FFA activities
      - Community service hours
   d. Complete degree and proficiency award applications as they apply to the SAE.

Mississippi Career Connections

Visit the SAE for All website for more information on developing student Immersion SAEs.
saeforall.org/immersion-sae/

Unit 2: Introduction to Animal Agriculture

Competencies and Suggested Objectives
1. Analyze the basic rules of safety in the animal science laboratory. DOK2 a. Discuss the safe and proper use of items found in an animal science laboratory. • Chemicals • Heat and fire • Laboratory equipment • Specimens and animals • Electrical equipment b. Explore Occupational Safety and Health Administration (OSHA) safety standards as they relate to the agricultural classroom, laboratory, and workplace. c. Discuss the procedures for reporting an accident. d. Illustrate the use of a Safety Data Sheet (SDS).
2. Demonstrate all safety equipment in the animal science laboratory. DOK2 a. Identify the location of safety equipment and discuss procedures for dealing with accidents, injuries, and spills. b. Describe general safety techniques using hand equipment and indicators. c. Identify the correct safety color codes that should be used in the animal science laboratory for the following: • Fire extinguishers • First aid kits • Emergency exits
3. Discuss the beef cattle industry. DOK1 a. Identify products produced from beef cattle. • Meat • By-products (edible/nonedible) b. Discuss beef cattle enterprises. • Cow-calf operation • Purebred herd • Stocker cattle • Feedlot c. Identify beef cattle breeds. • Angus • Hereford • Brahman • Brangus • Charolais • Simmental • Limousin • Santa Gertrudis • Texas Longhorn

4. Discuss the dairy cattle industry. DOK1
   a. Identify products produced from dairy cattle.
      - Milk
      - Milk by-products (e.g., butter, cheese, yogurt, ice cream, etc.)
      - Meat
   b. Discuss dairy cattle enterprises.
      - Milk production
      - Heifer development
   c. Identify dairy cattle breeds.
      - Jersey
      - Holstein
      - Guernsey
      - Brown Swiss
      - Ayrshire
   d. Identify and explore careers in the dairy cattle industry.

5. Discuss the equine industry. DOK1
   a. Identify uses for horses.
      - Work
      - Pleasure
      - Companion
      - Recreation
   b. Discuss equine enterprises.
      - Breeders
      - Trainers
      - Boarding
   c. Identify horse breeds.
      - Quarter horse
      - Appaloosa
      - Thoroughbred
      - Clydesdale
      - Arabian
      - Shetland ponies
   d. Identify and explore careers in the equine industry.

6. Discuss the swine industry. DOK1
   a. Identify products produced from swine.
      - Meat
      - By-products (edible/nonedible)
   b. Discuss swine enterprises and vertical integration.
      - Farrowing
      - Nursery
      - Feeder pig
      - Breeding
      - Finishing
   c. Identify swine breeds.
      - Duroc
      - Yorkshire

- Hampshire
- Chester White
- Spot
- Hereford

d. Identify and explore careers in the swine industry.

7. Discuss the poultry industry. DOK1
   a. Identify products produced from poultry.
      - Meat
      - Eggs
      - By-products
   b. Discuss poultry enterprises and vertical integration.
      - Layers
      - Broiler production
      - Backyard flocks
      - Turkey production
      - Game bird production
   c. Identify breeds of poultry.
      - Leghorns
      - Plymouth Rock
      - Rhode Island Red
   d. Identify and explore careers in the poultry industry.
8. Discuss the aquaculture industry. DOK1
   a. Identify products produced from aquaculture.
      - Meat
      - By-products
   b. Discuss aquaculture enterprises and vertical integration.
      - Fish
      - Shellfish
      - Alligators
      - Frogs
   c. Identify aquaculture species.
      - Catfish
      - Crawfish
      - Tilapia
      - Shrimp/prawn
   d. Identify and explore careers in the aquaculture industry.
9. Discuss the goat industry. DOK1
   a. Identify products produced from goats.
      - Meat
      - Milk
      - Fiber
      - By-products
   b. Discuss goat enterprises.
      - Market goats
      - Dairy goats
      - Companion goats

c. Identify goat breeds.
    - Boer
    - Kiko
    - Nubian
    - Lamancha
    - Pygmy
    - Nigerian dwarves

d. Identify and explore careers in the goat industry.

10. Discuss the sheep industry. DOK1
    a. Identify products produced from sheep.
        - Meat
        - Fiber (i.e., wool or hair)
        - By-products
    b. Discuss sheep enterprises.
        - Farm flocks
        - Purebred operations
    c. Identify sheep breeds.
        - Dorper
        - Katahdin
        - Suffolk
        - Dorset
        - Hampshire
        - Rambouillet
    d. Identify and explore careers in the sheep industry.
11. Conduct an in-depth investigation of the animal industry in your area that provides opportunities for hands-on experience while developing workplace skills. DOK3
12. Explore industries that implement vertical integration and the effects on the supply chain. DOK3

Note: Safety is to be taught as an ongoing part of the program. Students are required to complete a written safety test with 100% accuracy before entering the shop for lab simulations and projects. This test should be geared toward the specific school's needs, tools, facilities, etc. This test should be documented in each student's file.

Note: This unit will be ongoing throughout the year. Time allotted for this unit will be distributed over the entire year.

Unit 3: Biosecurity and Emergency Management

Competencies and Suggested Objectives

1. Develop and maintain an emergency action plan (EAP) for working in animal agriculture. DOK3
   a. Develop an EAP with the necessary information in the event of an emergency.
      - Premise identification number (PIN)
      - Owner/operator name
      - Farm Services Agency (FSA) number
      - Global Positioning System (GPS) coordinates
      - Physical address of the site (911 address)
      - Directions to the nearest town
      - Important telephone numbers and contact information
        - Veterinarian
        - Police
        - Fire
        - Doctor
        - Poison control
        - Utilities
        - Local emergency management agency
        - State board of animal health
        - CDC
2. Evaluate biosecurity risks in animal agriculture and understand how to mitigate risk. DOK2
   a. Define the term biosecurity and its effect on animal agriculture.
   b. Investigate biosecurity practices for animal agriculture.
      - Disease containment
      - Sanitation
      - Livestock management
      - Preventing infectious disease from entering and movement throughout operations
      - Controlling microbial contamination
      - Water contamination
      - Pest control
3. Discuss hazards and protocols within the animal industry. DOK3
   a. Define hazards and protocols related to the animal agriculture industry.
      - Manure pits
      - Fumes in areas with poor or no ventilation
      - Health products and pesticide handling/storage
        - Injuries from handling animals
        - Biosecurity outbreaks

Mississippi Career Connections

Beef Quality Assurance (BQA) is a program that provides U.S. beef producers with information on how good husbandry techniques, combined with accepted scientific knowledge, can be used to raise cattle under optimal management conditions. BQA programs have evolved to incorporate best practices in cattle handling, facility management, cattle transportation, record keeping, and protecting herd health. For Mississippi-specific BQA training, visit the MSU Extension BQA website.

Unit 4: Application of Feed and Feeding to Animal Growth and Production

Competencies and Suggested Objectives

1. Investigate the role of animal digestive systems. DOK1
   a. Describe a monogastric digestive system.
   b. Describe a ruminant digestive system.
      - Rumen
      - Reticulum
      - Omasum
      - Abomasum
   c. Describe a pseudoruminant digestive system (i.e., cecum).
   d. Describe an avian digestive system (i.e., crop, gizzard).
   e. Describe a fish's digestive system (i.e., stomach, intestines).

2. Examine the role of nutrition in animal growth and health at different stages of life. DOK2
   a. Explain metabolism.
   b. List six nutrients essential to life and how they are used to meet the nutritional requirements of animals.
      - Proteins
      - Carbohydrates
      - Fats
      - Vitamins
        - Fat-soluble (e.g., A, D, E, K)
        - Water-soluble (e.g., B, C)
      - Minerals
        - Macro (e.g., Ca P, Na, Cl)
        - Micro
      - Water (source and quality)
   c. Define common terms associated with feed and feeding.
      - Feedstuffs
      - Concentrates
      - Roughages
      - Rations
      - Total digestible nutrients (TDN)
      - Crude protein
      - Dry matter
   d. Distinguish between different sources of nutrients found in concentrates and roughages associated with various animal rations.
      - Plant sources (e.g., corn, soybean meal, cottonseed meal, hay)
      - Animal sources (e.g., bone meal, fish meal, feather meal)
      - Synthetic sources (e.g., urea)
   e. Explain the role of microorganisms in ruminants in increasing feed utilization.

3. Explain the role of nutrition in agricultural animal production. DOK3
   a. Determine the available/appropriate feedstuffs that meet the nutrient requirements of various types of livestock.
      - Beef cattle

- Dairy cattle
- Horses
- Sheep
- Goats
- Swine
- Poultry
- Aquaculture crops

b. Determine the nutritional requirements of a livestock class based on production purposes.
   - Growth
   - Maintenance
   - Reproduction
   - Production
   - Lactation
   - Work

4. Investigate workplace safety and the use of personal protective equipment (PPE). DOK1
   a. Describe safe practices when using equipment, handling livestock, handling animal feeding stations, and working around potentially hazardous areas.
      - Pastures
      - Hay rings
      - Feed bunks/troughs
      - Grain bins/silos
      - Fermentation vat
      - Feed mixer/tractor
      - Manure lagoon (swine facilities)
5. Describe the various types of feeding systems used in livestock production (e.g., hand-fed, free choice/ad libidum, creep feed). DOK1
6. Discuss forage management systems that emphasize production and utilization by ruminants and pseudoruminants. DOK2
   a. Compare cool-season and warm-season grasses.
   b. Describe grazing systems (e.g., continuous, rotational, intense).
   c. Determine carrying capacity (e.g., head per acre).
   d. Discuss the utilization and management of harvested forages (e.g., hay, haylage, silage, baleage).
7. Explain how animals are fed. DOK3
   a. Describe how a feed ration is formulated.
   b. Calculate feed rations using the Pearson square and related digital technologies.
   c. Interpret an ingredient label from a bag of livestock feed.
   d. Distinguish between feed additives and feed supplements.
   e. Interpret a hay sample report.
   f. Compare and contrast calculating a least-cost formulation for feeding livestock manually and digitally.

Unit 5: Animal Reproduction

Competencies and Suggested Objectives
1. Examine the basics of reproduction in animal production. DOK1 a. Define common terms associated with animal reproduction. • Copulation • Estrus/heat • Conception • Gestation • Fertilization • Ovulation • Lactation • Parturition • Incubation b. Describe the importance of reproduction and reproductive efficiency to animal enterprises. (e.g., breeding seasons, exposed vs. bred, etc.). c. Describe the process of fertilization. d. Identify the lengths of gestation for livestock species.
2. Examine the reproduction process. DOK2 a. Identify the parts of the male and female reproductive systems and discuss the function of each part. • Male (i.e., penis, testicle, scrotum, epididymis, accessory glands) • Female (i.e., uterus, cervix, ovary, Fallopian tubes, vagina, vulva, infundibulum) b. Discuss the male and female reproductive hormones as related to the estrus cycle and estrus synchronization. • Estrogen • Progesterone • Controlled Internal Drug Release (CIDR) • Luteinizing hormone (LH) • Follicle-stimulating hormone (FSH) • Gonadotropin-releasing hormone (GnRH) • Testosterone c. Identify signs of estrus, length of the estrus cycle, and time of ovulation in various female agricultural animals. • Cattle • Horses • Sheep • Goats • Swine d. Calculate the expected birth date for a given species based on the conception date. • Cattle • Sheep • Goats • Swine • Horses

e. Identify and describe the function of the reproductive organs and system in poultry.
    - Male (i.e., cloaca, vas deferens, testes)
    - Female (i.e., ovary, infundibulum, magnum, isthmus, uterus, vagina, cloaca, vent)

f. Indicate incubation and hatching conditions, including humidity and temperature required by various species.
    - Turkey
    - Chicken
    - Quail

g. Describe the general process of spawning and incubation of Mississippi farm-raised catfish.

3. Investigate the use of breeding systems and genetic improvement techniques. DOK1
    a. Describe various types of breeding systems.
        - Purebred breeding system
        - Crossbreeding system
        - Maternal vs. terminal cross
    b. Predict the transmission of a trait (i.e., genotype, phenotype) from parents to offspring using a Punnett square to complete a monohybrid and dihybrid cross.
    c. Discuss effects of genetic abnormalities in relation to genetic improvement (i.e., manipulations).

4. Investigate workplace safety and the use of personal protective equipment (PPE). DOK1
    a. Describe safe practices when using equipment, handling livestock, and working around potentially hazardous areas.
        - Restraints (i.e., chute, breeding stall)
        - Artificial insemination (AI) kit
        - Semen tank
        - Ultrasound and gel
        - Microscope
        - Syringes and needles
        - Hormone vials
    b. Identify the appropriate PPE when using equipment, handling livestock, and working around potentially hazardous areas.

5. Determine which breeding system works best for specific animal enterprises. DOK2
    a. Compare and contrast the types of mating systems.
        - Natural
        - Hand-mated
        - Artificial insemination
        - Embryo transfer
    b. Describe the application of estrus synchronization in breeding systems.
    c. Observe and describe the artificial insemination (AI) method of breeding.
    d. Observe and describe the procedure for collecting, processing, and sexing semen.
    e. Observe and describe the procedure for conducting a breeding soundness exam.
    f. Observe and describe the process of embryo transfer (ET).
    g. Discuss the male-to-female ratio (e.g., bull to cow) in a natural or hand-mated breeding program.

6. Discuss new scientific technology that will be of benefit to livestock producers. DOK1
    a. Investigate technology and issues related to genetic engineering.
    b. Investigate research and technology as it applies to cloning in animal production.
    c. Discuss the pros and cons of using new technologies in animal production.

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Mississippi Career Connections
Visit the Mississippi Cattlemen's Association website and research local breeders in your area, or those who produce specific breeds of interest. Establish an industry partnership with these breeders to provide demonstrations or mentorship for students regarding breeding practices and herd health management.

Unit 6: Livestock Evaluation and Selection

Competencies and Suggested Objectives
1. Evaluate the external parts of an agricultural animal as they relate to selecting quality animals for market or breeding purposes. DOK1 a. Describe the external parts of beef, dairy, horse, swine, goat, chicken, and lamb as they relate to selection and evaluation. • Neck • Shoulder • Back • Loin • Hip/rump • Hock • Foot • Flank • Barrel
2. Investigate the selection of market animals (i.e., beef, sheep, swine, goat, and chicken). DOK3 a. Critique the main points to consider when visually evaluating a market animal. • Type • Muscle • Finish • Balance • Style • Structural correctness b. Evaluate classes of market animals and discuss placings for each class. c. Develop logical reasoning for the selection of market livestock. d. Explain how to improve livestock quality through selection.
3. Describe the process of selecting breeding animals (i.e., beef, sheep, swine, goat, and chicken, mare). DOK2 a. Define characteristics used in selecting various species of animals for breeding purposes. • Structural soundness • Growth • Capacity • Pedigree • Breed characteristics • Sex characteristics • Body condition • Muscle b. Explain the types of performance data used in selecting breeding animals. • Birth weight (BW) • Calving ease (CE) • Weaning weight (WW) • Yearling weight (YW) • Milk (M) • Back fat (BF)

- Loin eye area (LEA) and ribeye area (REA)
- Number born alive—sheep and swine
- 21-day litter weight—swine
- Days to 250 lbs.—swine
- Expected progeny differences
- Estimated breeding value
- Term indexes
    - Sow productivity index—swine
    - Terminal sire index—swine
    - Maternal line index—swine

c. Evaluate various species of breeding animals and identify favorable characteristics for breeding in each animal.

4. Evaluate breeding livestock. DOK3
    a. Apply concepts in selecting high-quality animals for breeding.
    b. Evaluate breeding animals based upon high-quality breeding characteristics and performance data that is distinctive to each species of agricultural-breeding animals and present sound reasoning for placing animals in their respective positions within their class.
    c. Evaluate the classes of breeding animals and discuss the reasons for placing the animals in each class.

Mississippi Career Connections

Visit local farms or sale barns to practice evaluating livestock. Sale barn locations can be found on the Mississippi Cattlemen's Association website. Use the Mississippi FFA Livestock Evaluation CDE rules and rubrics as a guide for instruction of this unit.

Unit 7: Animal Production Management

Competencies and Suggested Objectives
1. Investigate workplace safety and the use of personal protective equipment (PPE). DOK1 a. Describe safe practices when using equipment, handling livestock, and working around potentially hazardous areas. • Restraints • Syringes and needles • Critical practice equipment
2. Examine basic concepts of animal health, including disease prevention, control, and treatment. DOK1 a. Describe the signs of good health in animals. b. Define disease and describe the major causes of diseases and their impact on animal health. • Infectious (pathogens) ○ Bacteria (contagious and noncontagious) ○ Viruses (contagious and noncontagious) ○ Protozoa • Zoonotic diseases • Noninfectious ○ Genetics ○ Poor nutrition ○ Toxins ○ Parasites (internal and external) ○ Injury c. Discuss methods for delivering medicines to animals. • Injection (e.g., intramuscular, subcutaneous, IV) • Drenching • Pills/bolus/paste • Topical (e.g., powders, liquids, etc.) • Infusions ○ Intramammary ○ Intravenous (IV)
3. Investigate how factors such as age, genetic background, stocking density, and natural immunity affect animal health and resistance to diseases. DOK2 a. Examine the effects of environmental conditions on animal health. • Temperature • Humidity • Air quality • Water source and quality • Light b. Discuss the role and functions of white blood cells in the development of natural immunity. c. Investigate the thermal neutral zone of beef cattle and how it affects animal performance (e.g., growth, reproduction, milk production). d. Describe how vaccinations prevent disease. e. Discuss practices that promote animal health. • Proper nutrition • Sanitation

- Vaccination
- Observation
- Isolation
- Biosecurity

f. Demonstrate methods for delivering medicines to animals.
- Injection (e.g., intramuscular, subcutaneous, IV)
- Drenching
- Pills/bolus/paste
- Topical (e.g., powders, liquids, etc.)
- Infusions
  - Intramammary
  - Intravenous (IV)

4. Observe and describe management and marketing practices for various animal enterprises. DOK3

a. Observe and assess critical practices in managing an animal enterprise.
- Castration
- Dehorning/disbudding
- Semen testing
- Identification (e.g., tagging, branding, ear notching)
- Animal health practices (e.g., injections, tubing, etc.)
- Breeding soundness exams

b. Analyze marketing practices for meat animals (e.g., cattle, swine, sheep).
- On-farm sale
- Public auction (e.g., sale barn, breeding sale, online)
- Order buyer
- Retained ownership

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Unit 8: Facility and Equipment Management in Animal Agriculture

Competencies and Suggested Objectives
1. Explore facility, equipment, and management needs for various animal enterprises. DOK3 a. Research and discuss general facility needs for different classes of animals (e.g., shelter, feeding, birthing, watering, examining, etc.). b. Demonstrate skills in building, repairing, and maintaining a safe, secure fenced area for agricultural animals.
2. Develop a production management plan, including facilities, equipment, production records, and maintaining and protecting animal health for a herd or flock. DOK3
3. Explore concepts of animal transportation as it relates to animal safety. DOK1 a. Review trailer safety practices and describe the process of verifying if a trailer is suitable for hauling livestock. b. Investigate precautionary procedures in the event of accidents or rollovers. c. Discuss appropriate handling practices when loading and unloading livestock.

Note: Safety is to be taught as an ongoing part of the program. Students are required to complete a written safety test with 100% accuracy before entering the shop for lab simulations and projects. This test should be geared toward the specific school's needs, tools, facilities, etc. This test should be documented in each student's file.

Unit 9: Issues in Animal Agriculture

Competencies and Suggested Objectives
1. Explore concepts of animal welfare and animal rights. DOK1 a. Define the concepts of animal welfare and animal rights. b. Discuss the practice of animal welfare and the implications of animal rights in animal production.
2. Examine consumer concerns and their effect on animal production. DOK1 a. Examine how consumer concerns and preferences about food and nutrition have affected animal production enterprises. b. Describe the role of quality assurance and safety in meat production today. c. Investigate concerns about animal waste and its effect on the environment. d. Identify and describe the role and function of government agencies in assisting animal producers in producing safe food products and protecting the environment.
3. Compare bioterrorism to biosecurity and discuss the effect each has on animal agriculture. DOK2
4. Analyze public perceptions of animal production for human food consumption and complete a project on the findings. DOK3 a. Describe the marketing goals of different types of production. b. List and describe different types of marketing goals. • Free-range • Organic • Antibiotic free (ABF) • Consumer demand
5. Identify laws and policies within food safety and regulations. DOK 1 a. List laws and policies associated with animal agriscience. • Hazard Analysis Critical Control Point (HACCP) • U.S. Food and Drug Administration (FDA) • U.S. Department of Agriculture (USDA) • Industry safety standards • Food Safety Modernization Act (FSMA)

Mississippi Career Connections
Using the competencies above as a guide, students should select a current issue in animal agriculture and research how Mississippi is impacted by the issue. To share their research findings, students are encouraged to participate in in-class debates, develop presentations to deliver to their classmates and/or industry partners, or write a research report.

Unit 10: Farm to Fork

Competencies and Suggested Objectives
1. Investigate the movement of food from "farm to fork." DOK2 a. Discuss the principles of purchasing, receiving, and inspecting food. b. Examine general storage guidelines and the types of storage.
2. Explain the role of food inspection. DOK3 a. USDA Food Safety and Inspection Service (FSIS) • Humane handling • Food inspection (pre- and post-mortem) • Sanitation b. State inspection
3. Understand the supply chain as it relates to large-scale animal-food production as compared to small farm operations. DOK3 a. Raising • Farm and mass production b. Processing and packaging • Food manufacturer, bulk shipper, and/or processor c. Transportation • Retail and food service distributor • International Shippers d. Selling • Grocery stores, restaurants, and/or international markets e. Buying • Customers and consumers

Student Competency Profile

Student's Name: _____

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student, and it can serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date (MM/DD/YY) on which the student mastered the competency.

Unit 1: Leadership and SAE for All		
	1.	Participate in local, state, and/or national FFA activities that provide opportunities for leadership development and career exploration.
	2.	Identify potential college and career opportunities in animal agriculture.
	3.	Review the types of programs under Supervised Agricultural Experience (SAE) for All utilizing AET.
	4.	Review individual plans for student Foundational SAE programs.
	5.	Develop an Immersion SAE and maintain agricultural records.
Unit 2: Introduction to Animal Agriculture		
	1.	Analyze the basic rules of safety in the animal science laboratory.
	2.	Demonstrate all safety equipment in the animal science laboratory.
	3.	Discuss the beef cattle industry.
	4.	Discuss the dairy cattle industry.
	5.	Discuss the equine industry.
	6.	Discuss the swine industry.
	7.	Discuss the poultry industry.
	8.	Discuss the aquaculture industry.
	9.	Discuss the goat industry.
	10.	Discuss the sheep industry.
	11.	Conduct an in-depth investigation of the animal industry in your area that provides opportunities for hands-on experience while developing workplace skills.
	12.	Explore industries that implement vertical integration and the effects on the supply chain.
Unit 3: Biosecurity and Emergency Management		
	1.	Develop and maintain an emergency action plan for working in animal agriculture.
	2.	Evaluate biosecurity risks in animal agriculture and understand how to mitigate risk.
	3.	Discuss hazards and protocols within the animal industry.

Unit 4: Application of Feed and Feeding to Animal Growth and Production		
	1.	Investigate the role of animal digestive systems.
	2.	Examine the role of nutrition in animal growth and health at different stages of life.
	3.	Explain the role of nutrition in agricultural animal production.
	4.	Investigate workplace safety and the use of personal protective equipment.
	5.	Describe the various types of feeding systems used in livestock production (e.g., hand-fed, free choice/ad libidum, creep feed).
	6.	Discuss forage management systems that emphasize production and utilization by ruminants and pseudoruminants.
	7.	Explain how animals are fed.
Unit 5: Animal Reproduction		
	1.	Examine the basics of reproduction in animal production.
	2.	Examine the reproduction process.
	3.	Investigate the use of breeding systems and genetic improvement techniques.
	4.	Investigate workplace safety and the use of personal protective equipment.
	5.	Determine which breeding system works best for specific animal enterprises.
	6.	Discuss new scientific technology that will be of benefit to livestock producers.
Unit 6: Livestock Evaluation and Selection		
	1.	Evaluate the external parts of an agricultural animal as they relate to selecting quality animals for market or breeding purposes.
	2.	Investigate the selection of market animals (i.e., beef, sheep, swine, goat, and chicken).
	3.	Describe the process of selecting breeding animals (i.e., beef, sheep, swine, goat, and chicken, mare).
	4.	Evaluate breeding livestock.
Unit 7: Animal Production Management		
	1.	Investigate workplace safety and the use of personal protective equipment.
	2.	Examine basic concepts of animal health, including disease prevention, control, and treatment.
	3.	Investigate how factors such as age, genetic background, stocking density, and natural immunity affect animal health and resistance to diseases.
	4.	Observe and describe management and marketing practices for various animal enterprises.
Unit 8: Facility and Equipment Management in Animal Agriculture		
	1.	Explore facility, equipment, and management needs for various animal enterprises.
	2.	Develop a production management plan, including facilities, equipment, production records, and maintaining and protecting animal health for a herd or flock.
	3.	Explore concepts of animal transportation as it relates to animal safety.

Unit 9: Issues in Animal Agriculture		
	1.	Explore concepts of animal welfare and animal rights.
	2.	Examine consumer concerns and their effect on animal production.
	3.	Compare bioterrorism to biosecurity and discuss the effect each has on animal agriculture.
	4.	Analyze public perceptions of animal production for human food consumption and complete a project on the findings.
	5.	Identify laws and policies within food safety and regulations.
Unit 10: Farm to Fork		
	1.	Investigate the movement of food from "farm to fork."
	2.	Explain the role of food inspection.
	3.	Understand the supply chain as it relates to large-scale animal-food production as compared to small farm operations.

Appendix A: Industry Standards

AFNR Pathway
Content Standards and Performance Elements

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	Units									
Standards	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
ABS - Agribusiness Systems		X				X	X		X	X
AS - Animal Systems		X	X	X	X	X	X	X	X	X
BS - Biotechnology Systems			X	X	X				X	
CRP - Career Ready Practices	X		X				X		X	X
ECL - Education, Communication, and Leadership	X					X			X	X
ESS - Environmental Sustainability Systems			X				X	X	X	X
FPP - Food Products and Processing Systems		X		X						X
FPS - Foundational Pathway Skills	X	X	X	X	X	X	X	X	X	X
NRS - Natural Resource Systems									X	
PS - Plant Systems				X						
PST - Power, Structural, and Technical Systems		X	X					X		

Agribusiness Systems
Career Pathway Content Standards

The Agribusiness Systems (ABS) Career Pathway encompasses the study of agribusinesses and their management including, but not limited to, record keeping, budget management (cash and credit), business planning, introduction to micro- and macroeconomic principles, and sales and marketing. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the planning, development, application, and management of agribusiness systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- ***Standards***– These are the standards owned by Advance CTE and used here with permission. The standards defined the scope and guided the development of the updated indicators and sample measurements.
- ***Performance Indicators*** – These statements distill each standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related standard at the conclusion of a program of study in this area.

ABS.01. Apply management planning principles in AFNR businesses.

ABS.01.01. Apply economic principles to plan and manage inputs and outputs in an AFNR business.
ABS.01.02. Evaluate and create statements of purpose and business goals for AFNR businesses.
ABS.01.03. Develop and apply skills to manage an AFNR business in an efficient, legal, and ethical manner.
ABS.01.04. Evaluate, develop, and implement procedures used to recruit, train, and retain productive human resources for AFNR businesses.

ABS.02. Use record keeping to accomplish AFNR business objectives, manage budgets and comply with laws and regulations.

ABS.02.01. Apply fundamental accounting principles, systems, tools, and applicable laws and regulations to record, track, and audit AFNR business transactions (e.g., accounts, debits, credits, assets, liabilities, equity, etc.).

ABS.02.02. Assemble, interpret, and analyze financial information and reports to monitor AFNR business performance and support decision-making (e.g., income statements, balance sheets, cash-flow analysis, inventory reports, break-even analysis, return on investment, taxes, etc.).

ABS.03. Manage cash budgets, credit budgets and credit for an AFNR business using generally accepted accounting principles.

ABS.03.01. Manage cash budgets, assets, Employment Tax Incentive opportunities for credits, loans, etc. to achieve AFNR business goals.

ABS.03.02. Analyze credit needs and manage credit budgets to achieve AFNR business goals.

ABS.04. Develop a business plan for an AFNR business.

ABS.04.01. Analyze characteristics and planning requirements associated with developing business plans for different types of AFNR businesses.

ABS.04.02. Develop production and operational plans for an AFNR business.

ABS.04.03. Identify and apply strategies to manage or mitigate risk.

ABS.05. Use sales and marketing principles to accomplish AFNR business objectives.

ABS.05.01. Determine the role of markets, trade, competition, and price in relation to AFNR business sales and marketing plan.

ABS.05.02. Assess and apply sales principles and skills to accomplish AFNR business objectives.

ABS.05.03. Assess marketing principles and develop marketing plans to accomplish AFNR business objectives.

Animal Systems
Career Pathway Content Standards

The Animal Systems (AS) Career Pathway encompasses the study of animal systems, including content areas such as life processes, health, nutrition, genetics, management, processing, and veterinary science, as applied to small animals, aquaculture, exotic animals, livestock, dairy, horses and/or poultry. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of animal systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- ***Standards***– These are the standards owned by Advance CTE and used here with permission. The standards defined the scope and guided the development of the updated indicators and sample measurements.
- ***Performance Indicators*** – These statements distill each standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related standard at the conclusion of a program of study in this area.

AS.01. Analyze historic and current trends impacting the animal systems industry.

AS.01.01. Evaluate the development and implications of animal origin, domestication, and distribution on production practices and the environment.

AS.01.02. Assess and select animal production, marketing, and management methods based upon effectiveness and potential social and environmental impacts.

AS.01.03. Analyze laws and sustainable practices that impact animal agriculture from a local, tribal, state, national, and global perspective.

AS.02. Utilize best-practice protocols based upon animal behaviors for animal husbandry and welfare.

AS.02.01. Explain management techniques that ensure animal welfare.

AS.02.02. Analyze procedures to ensure that animal products are safe for consumption.

AS.03. Design and provide proper animal nutrition to achieve desired outcomes for performance, development, reproduction and/or economic production.

AS.03.01. Analyze the nutritional needs of animals.

AS.03.02. Analyze feed rations and assess if they meet the nutritional needs of animals.

AS.03.03. Utilize tools, equipment, techniques, and technology to make animal nutrition decisions.

AS.04. Apply principles of animal reproduction to achieve desired outcomes for performance, development and/or economic production.

AS.04.01. Evaluate animals for breeding readiness and soundness.
AS.04.02. Apply scientific principles to select and care for breeding animals.
AS.04.03. Apply scientific principles to animal breeding.

AS.05. Evaluate environmental factors affecting animal performance and implement procedures for enhancing performance and animal health.

AS.05.01. Design and evaluate animal housing, equipment, and handling facilities for the major systems of animal production.
AS.05.02. Comply with government regulations and safety standards for facilities used in animal production.

AS.06. Classify, evaluate and select animals based on anatomical and physiological characteristics.

AS.06.01. Classify animals according to taxonomic classification systems and use (e.g., agricultural, companion, etc.).
AS.06.02. Apply principles of comparative anatomy and physiology to uses within various animal systems.
AS.06.03. Select animals for specific purposes and maximum performance based on anatomy and physiology.

AS.07. Apply principles of effective animal health care.

AS.07.01. Design programs to prevent animal diseases, parasites, and other disorders and ensure animal welfare.
AS.07.02. Analyze biosecurity measures utilized to protect the welfare of animals and health of humans on a local, state, national, and global level.

AS.08. Analyze environmental factors associated with animal production.

AS.08.01. Design management practices related to animal agriculture to enhance the environment.
AS.08.02. Evaluate the effects of environmental conditions on animals.

Biotechnology Systems
Career Pathway Content Standards

The Biotechnology Systems (BS) Career Pathway encompasses the study of using scientific techniques to gather and analyze data to solve problems concerning living organisms with an emphasis on applications to agriculture, food, and natural resource systems. Students completing a program of study in this pathway will demonstrate competence in principles and techniques for the development, application, and management of biotechnology in the context of AFNR.

Within each pathway, the standards are organized as follows:

- ***Standards***– These are the standards set forth by the National Council for Agricultural Education for Biotechnology Systems. They define what students should know and be able to do after completing instruction in a program of study focused on applying Biotechnology to AFNR systems.
- ***Performance Indicators*** – These statements distill each standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related standard at the conclusion of a program of study in this area.

BS.01. Assess factors that have influenced the evolution of biotechnology in agriculture (e.g., scientific technologies, historical events, societal trends, ethical and legal implications, etc.).

BS.01.01. Investigate and explain the relationships in the timeline of developing biotechnology applications and techniques in agriculture (e.g., major innovators, historical developments, potential applications of biotechnology, etc.).
BS.01.02. Evaluate the roles, scope, and implications of regulatory agencies on applications of biotechnology in agriculture and the protection of public interests (e.g., health, safety, environmental issues, etc.).
BS.01.03. Analyze the relationship and implications of bioethics, laws, and public perceptions on applications of biotechnology in agriculture (e.g., ethical, legal, social, cultural issues).

BS.02. Demonstrate proficiency by safely applying appropriate laboratory skills to complete tasks in a biotechnology research and development environment (e.g., standard operating procedures, record keeping, aseptic

technique, equipment maintenance, etc.).

BS.02.01. Read, document, evaluate, and secure accurate laboratory records of experimental protocols, observations, and results.

BS.02.02. Identify and apply standard laboratory procedures and equipment maintenance to create and maintain reliable data BS.02.01. Read, document, evaluate, and secure accurate laboratory records of experimental protocols, observations, and results.

BS.02.03. Apply standard operating procedures for the safe handling of biological and chemical materials in a laboratory.

BS.02.04. Safely manage and dispose of biological materials, chemicals, and wastes according to standard operating procedures.

BS.02.05. Examine and perform scientific procedures using microbes, DNA, RNA and proteins in a laboratory.

BS.03. Demonstrate the application of biotechnology to solve problems in Agriculture, Food and Natural Resources (AFNR) systems (e.g., bioengineering, food processing, waste management, horticulture, forestry, livestock, crops, etc.).

BS.03.01. Apply biotechnology principles, techniques, and processes to modify a species.

BS.03.02. Apply biotechnology principles, techniques, and processes to enhance the production of food through the use of microorganisms and enzymes.

BS.03.03. Apply biotechnology principles, techniques, and processes to protect the environment and maximize use of natural resources (e.g., biomass, bioprospecting, industrial biotechnology, etc.).

BS.03.04. Apply biotechnology principles, techniques, and processes to enhance plant and animal care and production (e.g., selective breeding, pharmaceuticals, biodiversity, etc.).

BS.03.05. Apply biotechnology principles, techniques, and processes to produce bioproducts (e.g., fermentation, transesterification, methanogenesis, etc.).

BS.03.06. Apply biotechnology principles, techniques, and processes to improve waste management (e.g., genetically modified organisms, bioremediation, etc.).

Career Ready Practices
Content Standards

Career Ready Practices (CRPs) encompass fundamental skills and practices that all students should acquire to be career ready such as: responsibility, productivity, healthy choices, maintaining personal finances, communication, decision-making, creativity and innovation, critical-thinking, problem-solving, integrity, ethical leadership, management, career planning, technology use and cultural/global competency. Students completing a program of study in any AFNR career pathway will demonstrate the knowledge, skills and behaviors that are important to career ready through experiences in a variety of settings (e.g., classroom, CTSO, work-based learning, community etc.).

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- ***Performance Indicators*** – These statements distill each standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related standard at the conclusion of a program of study in this area.

CRP.01. Act as a responsible and contributing citizen and employee.

CRP.01.01. Model personal responsibility in the workplace and community.

CRP.01.02. Explain the short-term and long-term impacts of personal and professional decisions on employers and community before taking action.

CRP.01.03. Identify and act upon opportunities for professional and community service at the workplace.

CRP.02. Apply appropriate academic and technical skills.

CRP.02.01. Use strategic thinking to connect and apply academic learning, technical knowledge, and skills to solve problems in the workplace and community.

CRP.03. Attend to personal health and financial well-being.

CRP.03.01. Design and implement a personal wellness plan.

CRP.03.02. Design and implement a personal financial management plan.

CRP.04. Communicate clearly, effectively and with reason.

- **CRP.04.01.** Communicate using strategies that ensure clarity, logic, purpose and professionalism in formal and informal settings.
- **CRP.04.02.** Produce clear, reasoned, and coherent written and visual communication in formal and informal settings.
- **CRP.04.03.** Model active listening strategies when interacting with others in formal and informal settings.

CRP.05. Consider the environmental, social and economic impacts of decisions.

- **CRP.05.01.** Assess, identify, and synthesize the information and resources needed to make decisions that positively impact the workplace and community.
- **CRP.05.02.** Make, defend, and evaluate decisions at work and in the community using information about the potential environmental, social, and economic impacts.

CRP.06. Demonstrate creativity and innovation.

- **CRP.06.01.** Synthesize information, knowledge, and experience to generate original ideas and challenge assumptions in the workplace and community.
- **CRP.06.02.** Assess a variety of workplace and community situations to identify ways to add value and improve the efficiency of processes and procedures.
- **CRP.06.03.** Create and execute a plan of action for new ideas and introduce innovations to workplace and community organizations.

CRP.07. Employ valid and reliable research strategies.

- **CRP.07.01.** Select and implement reliable research processes and methods to generate data for decision making in the workplace and community.
- **CRP.07.02.** Evaluate the validity of sources and data used when considering the adoption of new technologies, practices, and ideas in the workplace and community.

CRP.08. Utilize critical thinking to make sense of problems and persevere in solving them.

- **CRP.08.01.** Apply reason and logic to evaluate workplace and community situations from multiple perspectives.
- **CRP.08.02.** Investigate, prioritize and select solutions to solve problems in the workplace and community.
- **CRP.08.03.** Establish plans to solve workplace and community problems and execute them with resiliency.

CRP.09. Model integrity, ethical leadership and effective management.

- **CRP.09.01.** Model characteristics of ethical and effective leaders in the workplace and community (e.g. integrity, self-awareness, self-regulation, etc.).
- **CRP.09.02.** Implement personal management skills to function effectively and efficiently in the workplace (e.g., time management, planning, prioritizing, etc.).
- **CRP.09.03.** Demonstrate behaviors that contribute to a positive morale and culture in the workplace and community (e.g., positively influencing others, effectively communicating, etc.).

CRP.10. Plan education and career path aligned to personal goals.

- **CRP.10.01.** Identify career opportunities within a career cluster that match personal interests, talents, goals and preferences.
- **CRP.10.02.** Examine career advancement requirements (e.g., education, certification, training, etc.) and create goals for continuous growth in a chosen career.
- **CRP.10.03.** Develop relationships with and assimilate input and/or advice from experts (e.g., counselors, mentors, etc.) to plan career and personal goals in a chosen career area.
- **CRP.10.04.** Identify, prepare, update and improve the tools and skills necessary to pursue a chosen career path.

CRP.11. Use technology to enhance productivity.

- **CRP.11.01.** Research, select and use new technologies, tools and applications to maximize productivity in the workplace and community.
- **CRP.11.02.** Evaluate personal and organizational risks of technology use and take actions to prevent or minimize risks in the workplace and community.
- **CRP.01.03.** Identify and act upon opportunities for professional and community service at the workplace.

CRP.12. Work productively in teams while using cultural/global competence.

CRP.12.01. Contribute to team-oriented projects and builds consensus to accomplish results using cultural global competence in the workplace and community.

CRP.12.02. Create and implement strategies to engage team members to work toward team and organizational goals in a variety of workplace and community situations (e.g., meetings, presentations, etc.).

Education, Communication, and Leadership Career Pathway Content Standards

The Education, Communication, and Leadership (ECL) Career Pathway joins together three disciplines that focus on ways to best inform, educate and advance the agricultural industry. Students completing a program of study in this pathway will demonstrate an understanding of effective education, leadership, and strategic communication in AFNR settings.

Within each pathway, the standards are organized as follows:

- ***Standards***– These are the standards set forth by the National Council for Agricultural Education for Education, Communication, and Leadership. They define what students should know and be able to do after completing instruction in a program of study focused on applying Education, Communication, and Leadership to AFNR systems.
- ***Performance Indicators*** – These statements distill each standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related standard at the conclusion of a program of study in this area.

ECL.01. Develop a plan for an educational workshop or lesson - recognizing the breadth of opportunities in agricultural education - that informs, educates and promotes a topic or concept relevant to AFNR.

ECL.01.01. Explore the breadth of opportunities in agricultural education (e.g., using state or national resources, Teach Ag, university program information, professional associations, etc.).

ECL.01.02. Apply fundamental understanding of AFNR and agricultural education - including experiential learning - to the development of a workshop or lesson.

ECL.02. Apply curriculum development and effective instructional techniques to create, teach and evaluate an agricultural education lesson.

ECL.02.01. Develop and deliver a workshop or lesson using a variety of methods and best practices in instruction and facilitation.

ECL.02.02. Evaluate facilitation or presentation strategies that encourage appropriate social interactions, embrace diversity, promote equity and build a positive learning environment that is welcoming to all individuals.

ECL.02.03. Demonstrate impactful leadership as a credible resource for AFNR.

ECL.03. Evaluate the effectiveness of various communication strategies with related methods and platforms used by organizations across AFNR industries.

ECL.03.01. Identify the methods and characteristics of effective verbal, nonverbal, written, and visual communication.

ECL.03.02. Analyze the use of verbal, nonverbal, written, and visual communication platforms in AFNR.

ECL.03.03. Analyze similarities and differences between verbal, nonverbal, written, and visual communication methods.

ECL.04. Develop a written communication plan using various communication methods (e.g. news releases, social media, speaking opportunities, blogs, podcasts, etc.) to convey a message to an intended AFNR audience.

ECL.04.01. Develop a communications plan that includes purpose, target audience, message, medium, and outcome evaluation.

ECL.04.02. Identify, apply and demonstrate communication skills and methods per the communications plan.

ECL.05. Model characteristics of ethical, efficient, and effective leaders in the workplace and community (e.g. integrity, collaboration, self-awareness, self-regulation, etc.).

ECL.05.01. Identify characteristics and behaviors that constitute ethical, efficient, and effective leadership.

ECL.05.02. Demonstrate leadership through advocacy for AFNR-related issues.

Environmental Sustainability Systems
Career Pathway Content Standards

The Environmental Service Systems (ESS) Career Pathway encompasses the study of systems, instruments and technology, and sustainable practices used to monitor and minimize the impact of human activity on environmental systems in the supply chain. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of environmental service systems in AFNR settings.

Within each pathway, the standards are organized as follows:

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- ***Performance Indicators*** – These statements distill each standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related standard at the conclusion of a program of study in this area.

ESS.01. Use analytical procedures and instruments to manage environmental service systems.

- **ESS.01.01.** Analyze and interpret laboratory and field samples in environmental sustainability systems.
- **ESS.01.02.** Properly utilize scientific instruments in environmental monitoring situations (e.g., laboratory equipment, environmental monitoring instruments, etc.).

ESS.02. Evaluate the impact of public policies and regulations on environmental service system operations.

- **ESS.02.01.** Interpret and evaluate the impact of laws, agencies, policies, practices, and consumer preferences affecting environmental service systems.
- **ESS.02.02.** Compare and contrast the impact of current trends on regulation of environmental sustainability systems.
- **ESS.02.03.** Examine and summarize the impact of public perceptions and social movements on the regulation of environmental sustainability systems.

ESS.03. Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology.

- **ESS.03.01.** Apply meteorology principles to environmental sustainability systems.
- **ESS.03.02.** Apply soil science and hydrology principles to environmental sustainability systems.
- **ESS.03.03.** Apply chemistry principles to environmental sustainability systems.
- **ESS.03.04.** Apply microbiology principles to environmental sustainability systems.
- **ESS.03.05.** Apply ecology principles to environmental sustainability systems.

ESS.04. Demonstrate the operation of environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management and energy conservation).

- **ESS.04.01.** Develop systems of sustainability management for all categories of solid waste in environmental sustainability systems.
- **ESS.04.02.** Sustainably manage solid waste in environmental service systems.
- **ESS.04.03.** Apply techniques to ensure a safe supply of drinking water and adequate treatment of wastewater according to applicable rules and regulations.
- **ESS.04.04.** Compare and contrast the impact of conventional and alternative energy sources on the environment and operation of environmental sustainability systems.

ESS.05. Use tools, equipment, machinery and technology common to tasks in environmental service systems.

- **ESS.05.01.** Use technological and mathematical tools to map land, facilities, and infrastructure for environmental sustainability systems.
- **ESS.05.02.** Perform assessments of environmental conditions using equipment, machinery, and technology.

Food Products and Processing Systems
Career Pathway Content Standards

The Food Products and Processing Systems (FPP) Career Pathway encompasses the study of food safety, sanitation, nutrition, biology, microbiology, chemistry, human behavior in local and global food systems, food selection, processing for storage, distribution and consumption, and the historical and current development of the food industry. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application, and management of food products and processing systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- ***Standards***– These are the standards owned by Advance CTE and used here with permission. The standards defined the scope and guided the development of the updated indicators and sample measurements.
- ***Performance Indicators*** – These statements distill each standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related standard at the conclusion of a program of study in this area.

FPP.01. Develop and implement procedures to ensure safety, sanitation and quality in food products and processing facilities.

- **FPP.01.01.** Distinguish between various food safety programs and management systems in food products and processing facilities.
- **FPP 01.02.** Apply food safety and quality assurance procedures in the harvesting, handling and processing of food products.
- **FPP.01.03.** Apply food safety procedures during storage and distribution to ensure food quality.

FPP.02. Apply principles of nutrition, biology, microbiology, chemistry and human behavior to the development of food products.

- **FPP.02.01.** Apply principles of nutrition and biology to develop food products that provide a safe, wholesome, and nutritious food supply for local and global food systems.
- **FPP.02.02.** Apply principles of microbiology and chemistry to develop food products to provide a safe, wholesome, and nutritious food supply for local and global food systems.
- **FPP.02.03.** Apply principles of human behavior to develop food products to provide a safe, wholesome, and nutritious food supply for local and global food systems.

FPP.03. Select and process food products for storage, distribution and consumption.

- **FPP.03.01.** Implement selection, evaluation, and inspection techniques to ensure safe and quality food products.
- **FPP.03.02.** Design and apply techniques of food processing, preservation, packaging, and presentation for distribution and consumption of food products.
- **FPP.03.03.** Create food distribution plans and procedures to ensure safe delivery of food products.

FPP.04. Explain the scope of the food industry and the historical and current developments of food products and processing.

- **FPP.04.01.** Examine the scope of the food industry by evaluating local and global policies, trends, and customs for food production.
- **FPP.04.02.** Evaluate the significance and implications of changes and trends in the food products and processing industry in the local and global food systems.
- **FPP.04.03.** Identify the purpose of industry organizations, groups, and regulatory agencies that influence the local and global food systems.
- **FPP.04.04.** Evaluate the effectiveness of current sustainability practices in their role to food products and processing.

Foundational Pathway Skills
Content Standards

The Agriculture, Food, and Natural Resources (AFNR) Foundational Pathway Skills (FPS) encompasses the study of essential knowledge and skills related to all AFNR professions. Students completing a program of study in any AFNR career pathway will demonstrate fundamental knowledge of the nature, scope and relationships of AFNR systems and the skills necessary for analysis of current and historical issues and trends; application of technologies; safety, health, and environmental practices; stewardship of natural resources; and exploration of career opportunities.

Within each pathway, the standards are organized as follows:

- ***Standards 1-6*** – These are the standards owned by Advance CTE and used here with permission. The standards defined the scope and guided the development of the updated indicators and sample measurements.
- ***Standards 7-14*** – These are the standards set forth by the National Council for Agricultural Education for Foundational Pathway Skills. They define what students should know and be able to do after completing instruction in a program of study focused on applying Foundational Pathway Skills to AFNR systems.
- ***Performance Indicators*** – These statements distill each standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related standard at the conclusion of a program of study in this area.

FPS.01. Analyze how issues, trends, technologies and public policies impact systems in the Agriculture, Food & Natural Resources Career Cluster.

FPS.01.01. Research, examine, and discuss issues and trends that impact AFNR systems on local, state, national, and global levels.
FPS.01.02. Examine technologies and analyze their impact on AFNR systems.
FPS.01.03. Identify public policies and examine their impact on AFNR systems.

FPS.02. Evaluate the nature and scope of the Agriculture, Food & Natural Resources Career Cluster and the role of agriculture, food and natural resources (AFNR) in society and the economy.

FPS.02.01. Research and use geographic and economic data to solve problems in AFNR systems.
FPS.02.02. Examine the impact of AFNR on the local, state, national, and global society and economy.

FPS.03. Examine and summarize the importance of health, safety and environmental management systems in AFNR workplaces.

FPS.03.01. Identify and explain the implications of required regulations to maintain and improve safety, health, and environmental management systems.
FPS.03.02. Develop and implement a plan to maintain and improve health, safety, and environmental compliance and performance.
FPS.03.03. Apply health and safety practices to AFNR workplaces.
FPS.03.04. Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.

FPS.04. Demonstrate stewardship of natural resources in AFNR activities.

FPS.04.01. Identify and implement practices to steward natural resources in different AFNR systems.
FPS.04.02. Assess and explain the natural resource related trends, technologies and policies that impact AFNR systems.

FPS.05. Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.

FPS.05.01. Evaluate and implement the steps and requirements to pursue a career opportunity in each of the AFNR career pathways (e.g., goals, degrees, certifications, resumes, cover letter, portfolios, interviews, etc.).
FPS.05.02. Examine and choose career opportunities that are matched to personal skills, talents, and career goals in an AFNR pathway of interest.

FPS.06. Analyze the interaction among AFNR systems in the production, processing and management of food, fiber and fuel and the sustainable use of natural resources.

FPS.06.01. Examine and explain foundational cycles and systems of AFNR.

FPS.07. Recognize the value of a Supervised Agricultural Experience (SAE) as Work-Based Learning.

FPS.07.01. Evaluate the value of an SAE.
FPS.07.02. Connect SAE involvement to lifelong learning and career skills.
FPS.07.03. Define and summarize the foundational and immersion SAEs and the relationship between the two.

FPS.08. Utilize critical thinking to make sense of problems and persevere in solving them.

FPS.08.01. Explore career opportunities and create a plan to prepare for a chosen career.
FPS.08.02. Develop employability skills needed to be successful in a chosen career field.
FPS.08.03. Engage in personal financial practices that lead to financial independence.
FPS.08.04. Assess the importance of health and safety in the AFNR workplace.
FPS.08.05. Evaluate the nature and role that agriculture plays in society, the environment, and the economy.

FPS.09. Recognize the options within and participate in immersive supervised agricultural experiences.
FPS.09.01. Develop AFNR technical knowledge and skills through a personal immersion SAE.
FPS.09.02. Engage in record-keeping practices that promote financial literacy.

FPS.10. Analyze the history of the National FFA Organization and how this timeline has allowed the organization to remain relevant.
FPS.10.01. Evaluate the importance of key events within the organization's history.

FPS.11. Evaluate the structure and value of agricultural education.
FPS.11.01. Interpret the interaction of the three components of agricultural education.
FPS.11.02. Summarize the importance of classroom instruction within agricultural education.
FPS.11.03. Summarize the importance of the National FFA Organization within agricultural education.
FPS.11.04. Summarize the importance of Supervised Agricultural Experiences (SAE) within agricultural education.

FPS.12. Examine the key components providing directional leadership to the National FFA Organization.
FPS.12.01. Identify the importance of the FFA Creed.
FPS.12.02. Identify the importance of the FFA Emblem.
FPS.12.03. Identify the importance of the FFA Mission statement.
FPS.12.04. Identify the importance of a Program of Activities.

FPS.13. Analyze the structures and procedures to effectively and professionally run and manage a meeting.
FPS.13.01. Utilize parliamentary resources to solve problems of organizational management and operations.
FPS.13.02. Present a logical, realistic, and convincing debate on motions.
FPS.13.03. Evaluate agendas, minutes, the constitution, bylaws, and other organizational documents.

FPS.14. Evaluate opportunities to develop leadership, citizenship, and career skills.
FPS.14.01. Evaluate the importance and value of leadership skills.
FPS.14.02. Evaluate the importance and value of citizenship skills.
FPS.14.03. Evaluate the importance and value of career skills.
FPS.14.04. Connect opportunities in leadership, citizenship, and career skills to student development.

Natural Resource Systems
Career Pathway Content Standards

The Natural Resource Systems (NRS) Career Pathway encompasses the study of the management, protection, enhancement and improvement of soil, water, wildlife, forests, and air as natural resources. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application, and management of natural resource systems in AFNR settings.

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- ***Performance Indicators*** – These statements distill each standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related standard at the conclusion of a program of study in this area.

NRS.01. Plan and conduct natural resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goals.
NRS.01.01. Examine natural resource availability and ecosystem function in a particular region.
NRS.01.02. Classify different types of natural resources in order to enable protection, conservation, enhancement, and management in a particular geographical region.
NRS.01.03. Apply ecological concepts and principles (e.g., weather, air quality, UV protection, atmospheric pressure, etc.) to the interaction of atmospheric and natural resource systems.
NRS.01.04. Apply ecological concepts and principles to aquatic natural resource systems.
NRS.01.05. Apply ecological concepts and principles to terrestrial natural resource systems.
NRS.01.06. Apply ecological concepts and principles to biotic organisms in natural resource systems.

NRS.02.01. Analyze the interrelationships between natural resources and humans.

NRS.02.01. Examine and interpret the purpose, enforcement, impact, and effectiveness of laws, agencies, and private and public organizations related to natural resource management, protection, enhancement, and improvement (e.g., water regulations, game laws, environmental policy, local, state, and national conservation organizations, agricultural extension service, etc.).

NRS.02.02. Assess the impact of human activities on the availability of natural resources.

NRS.02.03. Analyze how social perceptions of natural resource management, protection, enhancement, and improvement change and develop over time.

NRS.02.04. Examine and explain how economics affects the use of natural resources.

NRS.02.05. Communicate information to the public regarding topics related to the management, protection, enhancement, and improvement of natural resources.

NRS.03. Develop plans to ensure sustainable production and processing of natural resources.

NRS.03.01. Sustainably produce, harvest, process, and use natural resource products (e.g., forest and rangeland products, wildlife, minerals, fossil fuels, shale oil, alternative energy, recreation, aquatic species, etc.).

NRS.03.02. Demonstrate cartographic skills, tools, and technologies to aid in developing, implementing and evaluating natural resource management plans.

NRS.04. Demonstrate responsible management procedures and techniques to protect, maintain, enhance, and improve natural resources.

NRS.04.01. Demonstrate natural resource protection, maintenance, enhancement, and improvement techniques.

NRS.04.02. Diagnose plant and wildlife diseases and follow protocols to prevent their spread.

NRS.04.03. Prevent or manage introduction of ecologically harmful species in a particular region.

NRS.04.04. Manage fires in natural resource systems.

Plant Systems
Career Pathway Content Standards

The Plant Systems (PS) Career Pathway encompasses the study of plant life cycles, classifications, functions, plant structures, greenhouse and nursery structures, field conditions, reproduction, media and nutrients, as well as growth and cultural practices through the study of crops, turf grass, trees, shrubs and/or ornamental plants. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of plant systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- ***Standards***– These are the standards owned by Advance CTE and used here with permission. The standards defined the scope and guided the development of the updated indicators and sample measurements.
- ***Performance Indicators*** – These statements distill each standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related standard at the conclusion of a program of study in this area.

PS.01. Develop and implement a crop management plan for a given production goal that accounts for environmental factors.

PS.01.01. Determine the influence of environmental factors on plant growth.

PS.01.02. Prepare and adjust growing media for use in plant systems.

PS.01.03. Demonstrate planting techniques and create the conditions needed for seed germination.

PS.01.04. Develop and implement a nutrient management and/or fertilizer plan for specific plants or crops.

PS.02. Apply principles of classification, plant anatomy, and plant physiology to plant production and management.

PS.02.01. Classify plants according to taxonomic systems.

PST.02.02. Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.

PS.02.03. Apply knowledge of plant physiology and energy conversion to plant systems.

PS.03. Propagate, culture and harvest plants and plant products based on current industry standards.

PS.03.01. Demonstrate plant propagation techniques in plant system activities.

PS.03.02. Develop and implement a management plan for plant production.
PS.03.03. Develop and implement a plan for integrated pest management for plant production.
PS.03.04. Apply principles and practices of sustainable agriculture to plant production.
PS.03.05. Harvest crops according to industry standards.
PS.03.06. Haul and store crops according to industry standards.

PS.04. Apply principles of design in plant systems to enhance an environment (e.g. floral, forest landscape, and farm).
PS.04.01. Evaluate, identify, and prepare plants to enhance an environment.
PS.04.02. Create designs using plants.

Power, Structural, and Technical Systems Career Pathway Content Standards

The Power, Structural and Technical Systems (PST) Career Pathway encompasses the study of agricultural equipment, power systems, sustainable fuel sources and precision technology, as well as woodworking, metalworking, welding, electrification, and project planning for agricultural structures. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of power, structural and technical systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- ***Standards***– These are the standards owned by Advance CTE and used here with permission. The standards defined the scope and guided the development of the updated indicators and sample measurements.
- ***Performance Indicators*** – These statements distill each standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related standard at the conclusion of a program of study in this area.

PST.01. Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural and technical systems.
PST.01.01. Apply physical science and engineering principles to assess and select energy sources for AFNR power, structural, and technical systems.
PST.01.02. Apply physical science and engineering principles to design, implement and improve safe and efficient mechanical systems in AFNR situations.
PST.01.03. Apply physical science and engineering principles to metal fabrication using a variety of welding and cutting processes and equipment (e.g., SMAW, GMAW, GTAW, Oxy-fuel, CNC, and plasma arc torch, etc.).

PST.02. Operate and maintain AFNR mechanical equipment and power systems.
PST.02.01. Perform preventative maintenance and scheduled service to maintain equipment, machinery, and power units used in AFNR settings.
PST.02.02. Operate machinery and equipment while observing all safety precautions in AFNR settings.

PST.03. Service and repair AFNR mechanical equipment and power systems.
PST.03.01. Troubleshoot, service, and repair components of internal combustion engines using manufacturers' guidelines.
PST.03.02. Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods.
PST.03.03. Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment, and power source systems (e.g., hydraulic, pneumatic, transmission, steering, powertrain, suspension, etc.).

PST.04. Plan, build and maintain AFNR structures.
PST.04.01. Create plans for AFNR structures.
PST.04.02. Determine structural requirements, specifications, customer needs, and estimate costs for AFNR structures.
PST.04.03. Apply best practices and safety guidelines for use of hand and power tools associated with constructing and maintaining AFNR structures.
PST.04.04. Follow architectural and mechanical plans to construct, maintain and/or repair AFNR structures (e.g., material selection, site preparation and/or layout, surveying, electrical, plumbing, concrete/masonry, etc.).
PST.04.05. Apply electrical wiring principles in AFNR structures.

PST.05. Use control, monitoring, geospatial and other technologies in AFNR power, structural, and technical systems.

PST.05.01. Apply current and/or identify emerging technologies (e.g., robotics, CNC, UAS, etc.) to solve problems and increase the efficiency of AFNR systems.

PST.05.02. Prepare and/or use electrical drawings to design, install, and troubleshoot electronic control systems in AFNR settings.

PST.05.03. Apply geospatial principles and technologies to solve problems and increase the efficiency of AFNR systems.

Mississippi College- and Career-Readiness Standards (MS CCRS)
Biology

	Units									
Standards	1	2	3	4	5	6	7	8	9	10
BIO.1A.1		X								
BIO.1A.2		X								
BIO.1A.3		X					X			
BIO.1A.4		X	X							
BIO.1B.1				X						
BIO.1B.2				X						
BIO.1C.1				X						
BIO.1C.2		X		X						
BIO.1C.3		X	X							
BIO.1D.1				X						
BIO.1D.2				X						
BIO.1E.1					X					
BIO.1E.2					X					
BIO.1E.3					X					
BIO.1E.4					X					
BIO.2.1				X						
BIO.2.2				X						
BIO.2.3				X						
BIO.2.4				X						
BIO.2.5				X						
BIO.2.6				X						
BIO.3A.1					X					
BIO.3A.2					X					
BIO.3A.3					X					
BIO.3B.1					X					
BIO.3B.2					X					
BIO.3B.3					X					
BIO.3B.4					X					
BIO.3C.1					X					
BIO.3C.2					X					
BIO.3C.3					X					
BIO.3C.4					X				X	
BIO.3C.5					X				X	

	Units									
Standards	1	2	3	4	5	6	7	8	9	10
BIO.4.1					X	X			X	
BIO.4.2						X				
BIO.4.3						X				
BIO.4.4						X				
BIO.4.5						X				
BIO.4.6						X				
BIO.4.7						X			X	
BIO.5.1									X	X
BIO.5.2									X	
BIO.5.3									X	
BIO.5.4				X					X	
BIO.5.5									X	
BIO.5.6									X	
BIO.5.7									X	
BIO.5.8									X	
BIO.5.9									X	

Cells in a System

BIO.1A Students will demonstrate an understanding of the characteristics of life and biological organization.

BIO.1A.1 Develop criteria to differentiate between living and non-living things.

BIO.1A.2 Describe the tenets of cell theory and the contributions of Schwann, Hooke, Schleiden, and Virchow.

BIO.1A.3 Using specific examples, explain how cells can be organized into complex tissues, organs, and organ systems in multicellular organisms.

BIO.1A.4 Use evidence from current scientific literature to support whether a virus is living or non-living.

BIO.1B Students will analyze the structure and function of the macromolecules that make up cells.

BIO.1B.1 Develop and use models to compare and contrast the structure and function of carbohydrates, lipids, proteins, and nucleic acids (DNA and RNA) in organisms.

BIO.1B.2 Design and conduct an experiment to determine how enzymes react given various environmental conditions (i.e., pH, temperature, and concentration). Analyze, interpret, graph, and present data to explain how those changing conditions affect the enzyme activity and the rate of the reactions that take place in biological organisms.

BIO.1C Students will relate the diversity of organelles to a variety of specialized cellular functions.

BIO.1C.1 Develop and use models to explore how specialized structures within cells (e.g., nucleus, cytoskeleton, endoplasmic reticulum, ribosomes, Golgi apparatus, lysosomes, mitochondria, chloroplast, centrosomes, and vacuoles) interact to carry out the functions necessary for organism survival.

BIO.1C.2 Investigate to compare and contrast prokaryotic cells and eukaryotic cells, and plant, animal, and fungal cells.

BIO.1C.3 Contrast the structure of viruses with that of cells, and explain why viruses must use living cells to reproduce.

BIO.1D Students will describe the structure of the cell membrane and analyze how the structure is related to its primary function of regulating transport in and out of cells to maintain homeostasis.

BIO.1D.1 Plan and conduct investigations to prove that the cell membrane is a semi-permeable, allowing it to maintain homeostasis with its environment through active and passive transport processes.

BIO.1D.2 Develop and use models to explain how the cell deals with imbalances of solute concentration across the cell membrane (i.e., hypertonic, hypotonic, and isotonic conditions, sodium/potassium pump).

BIO.1E Students will develop and use models to explain the role of the cell cycle during growth, development, and maintenance in multicellular organisms.

BIO.1E.1 Construct models to explain how the processes of cell division and cell differentiation produce and maintain complex multicellular organisms.

BIO.1E.2 Identify and describe the changes that occur in a cell during replication. Explore problems that might occur if the cell does not progress through the cycle correctly (cancer).

BIO.1E.3 Relate the processes of cellular reproduction to asexual reproduction in simple organisms (i.e., budding, vegetative propagation, regeneration, binary fission). Explain why the DNA of the daughter cells is the same as the parent cell.

BIO.1E.4 Enrichment: Use an engineering design process to investigate the role of stem cells in regeneration and asexual reproduction, then develop applications of stem cell research to solve human medical conditions.

Energy Transfer

BIO.2 Students will explain that cells transform energy through the processes of photosynthesis and cellular respiration to drive cellular functions.

BIO.2.1 Use models to demonstrate that ATP and ADP are cycled within a cell as a means to transfer energy.

BIO.2.2 Develop models of the major reactants and products of photosynthesis to demonstrate the transformation of light energy into stored chemical energy in cells. Emphasize the chemical processes in which bonds are broken and energy is released, and new bonds are formed and energy is stored.

BIO.2.3 Develop models of the major reactants and products of cellular respiration (aerobic and anaerobic) to demonstrate the transformation of the chemical energy stored in food to the available energy of ATP. Emphasize the chemical processes in which bonds are broken and energy is released, and new bonds are formed and energy is stored.

BIO.2.4 Conduct scientific investigations or computer simulations to compare aerobic and anaerobic cellular respiration in plants and animals, using real world examples.

BIO.2.5 Enrichment: Investigate variables (e.g., nutrient availability, temperature) that affect anaerobic respiration and current real-world applications of fermentation.

BIO.2.6 Enrichment: Use an engineering design process to manipulate factors involved in fermentation to optimize energy production.

Reproduction and Heredity

BIO.3A Students will develop and use models to explain the role of meiosis in the production of haploid gametes required for sexual reproduction.

BIO.3A.1 Model sex cell formation (meiosis) and combination (fertilization) to demonstrate the maintenance of chromosome number through each generation in sexually reproducing populations. Explain why the DNA of the daughter cells is different from the DNA of the parent cell.

BIO.3A.2 Compare and contrast mitosis and meiosis in terms of reproduction.

BIO.3A.3 Investigate chromosomal abnormalities (e.g., Down syndrome, Turner's syndrome, and Klinefelter syndrome) that might arise from errors in meiosis (nondisjunction) and how these abnormalities are identified (karyotypes).

BIO.3B Students will analyze and interpret data collected from probability calculations to explain the variation of expressed traits within a population.

BIO.3B.1 Demonstrate Mendel's law of dominance and segregation using mathematics to predict phenotypic and genotypic ratios by constructing Punnett squares with both homozygous and heterozygous allele pairs.

BIO.3B.2 Illustrate Mendel's law of independent assortment using Punnett squares and/or the product rule of probability to analyze monohybrid crosses.

BIO.3B.3 Investigate traits that follow non-Mendelian inheritance patterns (e.g., incomplete dominance, codominance, multiple alleles in human blood types, and sex-linkage).

BIO.3B.4 Analyze and interpret data (e.g., pedigrees, family, and population studies) regarding Mendelian and complex genetic traits (e.g., sickle-cell anemia, cystic fibrosis, muscular dystrophy, color-blindness, and hemophilia) to determine patterns of inheritance and disease risk.

BIO.3C Students will construct an explanation based on evidence to describe how the structure and nucleotide base sequence of DNA determines the structure of proteins or RNA that carry out essential functions of life.

BIO.3C.1 Develop and use models to explain the relationship between DNA, genes, and chromosomes in coding the instructions for the traits transferred from parent to offspring.

BIO.3C.2 Evaluate the mechanisms of transcription and translation in protein synthesis.

BIO.3C.3 Use models to predict how various changes in the nucleotide sequence (e.g., point mutations, deletions, and additions) will affect the resulting protein product and the subsequent inherited trait.

BIO.3C.4 Research and identify how DNA technology benefits society. Engage in scientific argument from evidence over the ethical issues surrounding the use of DNA technology (e.g., cloning, transgenic organisms, stem cell research, and the Human Genome Project, gel electrophoresis).

BIO.3C.5 Enrichment: Investigate current biotechnological applications in the study of the genome (e.g., transcriptome, proteome, individualized sequencing, and individualized gene therapy).

Adaptations and Evolution

BIO.4 Students will analyze and interpret evidence to explain the unity and diversity of life.

BIO.4.1 Use models to differentiate between organic and chemical evolution, illustrating the steps leading to aerobic heterotrophs and photosynthetic autotrophs.

BIO.4.2 Evaluate empirical evidence of common ancestry and biological evolution, including comparative anatomy (e.g., homologous structures and embryological similarities), fossil record, molecular/biochemical similarities (e.g., gene and protein homology), and biogeographic distribution.

BIO.4.3 Construct cladograms/phylogenetic trees to illustrate relatedness between species.

BIO.4.4 Design models and use simulations to investigate the interaction between changing environments and genetic variation in natural selection leading to adaptations in populations and differential success of populations.

BIO.4.5 Use Darwin's Theory to explain how genetic variation, competition, overproduction, and unequal reproductive success acts as driving forces of natural selection and evolution.

BIO.4.6 Construct explanations for the mechanisms of speciation (e.g., geographic and reproductive isolation).

BIO.4.7 Enrichment: Construct explanations for how various disease agents (bacteria, viruses, chemicals) can influence natural selection.

Interdependence of Organisms and Their Environment

BIO.5 Students will Investigate and evaluate the interdependence of living organisms and their environment.

BIO.5.1 Illustrate levels of ecological hierarchy, including organism, population, community, ecosystem, biome, and biosphere.

BIO.5.2 Analyze models of the cycling of matter (e.g., carbon, nitrogen, phosphorus, and water) between abiotic and biotic factors in an ecosystem and evaluate the ability of these cycles to maintain the health and sustainability of the ecosystem.

BIO.5.3 Analyze and interpret quantitative data to construct an explanation for the effects of greenhouse gases on the carbon dioxide cycle and global climate.

BIO.5.4 Develop and use models to describe the flow of energy and amount of biomass through food chains, food webs, and food pyramids.

BIO.5.5 Evaluate symbiotic relationships (e.g., mutualism, parasitism, and commensalism) and other co-evolutionary (e.g., predator-prey, cooperation, competition, and mimicry) relationships within specific environments.

BIO.5.6 Analyze and interpret population data, both density-dependent and density-independent, to define limiting factors. Use graphical representations (growth curves) to illustrate the carrying capacity within ecosystems.

BIO.5.7 Investigate and evaluate factors involved in primary and secondary ecological succession using local, real-world examples.

BIO.5.8 Enrichment: Use an engineering design process to create a solution that addresses changing ecological conditions (e.g., climate change, invasive species, loss of biodiversity, human population growth, habitat destruction, biomagnification, or natural phenomena).

BIO.5.9 Enrichment: Use an engineering design process to investigate and model current technological uses of biomimicry to address solutions to real-world problems.

Appendix C: CTSO Standards

FFA Career and Leadership Development Events Alignment

Dairy Cattle Evaluation and Management		
Unit	**Competency/Objective**	**CDE/LDE Alignment**
Unit 1: Leadership and SAE for All	1. Participate in local, state and/or national FFA activities that provide opportunities for leadership development and career exploration 1a. Actively participate in FFA activities.	Entire Event
Unit 2: Introduction to Animal Agriculture	4. Discuss the dairy cattle industry 4a. Identify products produced from dairy cattle 4b. Discuss dairy cattle enterprises 4c. Identify dairy cattle breeds 4d. Identify & explore careers in the dairy industry	Team Practicums (Herd Records; Keep/Cull; Feed/Nutrition) Individual Activities
Unit 3: Biosecurity and Emergency Management	1. Develop & maintain an emergency action plan (EAP) for animal agriculture 2. Evaluate biosecurity risks and mitigation practices 3. Discuss industry hazards & protocols (manure pits, fumes, zoonoses, etc.)	Team Practicums (Housing/Facilities, Health/Diseases; Current Issues)
Unit 4: Feed and Feeding	3. Explain the role of nutrition in animal production 3a. Determine feedstuffs that meet the nutrient requirements of dairy cattle 3b. Calculate feed rations (Pearson square & software) 4. Describe feeding systems & forage management	Team Practicums (Feed/Nutrition) Team Activity (Feeds/Nutrition)
Unit 5: Animal Reproduction	2. Identify male/female reproductive systems & functions 3. Discuss reproductive hormones & estrus synchronization 5. Describe breeding systems & genetic-improvement techniques 5c. Predict trait transmission with Punnett squares	Team Practicum (Genomic Data) Team Activity (Genetics/Reproduction)
Unit 6: Livestock Evaluation and Selection	1. Evaluate external parts of dairy cattle 2. Investigate selection of market animals (type, muscle, finish, balance) 3. Describe performance data & EPDs used in dairy selection 4. Evaluate breeding livestock & give logical reasons	Individual Activities Team Practicums (Keep/Cull)
Unit 7: Animal Production Management	1. Investigate animal-health concepts & disease prevention 2. Demonstrate methods for delivering medications 3. Observe critical management practices (calf care, ID, breeding soundness, etc.)	Team Practicums (Herd Health, Calf & Heifer Management Team Activity (Young-Stock Management)
Unit 8: Facility and Equipment Management	1. Research housing, milking and handling facilities 1b. Develop a production-management plan (records, equipment, herd health) 2. Review trailer safety & livestock transport procedures	Team Activity (Housing/Facilities) Team Practicums (Milking Equipment and Quality)
Unit 9: Issues in Animal Agriculture	1. Explore animal welfare vs. animal rights 2. Examine consumer concerns & quality assurance 3. Investigate environmental and regulatory issues (HACCP, FDA, USDA, FSMA)	Team Practicums (Current Issues) Team Activity (Current Issues; Biosecurity)
Unit 10: Farm to Fork	1. Investigate the movement of food from farm to fork 2. Explain the role of USDA FSIS inspection & humane handling 3. Understand the livestock-product supply chain (production → processing → retail)	Team Activity (Economic Evaluation and Decision-Making)

Horse Evaluation		
Unit	**Competency/Objective**	**CDE/LDE Alignment**
Unit 1: Leadership and SAE for All	1. Participate in local, state, and/or national FFA activities that provide opportunities for leadership development and career exploration. 1a. Actively participate in FFA activities.	Entire Event
Unit 2: Introduction to Animal Agriculture	5. Discuss the equine industry. 5a. Identify uses for horses. 5c. Identify major horse breeds.	Individual Activities (Horse Knowledge Test)
Unit 4: Application of Feed and Feeding to Animal Growth and Production	2. Examine the role of nutrition in animal growth and health at different stages of life. 3a. Determine the available/appropriate feedstuffs that meet the nutrient requirements of various types of livestock. 7. Explain how animals are fed.	Practical Application Activities (Feed/Hay Selection)
Unit 5: Animal Reproduction	1. Examine the basics of reproduction in animal production. 1d. Identify the lengths of gestation for livestock species. 2c. Identify signs of estrus, length of estrus cycle, and time in ovulation in various female agricultural animals.	Individual Activities (Horse Knowledge Test) Team Activities (Reproduction)
Unit 6: Livestock Evaluation and Selection	1. Evaluate the external parts of an agricultural animal as they relate to selecting quality animals for market or breeding purposes. 2a. Critique the main points to consider when visually evaluating a market animal. 4. Evaluate breeding livestock. 4b. Evaluate breeding animals based upon high-quality breeding characteristics and performance data that is distinctive to each species of agricultural-breeding animals and present sound reasoning for placing animals in their respective positions within their class.	Individual Activities (Selection Class: Halter, Performance) Individual Activities (Oral Reasons)
Unit 7: Animal Production Management	2. Examine basic concepts of animal health, including disease prevention, control, and treatment. 2a. Describe the signs of good health in animals. 2c. Discuss methods for delivering medicines to animals.	Team Activities (Practical Application Activities)
Unit 8: Facility and Equipment Management in Animal Agriculture	1. Explore facility, equipment, and management needs for various animal enterprises. 1a. Research and discuss general facility needs for different classes of animals.	Team Activities (Practical Application Activities)

Livestock Evaluation		
Unit	**Competency/Objective**	**CDE/LDE Alignment**
Unit 1: Leadership and SAE for All	1. Participate in local, state, and/or national FFA activities that provide opportunities for leadership development and career exploration. 1a. Actively participate in FFA activities.	Entire Event
Unit 2: Introduction to Animal Agriculture	4. Discuss the dairy cattle industry. 6. Discuss the swine industry. 10. Discuss the sheep industry.	Individual Activities (Livestock evaluation/placing classes)
Unit 3: Biosecurity and Emergency Management	2. Evaluate biosecurity risks in animal agriculture and understand how to mitigate risk	Individual Activities (Livestock evaluation/placing classes) Team Questions

Unit 6: Livestock Evaluation and Selection	1. Evaluate the external parts of an agricultural animal as they relate to selecting quality animals for market or breeding purposes. 1a. Describe the external parts of beef, dairy, horse, swine, goat, chicken, and lamb as they relate to selection and evaluation. 2. Investigate the selection of market animals. 2a. Critique the main points to consider when visually evaluating a market animal 2b. Evaluate classes of market animals and discuss placings for each class. 2c. Develop logical reasoning for the selection of market livestock. 2d. Explain how to improve livestock quality through selection. 3. Describe the process of selecting breeding animals. 3a. Define characteristics used in selecting various species of animals for breeding purposes. 3b. Explain the types of performance data used in selecting breeding animals. 3c. Evaluate various species of breeding animals and identify favorable characteristics for breeding in each animal. 4. Evaluate breeding livestock. 4a. Apply concepts in selecting high-quality animals for breeding. 4b. Evaluate breeding animals based upon high-quality breeding characteristics and performance data that is distinctive to each species of agricultural-breeding animals and present sound reasoning for placing animals in their respective positions within their class. 4c. Evaluate the classes of breeding animals and discuss the reasons for placing the animals in each class.	Individual Activities (Keep/Cull; Livestock evaluation/placing classes; Oral reasons) Team Questions

Meats Evaluation and Technology		
Unit	**Competency/Objective**	**CDE/LDE Alignment**
Unit 1: Leadership and SAE for All	1. Participate in local, state, and/or national FFA activities that provide opportunities for leadership development and career exploration. 1a. Actively participate in FFA activities.	Entire Event
Unit 3: Biosecurity and Emergency Management	2. Evaluate biosecurity risks in animal agriculture and understand how to mitigate risk. 2b. Investigate biosecurity practices for animal agriculture. 3. Discuss hazards and protocols within the animal industry.	Individual Activities (Written Exam) Team Activities (Food Safety/Sanitation)
Unit 6: Livestock Evaluation and Selection	1a. Describe the external parts of beef, dairy, horse, swine, goat, chicken, and lamb as they relate to selection and evaluation. 2b. Evaluate classes of market animals and discuss placings for each class. 2c. Develop logical reasoning for the selection of market livestock.	Individual Activities (Retail Meat Cuts Identification; Evaluation Classes; Keep/Cull Class; Question Classes)
Unit 7: Animal Production Management	4. Observe and describe management & marketing practices for various animal enterprises. 4b. Analyze marketing practices for meat animals.	Individual Activities (Value-Based Pricing) Team Activities (Meat Pricing)

Unit 9: Issues in Animal Agriculture	1c. Describe the role of quality assurance and safety in meat production today	Individual Activities (Written Exam) Team Activities (Food Safety/Sanitation)
Unit 10: Farm to Fork	1a. Discuss the principles of purchasing, receiving, and inspecting food. 2. Explain the role of food inspection.	Individual Activities (Written Exam) Team Activities (Retail Identification)

Poultry Evaluation		
Unit	**Competency/Objective**	**CDE/LDE Alignment**
Unit 1: Leadership and SAE for All	1. Participate in local, state, and/or national FFA activities that provide opportunities for leadership development and career exploration. 1a. Actively participate in FFA activities.	Entire Event
Unit 2: Introduction to Animal Agriculture	7a. Identify products produced from poultry. 7b. Discuss poultry enterprises & vertical integration. 7c. Identify breeds of poultry. 7d. Identify and explore careers in the poultry industry.	Written Exam (Production Segments of the Poultry Industry; Careers in the Poultry Industry) Individual Activity (Live Poultry)
Unit 3: Biosecurity and Emergency Management	2.Evaluate biosecurity risks in animal agriculture and understand how to mitigate risk. 2b. Investigate biosecurity practices for animal agriculture.	Written Exam (Poultry Waste Management)
Unit 4: Application of Feed and Feeding to Animal Growth and Production	3a. Determine the available/appropriate feedstuffs that meet the nutrient requirements of various types of livestock. 3b. Determine the nutritional requirements of a class of livestock based on production purposes	Written Exam (Poultry Nutrition) Individual Activity (Ready-to-Cook Poultry; Live Poultry)
Unit 5: Animal Reproduction	2e. Identify and describe the function of the reproductive organs and system in poultry. 2f. Indicate incubation and hatching conditions, including humidity and temperature required by various species.	Written Exam (Poultry Embryology; Anatomy and Physiology of the Fowl)
Unit 6: Livestock Evaluation and Selection	2. Investigate the selection of market animals. 2b. Evaluate classes of market animals and discuss placings for each class. 4. Evaluate breeding livestock. 4a. Apply concepts in selecting high-quality animals for breeding. 4b. Evaluate breeding animals based upon high-quality breeding characteristics and performance data that is distinctive to each species of agricultural-breeding animals and present sound reasoning for placing animals in their respective positions within their class. 4c. Evaluate the classes of breeding animals and discuss the reasons for placing the animals in each class.	Individual Activity (Live Poultry; Ready-to-Cook Poultry; Shell Eggs; Further Processed Poultry)
Unit 7: Animal Production Management	2. Examine basic concepts of animal health, including disease prevention, control, and treatment. 2a. Describe the signs of good health in animals. 3. Investigate how factors such as age, genetic background, stocking density, and natural immunity affect animal health and resistance to diseases.	Written Exam (Poultry Health Management)

Unit 8: Facility and Equipment Management in Animal Agriculture	1. Explore facility, equipment, and management needs for various animal enterprises. 2. Develop a production management plan, including facilities, equipment, production records, and maintaining and protecting animal health for a herd or flock.	Individual Activity (Live Poultry)
Unit 9: Issues in Animal Agriculture	1. Explore concepts of animal welfare and animal rights. 1a. Define the concepts of animal welfare and animal rights. 1b. Discuss the practice of animal welfare and the implications of animal rights in animal production. 2b. Describe the role of quality assurance and safety in meat production today. 4. Analyze public perceptions of animal production for human food consumption and complete a project on the findings.	Written Exam (Processing Poultry Products; Poultry Waste Management; Marketing Poultry Products) Team Activity
Unit 10: Farm to Fork	1. Investigate the movement of food from "farm to fork." 1a. Discuss the principles of purchasing, receiving, and inspecting food. 1b. Examine general storage guidelines and the types of storage. 2. Explain the role of food inspection. 3. Understand the supply chain as it relates to large scale animal-food production as compared to small farm operations.	Individual Activity (Ready-to-Cook Poultry; Further Processed Poultry) Written Exam (Processing Poultry Products; Marketing Poultry Products)

Veterinary Science		
Unit	**Competency/Objective**	**CDE/LDE Alignment**
Unit 1: Leadership and SAE for All	1. Participate in local, state, and/or national FFA activities that provide opportunities for leadership development and career exploration. 1a. Actively participate in FFA activities.	Entire Event
Unit 2: Introduction to Animal Agriculture	1. Analyze basic rules of safety in the animal-science laboratory. 1b. Explore Occupational Safety and Health Administration (OSHA) safety standards as they relate to the agricultural classroom, laboratory, and workplace 3. Demonstrate all safety equipment in the animal science laboratory 4. Discuss the dairy cattle industry. 5. Discuss the equine industry. 6. Discuss the swine industry. 7. Discuss the poultry industry. 8. Discuss the aquaculture industry. 9. Discuss the goat industry. 10. Discuss the sheep industry.	Individual Activities (General Knowledge; Identification)
Unit 3: Biosecurity and Emergency Management	1. Develop and maintain an emergency action plan (EAP) for working in animal agriculture. 2. Evaluate biosecurity risks in animal agriculture and understand how to mitigate risk. 3. Discuss hazards and protocols within the animal industry.	Individual Activities (General Knowledge) Team Activity
Unit 4: Application of Feed and Feeding to Animal Growth and Production	2. Examine the role of nutrition in animal growth and health at different stages of life. 2b. List six nutrients essential to life and how they are used to meet the nutritional requirements of animals.	Individual Activities (General Knowledge; Math Applications)
Unit 5: Animal Reproduction	2. Examine the reproduction process. 2a. Identify the parts of the male and female reproductive systems and discuss the function of each part.	Individual Activities (General Knowledge)

Unit 6: Livestock Evaluation and Selection	1. Evaluate the external parts of an agricultural animal as they relate to selecting quality animals for market or breeding purposes. 3. Describe the process of selecting breeding animals.	Individual Activities (General Knowledge; Identification)
Unit 7: Animal Production Management	1. Investigate workplace safety and the use of personal protective equipment (PPE). 2. Examine basic concepts of animal health, including disease prevention, control, and treatment. 2c. Discuss methods for delivering medicines to animals. 3. Investigate how factors such as age, genetic background, stocking density, and natural immunity affect animal health and resistance to diseases.	Individual Activities (General Knowledge; Practicums)
Unit 8: Facility and Equipment Management in Animal Agriculture	1. Explore facility, equipment, and management needs for various animal enterprises. 1a. Research and discuss general facility needs for different classes of animals. 2. Develop a production management plan, including facilities, equipment, production records, and maintaining and protecting animal health for a herd or flock. 3. Explore concepts of animal transportation as it relates to animal safety. 3a. Review trailer safety practices and describe the process of verifying if a trailer is suitable for hauling livestock.	Individual Activities (General Knowledge; Practicums)
Unit 9: Issues in Animal Agriculture	1. Explore concepts of animal welfare and animal rights. 5. Identify laws and policies within food safety and regulations.	Individual Activities (General Knowledge)