Texas CTE

Principles of Agriculture, Food, and Natural (2010): Grade 10

Adopted 2010

Principles of Agriculture, Food, and Natural Resources

(1) The student learns the employability characteristics of a successful employee. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the field of agriculture, food, and natural resources, including how to search for and obtain employment, what qualifications are required for varying career fields, and how to advance in a position;

(B) identify careers in agriculture, food, and natural resources with required aptitudes in science, mathematics, language arts, and social studies;

(C) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation in agriculture, food, and natural resources;

(D) demonstrate knowledge of personal and occupational safety, health, and first-aid policy in the workplace;

(E) develop response plans to emergency situations; and

(F) identify employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.

(2) The student develops a supervised agriculture experience program as it relates to agriculture, food, and natural resources. The student is expected to:

(A) plan, propose, conduct, and evaluate entrepreneurship; placement; exploratory; research, either experimental or analytical; improvement; supplementary; laboratory-based; or other identified, supervised agricultural experience as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to the supervised agricultural experience;

(C) design and use a customized record-keeping system for the individual supervised agricultural experience;

(D) participate in youth leadership opportunities to create a well-rounded-experience program in agriculture; and

(E) produce a challenging approach for a local program of activities in agriculture, food, and natural resources.

(3) The student identifies concepts related to cultural diversity. The student is expected to:

(A) discuss significant similarities and differences in international agriculture;

(B) explain the variety of world markets; and

(C) describe marketing factors and practices that impact other cultures.

(4) The student describes the historical, current, and future significance of the agricultural industry. The student is expected to:

(A) define agriculture;

(B) identify the scope of agriculture and its effect upon society;

(C) identify significant historical and current agriculture, food, and natural resource developments;

(D) identify potential future scenarios for agriculture, food, and natural resource systems;

(E) describe how emerging technologies and globalization impacts agriculture, food, and natural resources; and

(F) compare and contrast issues impacting agriculture, food, and natural resources such as biotechnology, employment, safety, environmental, and animal welfare.

(5) The student analyzes the structure of agricultural leadership in organizations. The student is expected to:

(A) develop premiere leadership skills and collaborate with others to accomplish organizational goals and objectives through the demonstration of characteristics such as empowerment, risk, communication, focusing on results, decision making, problem solving, investment in individuals, resource use and access, service, listening, coaching, developing others, team development, understanding and appreciating others, enthusiasm, creativity, conviction, mission, courage, focus, principles, change, integrity, values, ethics, humility, perseverance, self-discipline, responsibility, community, diversity, global awareness and knowledge, innovation, intuition, adaptation, lifelong learning, and coachability;

(B) develop personal growth skills and collaborate with others to accomplish organizational goals and objectives through the demonstration of characteristics such as attitude, exercise, goal setting, planning, self-discipline, sense of balance, persistence, respect, friendship, integrity, morals, values, etiquette, citizenship, cross-cultural awareness, acceptance of change, respect for differences, decision making, principles, dependability, loyalty, trustworthiness, communication, learning, critical thinking, reasoning, creative thinking, problem solving, self-discovery, coping, friendship, self-reliance, sense of balance, empathy, compassion, ethics, coping, courage, and self-image or worth;

(C) identify opportunities for leadership development and personal growth;

(D) demonstrate democratic principles in conducting effective meetings;

(E) describe team dynamics; and

(F) describe the development of organizational vision, mission, and goals through strategic planning processes.

(6) The student explains agriculture, food, and natural resource systems at the local, state, national, and international levels. The student is expected to:

(A) identify reasons for world trade;

(B) identify the political impact of agriculture, food, and natural resources;

(C) identify the interdependency of agriculture and the environment;

(D) explain ethical stewardship practices that reduce negative impacts of agriculture upon land, air, and water resources;

(E) review regulations and major laws to evaluate their impact on agriculture, food, and natural resources management;

(F) analyze appropriate written material to stay abreast of current issues impacting agriculture, food, and natural resources management;

(G) collect and analyze public opinion and data in order to make informed decisions; and

(H) use critical-thinking skills to identify, organize alternatives, and evaluate public policy issues related to agriculture, food, and natural resources.

(7) The student demonstrates appropriate personal and communication skills. The student is expected to:

(A) describe professional, ethical, and legal responsibilities;

(B) demonstrate the uses of proper etiquette and behavior;

(C) identify appropriate personal appearance and health habits;

(D) practice written and oral communication skills and employ effective listening skills in formal and informal situations;

(E) analyze written materials common to the agricultural industry;

(F) demonstrate sound writing and preparation skills for oral presentations, including prepared and extemporaneous presentations; and

(G) demonstrate effective speaking skills.

(8) The student applies appropriate research methods to agriculture, food, and natural resources topics. The student is expected to:

(A) define major research and development fields of agriculture, food, and natural resources;

(B) identify and apply research in the food and fiber products industries;

(C) use a variety of resources for both research and development; and

(D) describe scientific methods of research.

(9) The student applies problem-solving, mathematical, and organizational skills in order to plan and propose supervised agricultural experience programs as well as maintain financial and logistical records. The student is expected to:

(A) Develop project proposals by using business strategies which may include identifying learning objectives; describing project logistics, methodologies, and background; forecasting expenses and potential income through budgeting; and planning for major project timeline events through calendar implementation and documentation;

(B) develop and maintain records appropriate to project type following project approval;

(C) maintain appropriate financial records through use and management of appropriate journals, inventories, income and expense logs, financial statements, and balance sheets; and

(D) conduct formative and summative reflective and financial analyses on project learning objectives and records in order to plan for the future.

(10) The student uses information technology tools specific to agriculture, food, and natural resource to access, manage, integrate, and create information. The student is expected to:

(A) Identify personal management software, electronic mail applications, and Internet applications;

(B) use word-processing, spreadsheet, and presentation software;

(C) identify collaborative, groupware, and virtual meeting software;

(D) explain the benefits of Geographic Information Systems and Global Positioning Systems; and

(E) recognize other computer-based equipment in agriculture, food, and natural resources.

(11) The student develops technical knowledge and skills related to plant systems. The student is expected to:

(A) identify the components and properties of soils;

(B) describe the process of soil formation;

(C) classify soil formations;

(D) describe the structure and functions of plant parts;

(E) discuss plant germination, growth, and development;

(F) describe plant reproduction, genetics, and breeding;

(G) identify plants of importance to agriculture, food, and natural resources;

(H) identify technological needs for improved capacity in transportation, improved production, increased product quality and operation, and specialized skills specific to plant systems; and

(I) select, maintain, operate, and use tools, equipment, and personal protective equipment common to plant systems.

(12) The student develops technical knowledge and skills related to animal systems. The student is expected to:

(A) describe animal growth and development;

(B) identify animal anatomy and physiology;

(C) identify breeds and classes of livestock; and

(D) discuss animal selection, reproduction, breeding, and genetics.

(13) The student describes the principles of food products and processing systems. The student is expected to:

(A) identify the importance of food products and processing systems;

(B) determine trends in world food production;

(C) identify technological needs for improved capacity in transportation, improved production, increased product quality and operation, and specialized skills specific to food products and processing systems; and

(D) select, maintain, operate, and use tools, equipment, and personal protective equipment common to food products and processing systems.

(14) The student safely performs basic power, structural, and technical system skills in agricultural applications. The student is expected to:

(A) identify major areas of power, structural, and technical systems as well as their impact on world agricultural production;

(B) understand safe and appropriate laboratory procedures and policies;

(C) create proposals that include bill of materials, budget, schedule, drawings, and technical skills developed for basic power, structural, and technical system projects or structures;

(D) identify building materials and fasteners common to power, structural, and technical systems;

(E) use basic tools, skills, and common building materials to construct projects or structures;

(F) select, maintain, operate, and use tools, equipment, and personal protective equipment common to power, structural, and technical systems; and

(G) identify technological needs for improved capacity in transportation, improved production, increased product quality and operation, and specialized skills specific to power, structural, and technical systems.

(15) The student explains the relationship between agriculture and safety, health, and the environment. The student is expected to:

(A) determine the effects of agriculture, food, and natural resources upon safety, health, and the environment;

(B) identify regulations relating to safety, health, and environmental systems in agriculture, food, and natural resources;

(C) describe methods to maintain and improve safety, health, and environmental systems in agriculture, food, and natural resources;

(D) identify alternative energy sources that stem from or impact agriculture, food, and natural resources;

(E) evaluate energy and water conservation methods; and

(F) describe the importance of safety, health, and environmental regulations and procedures in the workplace.

Livestock Production

(1) The student learns the employability characteristics of a successful employee. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the field of animal systems;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation in animal systems;

(C) demonstrate knowledge of personal and occupational safety and health practices in the workplace; and

(D) identify employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.

(2) The student demonstrates technical skills relating to the interrelated human, scientific, and technological dimensions of animal systems. The student is expected to:

(A) assess the importance of the United States impact on world commodity markets;

(B) apply the principles of livestock breeding and nutrition in predicting the impact of current advances in genetics; and

(C) examine the interrelationship of plants and animals.

(3) The student performs technical skills related to livestock production. The student is expected to:

(A) gather performance data;

(B) describe common veterinary procedures and skills;

(C) practice proper animal restraint techniques;

(D) demonstrate identification techniques; and

(E) demonstrate effective management strategies.

(4) The student explains anatomy and physiology related to nutrition, reproduction, health, and management of domesticated animals. The student is expected to:

(A) explain the skeletal, muscular, respiratory, reproductive, and circulatory systems of animals; and

(B) evaluate vital signs and normal behavior.

(5) The student determines nutritional requirements of ruminant and non-ruminant animals, including poultry. The student is expected to:

(A) describe the digestive system;

(B) identify sources of nutrients and classes of feed;

(C) identify vitamins, minerals, and feed additives;

(D) formulate rations; and

(E) discuss feeding practices and feed quality issues.

(6) The student explains animal genetics and reproduction. The student is expected to:

(A) describe the reproductive system;

(B) explain the use of genetics in animal agriculture;

(C) identify systems of animal breeding; and

(D) research current and emerging technologies in animal reproduction.

(7) The student identifies animal pests and diseases. The student is expected to:

(A) describe the role of bacteria, fungi, viruses, genetics, and nutrition in disease; and

(B) identify methods of disease control, treatment, and prevention.

(8) The student knows the factors impacting commodity prices and costs. The student is expected to:

(A) evaluate the relationship between commodity markets;

(B) formulate rations based on least-cost factors; and

(C) design and conduct experiments to support known principles of genetics and feed efficiency.

(9) The student plans for dynamic changes in business operation. The student is expected to:

(A) design, conduct, and complete research to solve self-identified problems; and

(B) use charts, tables, or graphs to prepare written summaries of data obtained in a laboratory activity and an individual scientific research project.

(10) The student develops an improved supervised agriculture experience program as it relates to agriculture, food, and natural resources. The student is expected to:

(A) plan, propose, conduct, and evaluate entrepreneurship; placement; exploratory; research, either experimental or analytical; improvement; supplementary; laboratory-based; or other identified, supervised agricultural experience as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to a supervised experience;

(C) design and use a customized record-keeping system for the individual supervised experience;

(D) participate in youth leadership opportunities to create a well-rounded experience program in agriculture; and

(E) produce a challenging approach for a local program of activities in agriculture.

Small Animal Management

(1) The student describes the importance of responsible small animal ownership. The student is expected to:

- (A) explain the domestication and use of small animals;
- (B) identify the influence small animals have on society;
- (C) describe the importance of the small animal industry;
- (D) describe the obligations and benefits of small animal ownership; and
- (E) discuss the use and services provided by small animals.

(2) The student learns the hazards associated with working in the small animal industry. The student is expected to:

- (A) explain the importance of safe practices when working with small animals;
- (B) identify diseases that can be transmitted from small animals to humans;
- (C) describe methods of preventing the spread of disease;
- (D) follow guidelines for safety when handling dangerous chemicals and when working with small animals; and
- (E) demonstrate the proper use of laboratory equipment.

(3) The student evaluates current topics in animal rights and animal welfare. The student is expected to:

- (A) compare and contrast animal rights and animal welfare;
- (B) research important persons, organizations, and groups involved in the animal rights movement;
- (C) create a timeline of dates and acts of legislation related to animal welfare; and
- (D) analyze current issues in animal rights and animal welfare.

(4) The student knows the care and management requirements for a variety of small animals. The student is expected to:

- (A) discuss the physical characteristics for each species studied;
- (B) list the breeds or types of each species studied as appropriate;
- (C) discuss the habitat, housing, and equipment needs for each species studied;
- (D) compare and contrast nutritional requirements for each species studied;
- (E) explain health maintenance in each species studied, including the prevention and control of diseases and parasites;
- (F) describe and practice common methods of handling each species studied; and
- (G) use available laboratory equipment to perform procedures such as fecal test, blood testing, and basic grooming procedures.

(5) The student examines career opportunities in small animal care. The student is expected to:

(A) identify, describe, and compare career opportunities in small animal care and management; and

(B) describe the nature of the work, salaries, and educational requirements for careers in small animal care.

(6) The student learns the employability characteristics of a successful employee. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the field of specialty agricultural enterprises;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation in specialty agricultural enterprises;

(C) demonstrate knowledge of personal and mechanical safety and health practices in the workplace; and

(D) identify employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.

(7) The student develops a supervised agriculture experience program as it relates to agriculture, food, and natural resources. The student is expected to:

(A) plan, propose, conduct, and evaluate entrepreneurship; placement; exploratory; research, either experimental or analytical; improvement; supplementary; laboratory-based; or other identified, supervised agricultural experience as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to a supervised experience;

(C) design and use a customized record-keeping system for the individual supervised experience;

(D) participate in youth leadership opportunities to create a well-rounded experience program in agriculture; and

(E) produce a challenging approach for a local program of activities in agriculture.

Equine Science

(1) The student analyzes equine science as it relates to the selection of horses. The student is expected to:

(A) recognize the importance of the equine industry; and

(B) evaluate and select horses.

(2) The student knows how to provide proper nutrition using accepted protocols and processes to maintain animal performance. The student is expected to:

(A) determine nutritional requirements of horses;

(B) describe the anatomy and physiology of horses; and

(C) explain methods of maintaining horse health and soundness.

(3) The student analyzes equine science as it relates to the management of horses. The student is expected to:

(A) select equipment and facilities for horses;

(B) demonstrate methods of handling horses safely; and

(C) identify the procedures for breeding horses.

(4) The student compares and contrasts issues affecting the equine industry. The student is expected to:

(A) describe issues concerning biotechnology related to the equine industry; and

(B) identify animal welfare policy pertaining to the equine industry.

(5) The student learns the employability characteristics of a successful employee. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the field of equine science;

(B) demonstrate competencies related to resources, information, interpersonal skills, and systems of operation in equine science;

(C) demonstrate knowledge of personal and occupational health and safety practices in the workplace;

(D) identify employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and

(E) access and navigate the Internet for research.

(6) The student develops an improved supervised agricultural experience program as it relates to agriculture, food, and natural resources. The student is expected to:

(A) plan, propose, conduct, and evaluate entrepreneurship; placement; exploratory; research, either experimental or analytical; improvement; supplementary; laboratory-based; or other identified, supervised agricultural experience as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to a supervised experience;

(C) design and use a customized record-keeping system for the individual supervised experience;

(D) participate in youth leadership opportunities to create a well-rounded experience program in agriculture; and

(E) produce a challenging approach for a local program of activities in agriculture.

Professional Standards in Agribusiness

(1) The student learns the employability characteristics of a successful contributor to the modern agricultural workplace. The student is expected to:

(A) identify career and entrepreneurship opportunities related to agribusiness;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation in agriculture, food, and natural resource industries;

(C) demonstrate employers' expectations, appropriate work habits, and good citizenship skills; and

(D) employ leadership skills to accomplish organizational goals and objectives.

(2) The student demonstrates professional development related to effective leadership in agribusiness. The student is expected to:

(A) describe the importance of positive self-concept, social skills, and maintaining a professional image with respect to cultural diversity;

(B) identify leadership styles;

(C) prepare personal resumés and employment applications; and

(D) use positive interpersonal skills to work cooperatively with others from different cultures, genders, and backgrounds.

(3) The student evaluates employer and employee responsibilities for occupations in agriculture, food, and natural resources. The student is expected to:

(A) identify and discuss work-related and agribusiness-related ethics;

(B) demonstrate methods for working effectively with others;

(C) practice job interview and evaluation skills; and

(D) outline complaint and appeal processes.

(4) The student communicates effectively with groups and individuals. The student is expected to:

(A) understand the elements of communication both in informal group discussions and formal presentations such as accuracy, relevance, rhetorical features, and organization of information by:<ol type="i">
describing how style and content of spoken language varies in different contexts and influences the listener's understanding; and
modifying presentations such as delivery, vocabulary, length, audience needs, and purposes;

(B) identify appropriate written and verbal communications in agribusiness;

(C) demonstrate effective listening in a variety of settings;

(D) demonstrate nonverbal communications skills and effective listening strategies; and

(E) discuss the importance of relationships and group organization.

(5) The student identifies professional agricultural communications in relation to using appropriate spoken communication techniques and procedures. The student is expected to:

(A) identify the importance of verbal and nonverbal communications;

(B) know the importance of communicating factual and unbiased data and information obtained from reliable sources;

(C) demonstrate speech preparation and delivery skills; and

(D) plan and deliver focused and coherent presentations that convey clear and distinct perspectives and demonstrate solid reasoning.

(6) The student demonstrates the factors of group and individual efficiency. The student is expected to:

(A) define the significance of personal and group goals;

(B) exhibit traits such as empowerment, risk, communication, focusing on results, decision making, problem solving, and investment in individuals when leading a group in solving a problem;

(C) discuss the importance of time management and teamwork;

(D) list the steps in the decision-making and problem-solving processes; and

(E) demonstrate a working knowledge of parliamentary law.

(7) The student identifies involvement opportunities in agribusiness professional organizations. The student is expected to:

(A) discuss the role of agricultural organizations in formulating public policy;

(B) develop strategies for effective participation in agricultural organizations; and

(C) identify various agricultural organizations such as Texas Farm Bureau, The Association of Soil and Water Conservation Districts, Texas and Southwestern Cattle Raisers Association, Independent Cattlemen's Association, agricultural cooperatives, commodity associations, and breed associations.

(8) The student identifies and researches current agribusiness issues. The student is expected to:

(A) compare and contrast the marketing of agricultural and non-agricultural products; and

(B) describe the effects of urbanization on traditional agriculture.

(9) The student develops an improved supervised agriculture experience program as it relates to agriculture, food, and natural resources. The student is expected to:

(A) plan, propose, conduct, and evaluate entrepreneurship; placement; exploratory; research, either experimental or analytical; improvement; supplementary; laboratory-based; or other identified, supervised agricultural experience as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to a supervised experience;

(C) design and use a customized record-keeping system for the individual supervised experience;

(D) employ youth leadership opportunities to create a well-rounded experience program in agriculture; and

(E) produce a challenging approach for a local program of activities in agriculture.

Agribusiness Management and Marketing

(1) The student learns the employability characteristics of a successful employee in the field of agriculture, food, and natural resources. The student is expected to:

(A) identify career development and entrepreneurship opportunities in agribusiness systems;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation in agribusiness systems;

(C) demonstrate knowledge of personal and occupational health and safety practices in the workplace; and

(D) identify employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.

(2) The student recognizes roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. The student is expected to:

(A) identify how key organizational systems affect organizational performance and the quality of products and services related to agriculture, food, and natural resources;

(B) understand the global context of agricultural industries and careers; and

(C) describe the nature and types of agribusiness organizations to build an understanding of the scope of organizations.

(3) The student examines critical aspects of career opportunities in one or more agriculture, food, and natural resources careers. The student is expected to:

(A) research and interpret information for one or more careers in agriculture, food, or natural resources; and

(B) identify educational and credentialing requirements for one or more careers in agriculture, food, and natural resources.

(4) The student defines and examines agribusiness management and marketing and its importance to the local and international economy. The student is expected to:

(A) describe the roles and functions of management in agribusiness;

(B) identify key economic principles of free enterprise; and

(C) analyze the economic opportunities of agribusiness.

(5) The student defines the importance of records and budgeting in agribusiness. The student is expected to:

(A) maintain appropriate agribusiness records such as payroll, employee benefits, journals, inventories, income and expense logs, financial statements, and balance sheets;

(B) identify methods of obtaining agribusiness loans and financing; and

(C) compare methods of capital resource acquisition as it pertains to agriculture.

(6) The student describes issues related to government policy and recognizes concepts related to cultural diversity. The student is expected to:

(A) analyze methods of decision making;

(B) examine the effects of government policies and regulations in making management decisions;

(C) describe the management of human resources with respect to cultural diversity;

(D) identify laws pertaining to land and property ownership and uses, taxes, wills, and liabilities; and

(E) develop a personal economic philosophy.

(7) The student defines key issues of agribusiness success and failure. The student is expected to:

(A) use the decision-making process for budgeting issues;

(B) analyze business records and record-keeping procedures;

(C) determine methods of financing agribusiness; and

(D) identify methods of obtaining capital resources.

(8) The student describes the marketing of agricultural products. The student is expected to:

(A) describe the purpose and importance of marketing;

(B) develop a marketing plan;

(C) identify the competitive environment and the impact of foreign markets;

(D) compare types of markets and influence factors; and

(E) identify methods of managing risk.

(9) The student knows the efficiency aspects of agribusiness management. The student is expected to:

(A) use management software and information technology such as spreadsheets and databases;

(B) develop an entrepreneurial plan based on personal economic philosophy;

(C) develop a financial management plan; and

(D) present a business proposal.

(10) The student develops an improved supervised agriculture experience program as it relates to agriculture, food, and natural resources. The student is expected to:

(A) plan, propose, conduct, and evaluate entrepreneurship; placement; exploratory; research, either experimental or analytical; improvement; supplementary; laboratory-based; or other identified, supervised agricultural experience as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to a supervised experience;

(C) design and use a customized record-keeping system for the individual supervised experience;

(D) participate in youth leadership opportunities to create a well-rounded experience program in agriculture; and

(E) produce a challenging approach for a local program of activities in agriculture.

Mathematical Applications in Agriculture, Food, and Natural Resources

(1) The student demonstrates mathematics knowledge and skills required to solve problems related to the agriculture, food, and natural resources industries. The student is expected to:

(A) demonstrate use of relational expressions in agribusiness, animal, environmental service, food products and processing, natural resources, plant, and power, structural, and technical systems such as equal to, not equal, greater than, and less than;

(B) apply statistical and data analysis to solve problems in agribusiness, animal, environmental service, food products and processing, natural resources, plant, or power, structural, and technical systems;

(C) analyze mathematical problem statements for missing or irrelevant data essential to agribusiness, animal, environmental service, food products and processing, natural resources, plant, and power, structural, and technical systems;

(D) construct and analyze charts, tables, and graphs from functions and data generated in agribusiness, animal, environmental service, food products and processing, natural resources, plant, and power, structural, and technical systems;

(E) analyze data using measures of central tendency when interpreting operational documents in agribusiness, animal, environmental service, food products and processing, natural resources, plant, and power, structural, and technical systems; and

(F) use mathematic operations and knowledge of relationships to solve problems inherent to systems of agriculture and agribusiness such as the calculation of gallons of water from inches of rain, acres of ground water, liquid and gaseous volumes, and conversion of units; calculation of caloric value, parts per million of restricted ingredients, conversion of measurements, and United States Department of Agriculture (USDA) grades; and estimation of wildlife populations, pulpwood yields, and calculation of mapping data.

(2) The student demonstrates mathematics knowledge and skills to solve problems related to agribusiness systems and career opportunities. The student is expected to:

(A) use mathematic operations and knowledge of relationships to solve daily problems inherent to agribusiness systems such as record keeping, profit/loss statements, income statements, capital asset inventories, insurance, risk management, lease agreements, loan documentation, employee payroll, benefits, investments, tax documentation, and real estate contract documentation;

(B) demonstrate knowledge of algebraic applications linear and exponential functions related to agribusiness systems concepts such as simple interest, compound interest, maturity value, tax rates, depreciation, production analysis, market trends, investments, and price determination; and

(C) demonstrate use of statistical and data analysis for the evaluation of agribusiness systems such as the collection of demographic, production, consumption, weather, market data for analysis through counts, percentages, central tendency, and prediction. Data is to be reported numerically or graphically on concepts such as pricing, market trends, commodity prices, exports and imports, supply and demand, and production yields.

(3) The student demonstrates mathematics knowledge and skills to solve problems related to animal systems and career opportunities. The student is expected to:

(A) use mathematic operations and knowledge of relationships to solve problems inherent to animal systems such as the calculation of purchasing and marketing, housing requirements, conversion of units, average daily gain, topical and injectable medications, USDA grade calculation, feeding schedules, volumes, production cost, stocking rates, breeding, and gestation;

(B) demonstrate knowledge of algebraic applications related to animal systems concepts such as ration calculation using the Pearson Square, percent homozygosity, heritability, USDA grade calculation, gene frequency, cost per unit of nutrient, and weaning weight ratio;

(C) use geometric principles to solve problems inherent to animal systems such as square footage for housing requirements; acreage calculation for normal and irregular shaped pastures; the use of right triangles for perpendicular cross fencing; calculation of feed bin volume based upon shape such as cylinder, cone, cube, or pyramid; and housing volume calculations for ventilation; and

(D) demonstrate use of statistical and data analysis in animal systems such as the collection and analysis of production data to be reported numerically or graphically on concepts such as birth weight, weaning weights, days to market weight, expected progeny differences, feed efficiencies, birth type, litter size, presence or absence of genetic abnormality, milk production, sow productivity index, and veterinary costs or records.

(4) The student demonstrates mathematical knowledge and skills to solve problems related to environmental service systems and career opportunities. The student is expected to:

(A) demonstrate knowledge of algebraic applications to create solutions to problems related to environmental service systems concepts such as the calculation of acre feet of water, water volume in ponds, water well volume, water pressure friction loss, flow rate, total head pressure, pump efficiency, soil solids volume, and soil degree of saturation;

(B) use geometric principles to solve problems inherent to environmental service systems such as acreage calculation for normal and irregular shaped pastures, calculating slope of land, planning runoff drainage structures, and applying differential leveling techniques; and

(C) demonstrate use of statistical and data analysis in environmental service systems such as the collection and analysis of environmental data to be reported numerically or graphically on concepts such as rainfall, soil classifications, groundwater levels, recycling activities, and pollution rates.

(5) The student demonstrates mathematics knowledge and skills required to solve problems related to food products and processing systems and career opportunities. The student is expected to:

(A) demonstrate knowledge of algebraic applications related to food products and processing systems concepts such as the calculation of exponential growth of bacteria, contribution margin in processing, percentage of weight loss in packaged food, percentage of water absorption in packaged food, and microbe analysis following pasteurization;

(B) use geometric principles to solve problems inherent to food products and processing systems such as the calculation of packaging requirements, construction of food storage structures and containers, liquid transfer materials, and vessels design and volume; and

(C) demonstrate use of statistical and data analysis in food products and processing systems data to be reported numerically or graphically on concepts such as governmental regulations, hazard analysis, critical control points data, taste tests, quality assurance data, and industry packing practices.

(6) The student demonstrates mathematics knowledge and skills to solve problems related to natural resources systems and career opportunities. The student is expected to:

(A) demonstrate knowledge of algebraic applications related to natural resource systems concepts such as the calculation of mean harvest area, calibration of pesticides, and the Doyle Log Rule;

(B) use geometric principles to solve problems inherent to natural resource systems such as planning and construction of structures related to wildlife and fisheries management, determination of lumber volume in given tree stock, and calculation of tank volume for chemical application; and

(C) demonstrate use of statistical and data analysis for the evaluation of natural resource systems data to be reported numerically or graphically for resource data analysis, analysis of Geographic Information Systems and Global Positioning Systems data, analysis of weather-related data, and analysis of data related to wildlife and habitat.

(7) The student demonstrates mathematics knowledge and skills to solve problems related to plant systems and career opportunities. The student is expected to:

(A) use mathematic operations and knowledge of relationships to solve problems inherent to plant systems such as the calculation of crop yields, crop loss, grain drying requirements, grain weight shrinkage, germination rates, greenhouse heating, and cooling and fertilizer application rates;

(B) demonstrate knowledge of algebraic applications related to plant systems concepts such as the calculation of grain handling efficiency, harvesting capacity, crop rotation, seeding rates, fertilizer nutrient requirements, and greenhouse ventilation;

(C) use geometric principles for the analysis of problems inherent to plant systems such as plan grain storage structures, volume of grain storage vessels, grain handling volume, greenhouse capacity, and regular and irregular shaped planting bed size; and

(D) demonstrate use of statistical and data analysis in plant systems such as crop yields, Global Information Systems data, plant growth data, and climate data.

(8) **The student demonstrates mathematics knowledge and skills to solve problems related to power, structural, and technical systems education and career opportunities. The student is expected to:**

(A) use mathematic operations and knowledge of relationships to solve problems inherent to power, structural, and technical systems such as the calculation of gear ratio, fuel efficiency, construction costs, project layout, energy costs, unit conversions, bid preparation, and labor-related calculations;

(B) demonstrate knowledge of algebraic applications related to power, structural, and technical systems concepts such as the calculation of strength of magnetism, chain or belt tension, horsepower, Ohm's Law, hydraulic multiplication of force, and Mohr's Circle tensile strength test;

(C) use geometric principles for the evaluation of problems inherent to power, structural, and technical systems such as rafter length, land measurement, differential leveling, concrete volume, heating, ventilating, and air conditioning requirements and creation of structural drawings;

(D) use statistical and data analysis to evaluate power, structural, and technical systems problems such as construction cost data; equipment maintenance; heating, ventilating, and air conditioning efficiencies; engine performance; and labor costs; and

(E) use geometry concepts to develop and implement a plan for construction of a project such as a trailer, an agricultural structure, a storage facility, or a fence.

(9) **The student develops an improved supervised agriculture experience program as it relates to agriculture, food, and natural resources. The student is expected to:**

(A) plan, propose, conduct, and evaluate entrepreneurship; placement; exploratory; research, either experimental or analytical; improvement; supplementary; laboratory-based; or other identified, supervised agricultural experience as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to a supervised experience;

(C) design and use a customized record-keeping system for the individual supervised experience;

(D) participate in youth leadership opportunities to create a well-rounded experience program in agriculture; and

(E) produce a challenging approach for a local program of activities in agriculture.

Energy and Natural Resources Technology

(1) The student develops an improved supervised agriculture experience program as it relates to agriculture, food, and natural resources. The student is expected to:

(A) plan, propose, conduct, and evaluate entrepreneurship; placement; exploratory; research, either experimental or analytical; improvement; supplementary; laboratory-based; or other identified, supervised agricultural experience as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to a supervised experience;

(C) design and use a customized record-keeping system for the individual supervised experience;

(D) participate in youth leadership opportunities to create a well-rounded experience program in agriculture; and

(E) produce a challenging approach for a local program of activities in agriculture.

(2) The student uses instructional time to conduct field and laboratory investigations using safe, environmentally appropriate, and ethical practices in a documented supervised experience. The student is expected to:

(A) demonstrate safe practices during field and laboratory investigations in a documented supervised experience; and

(B) use accepted procedures for the use and conservation of resources and for the safe handling of materials.

(3) The student learns the employability characteristics of a successful employee. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the fields of energy and natural resources;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation in energy and natural resources;

(C) demonstrate knowledge of personal and occupational health and safety practices in the workplace;

(D) identify employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and

(E) demonstrate leadership skills to accomplish organizational goals and objectives.

(4) The student determines the importance and scope of energy and natural resources. The student is expected to:

(A) identify various types of natural resources;

(B) discuss renewable, non-renewable, and sustainable energy resources and their availability;

(C) define the impacts of energy production on natural resources and the effect on the agricultural economy; and

(D) analyze the geographic and demographic distribution of natural resources.

(5) The student analyzes ethical issues related to natural resource management and energy production. The student is expected to:

(A) compile examples of different lease agreements used for leasing minerals and natural resources;

(B) understand landowner and leasing company relationships;

(C) review public interest in natural resource management; and

(D) understand the impacts of natural resource management on the landowner.

(6) The student understands energy and natural resource policies at the local, state, and national level. The student is expected to:

(A) identify policy affecting the use of natural resources;

(B) identify policy affecting energy production;

(C) research ecological controls of natural resources;

(D) identify state and federal agencies that have natural resource management responsibilities; and

(E) define the roles of government, society, and property owners in the development of energy and natural resource policy.

(7) The student recognizes the purpose of land use planning. The student is expected to:

(A) identify the major categories of land use;

(B) evaluate considerations for land use planning, including ecological benefits;

(C) discuss advantages and disadvantages of land use planning;

(D) compare and contrast land use policy trends within the state; and

(E) discuss the advantages and disadvantages of land use planning for energy production.

(8) The student identifies water and wastewater use and management. The student is expected to:

- (A) identify municipal, industrial, and agricultural uses of water, including recycling opportunities;
- (B) discuss how different types of water uses pollute water resources;
- (C) define point source and non-point source pollution;
- (D) identify sources of point source and non-point source pollution associated with municipal, industrial, and agricultural uses;
- (E) describe effective management practices commonly used to abate point and non-point sources of pollution;
- (F) discuss how the different types of water uses impact water availability;
- (G) research water use legislation;
- (H) review water quality policy, including the agricultural storm water exclusion, and how it affects the decisions made in agricultural production; and
- (I) discuss the potential impacts of energy production on water resources.

(9) The student describes air quality associated with energy production. The student is expected to:

- (A) define air pollution;
- (B) research air quality legislation;
- (C) identify sources and effects of air pollution from energy production;
- (D) discuss different emission management strategies; and
- (E) identify air pollution controls used in energy production.

(10) The student examines soil erosion as related to energy production. The student is expected to:

- (A) identify sources of energy production that can contribute to soil erosion;
- (B) illustrate harmful effects of soil erosion;
- (C) discuss legal aspects of soil erosion; and
- (D) list soil erosion control methods and programs.

(11) The student analyzes the identification, handling, storing, and disposing of waste and hazardous materials. The student is expected to:

- (A) identify types of waste and hazardous materials;
- (B) research legislation related to waste and hazardous materials;
- (C) identify entities responsible for waste and hazardous material management; and
- (D) describe safe handling, storing, and disposal of waste materials, including composting and recycling.

(12) The student learns the processes for producing energy from agricultural crops, biomass, fossil fuel, wind, solar, and geothermal sources. The student is expected to:

- (A) identify agricultural and silvicultural crops and bi-products suitable for renewable energy production;
- (B) discuss production processes for agricultural- and silvicultural-based biofuels;
- (C) describe the fundamentals for oil, gas, and coal recovery;
- (D) compare and contrast oil and gas drilling methods and the environmental considerations associated with each, including environmentally friendly alternatives;
- (E) compare and contrast coal mining methods and the environmental considerations associated with each;
- (F) analyze advantages and disadvantages of wind-generated energy;
- (G) identify public policy considerations associated with transmission line construction to move wind-generated energy;
- (H) locate areas in the state that have geothermal energy production potential;
- (I) explain the benefits of geothermal energy;
- (J) identify solar energy systems and describe the function of each; and
- (K) identify the environmental considerations associated with biofuels and wind energy.

Food Technology and Safety

(1) The student explains the impact of food science systems. The student is expected to:

- (A) know the significance of food science systems;
- (B) define trends in food production, world population, and supply and demand for food products;
- (C) research trends in animal and food science research; and
- (D) evaluate the relationship between biotechnology and the food science industry.

(2) The student analyzes the nutritive value of food constituents. The student is expected to:

- (A) define the terms used in food technology;
- (B) compare and contrast the nutritive value of food groups; and
- (C) apply data and measurements to solve a problem related to food processing.

(3) The student identifies procedures and regulations for sanitation and safety in the food industry. The student is expected to:

- (A) identify food industry inspection standards, including hazard analysis and critical control points;
- (B) describe procedures for insect and rodent control;
- (C) identify appropriate chemicals used in the food industry; and
- (D) assess conditions with regard to safety and health.

(4) The student identifies safety and governmental regulations involved in the processing and labeling of foods. The student is expected to:

- (A) research regulations dealing with preserving red meat, poultry, and fish;
- (B) describe packaging, labeling, and storage requirements for red meat, poultry, and fish;
- (C) explain the impact of temperature in food preservation; and
- (D) compare and contrast packaging requirements.

(5) The student compares and contrasts issues affecting the food science industry, including biotechnology, employment, safety, environmental, and animal welfare, to demonstrate an understanding of the trends and issues important to careers in the food science industry. The student is expected to:

- (A) select solutions for different environmental issues;
- (B) identify issues affecting food science;
- (C) research history and policies related to the issue;
- (D) analyze and defend solutions for different environmental issues; and
- (E) learn economic principles in order to apply them to food science systems such as supply, demand, and profit.

(6) The student describes the processing, packaging, quality analysis, and marketing of red meats and their by-products. The student is expected to:

- (A) describe preparing livestock carcasses for market;
- (B) describe United States Department of Agriculture inspection and grading procedures;
- (C) identify wholesale and retail cuts;
- (D) evaluate and grade beef, pork, and lamb carcasses and wholesale cuts; and
- (E) identify methods of fabricating and marketing processed meats.

(7) The student describes the processing, packaging, quality analysis, and marketing of eggs, poultry, and fish and their by-products. The student is expected to:

(A) describe processing techniques;

(B) demonstrate poultry and retail cuts evaluation;

(C) identify grades and classes of eggs, poultry, fish, and seafood;

(D) fabricate specialty and value-added products;

(E) know quality and portion control procedures; and

(F) describe marketing procedures for eggs, poultry, fish, and seafood.

(8) The student describes the processing, packaging, quality analysis, and marketing of fruits, nuts, and vegetables and their by-products. The student is expected to:

(A) identify, classify, and grade fruits, nuts, and vegetables;

(B) demonstrate trimming, washing, waxing, peeling, blanching, and other marketing techniques;

(C) research critical issues in transporting, receiving, and storing fruits, nuts, and vegetables; and

(D) discuss preserving, packaging, and storing fruits, nuts, and vegetables.

(9) The student describes the processing, packaging, quality analysis, and marketing of milk and dairy products for distribution. The student is expected to:

(A) describe methods of preparing milk for processing;

(B) evaluate methods of processing milk and dairy products;

(C) identify cultured milk products and frozen dairy desserts;

(D) process, classify, and grade cheese; and

(E) identify dairy products.

(10) The student learns the employability characteristics of a successful employee. The student is expected to:

(A) locate and identify career opportunities that appeal to personal career goals;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation of value-added and food processing;

(C) demonstrate knowledge of personal and occupational health and safety practices in the workplace;

(D) identify employers' expectations, appropriate work habits, and good citizenship skills; and

(E) access and navigate the Internet for research.

(11) The student develops an improved supervised agriculture experience program as it relates to agriculture, food, and natural resources. The student is expected to:

(A) plan, propose, conduct, and evaluate entrepreneurship; placement; exploratory; research, either experimental or analytical; improvement; supplementary; laboratory-based; or other identified, supervised agricultural experience as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to a supervised experience;

(C) design and use a customized record-keeping system for the individual supervised experience;

(D) participate in youth leadership opportunities to create a well-rounded experience program in agriculture; and

(E) produce a challenging approach for a local program of activities in agriculture.

Food Processing

(1) The student knows the relationship of the food processing industry to the free enterprise system. The student is expected to:

(A) explain the importance of the food processing industry in the free enterprise system; and

(B) explain trends in the consumption of food products.

(2) The student understands consumer satisfaction issues. The student is expected to:

(A) practice equipment maintenance and sanitation procedures;

(B) explain the factors that affect food palatability;

(C) fabricate red meat, poultry, game, and fish into wholesale and retail cuts; and

(D) demonstrate work ethics, customer relations skills, and management competencies consistent with industry standards.

(3) The student understands quality control issues in food processing. The student is expected to:

(A) practice procedures relating to the safe manufacture of foods through hygienic food handling and processing;

(B) develop and maintain sanitation schedules;

(C) describe hazard analysis and critical control point implementation issues;

(D) research food safety laws; and

(E) describe solutions for different environmental issues.

(4) The student identifies marketing considerations for food processing. The student is expected to:

(A) practice methods of merchandising red meat, poultry, game, fish, and their by-products;

(B) identify, select, and grade meat;

(C) develop food preservation programs using appropriate food preservation methods by:<ol type="i">
explaining the impact of temperature in food preservation; and
comparing and contrasting packaging preservation such as film, plastic, and can; and

(D) describe harvest and inspection techniques to process food products and analyze food product options.

(5) The student learns the employability characteristics of a successful employee. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the value-added and food processing industry;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation in the value-added and food processing industry;

(C) demonstrate knowledge of personal and occupational safety practices in the workplace;

(D) identify employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and

(E) access and navigate the Internet for research.

(6) The student develops an improved supervised agriculture experience program as it relates to agriculture, food, and natural resources. The student is expected to:

(A) plan, propose, conduct, and evaluate entrepreneurship; placement; exploratory; research, either experimental or analytical; improvement; supplementary; laboratory-based; or other identified, supervised agricultural experience as an experiential learning activity;

(B) apply proper record-keeping skills related to a supervised experience;

(C) design and use a customized record-keeping system for the individual supervised experience;

(D) participate in youth leadership opportunities to create a well-rounded experience program in agriculture; and

(E) produce a challenging approach for a local program of activities in agriculture.

Wildlife, Fisheries, and Ecology Management

(1) The student learns the employability characteristics of a successful employee. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the field of natural resources;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation in natural resources;

(C) demonstrate knowledge of personal and occupational health and safety practices in the workplace; and

(D) identify employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.

(2) The student analyzes the importance of wildlife, with an emphasis on use and management. The student is expected to:

(A) analyze the importance of wildlife, fisheries, and ecology management;

(B) discuss the history of wildlife, fisheries, and ecology management;

(C) discuss policies, laws, and the administration of wildlife, fisheries, and ecology management; and

(D) describe how public recreation use is a product.

(3) The student knows the scientific basis for wildlife management. The student is expected to:

(A) identify the basic ecological concepts of game management;

(B) identify game, non-game, and fish species;

(C) describe the management of wildlife populations;

(D) identify observable diseases impacting plants and animals; and

(E) describe how to report observance of disease infestations.

(4) The student knows the interrelationships between the various aspects of wildlife and outdoor public use management. The student is expected to:

(A) identify special areas of importance in wildlife and public use management;

(B) identify laws and regulations regarding the use of wildlife resources;

(C) discuss laws and regulations regarding recreation safety;

(D) list factors involved in landowner and property rights;

(E) demonstrate specific safety certification requirements;

(F) demonstrate precautions to use when interfacing with the public concerning regulations and law enforcement;

(G) describe security issues for closed and restricted areas;

(H) describe solutions to issues concerning public protection;

(I) recognize potential threat situations for the public and other users;

(J) identify the appropriate law enforcement authority;

(K) describe wildlife harvest techniques and procedures; and

(L) describe fish harvest techniques and procedures.

(5) The student examines natural cycles and related phenomena to describe ecologic concepts and principles. The student is expected to:

(A) explain the hydrologic, nitrogen, carbon, and nutrient cycles;

(B) describe succession;

(C) describe population dynamics;

(D) distinguish between primary and secondary producers;

(E) describe predator-prey relationships;

(F) identify potential pollution sources;

(G) define watershed boundaries;

(H) use the stream classification system; and

(I) describe the influence of weather and climatic factors.

(6) The student applies cartographic skills to natural resource activities. The student is expected to:

(A) describe different types of maps;

(B) interpret map features and legends;

(C) determine map scale and actual distance;

(D) determine direction from map;

(E) determine elevation and terrain features from topographic maps;

(F) use directional tools with maps to locate position;

(G) use land survey and coordinate system; and

(H) use a Geographic Information System to interface geospatial data and interpret photos and images.

(7) The student obtains planning data by monitoring natural resource status. The student is expected to:

(A) describe resource inventory and population studies;

(B) devise sample plots and points;

(C) identify and locate resources;

(D) interpret data concerning resource availability and health;

(E) organize databases of resource data;

(F) use a Geographic Information System to analyze resource data;

(G) create a technical report; and

(H) describe the relationship of harvest levels to long-term availability of resources.

(8) The student executes various natural resource enhancement techniques using scientific knowledge from the study of environment and wildlife. The student is expected to:

(A) demonstrate stream enhancement techniques;

(B) demonstrate wildlife habitat enhancement techniques; and

(C) demonstrate public use and recreation area enhancement techniques.

(9) The student demonstrates the concepts related to the importance of facilities, harvest, processing, and marketing of aquaculture products. The student is expected to:

(A) discuss the importance and progress of aquaculture as an emerging industry; and

(B) identify and classify plant and animal aquaculture species.

(10) The student demonstrates concepts related to optimum production. The student is expected to:

(A) describe nutritional aspects of aquaculture production;

(B) discuss requirements for optimum growth of species-specific aquacrops;

(C) plan and administer treatments for diseases, parasites, predators, and pests of species-specific aquacrops;

(D) recognize weather-related dangers;

(E) recognize hazards as they relate to terrain;

(F) identify poisonous plants and animals;

(G) recognize hazardous situations; and

(H) demonstrate personal fire prevention precautions while working in natural environments.

(11) The student develops an improved supervised agriculture experience program as it relates to agriculture, food, and natural resources. The student is expected to:

(A) plan, propose, conduct, and evaluate entrepreneurship; placement; exploratory; research, either experimental or analytical; improvement; supplementary; laboratory-based; or other identified, supervised agricultural experience as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to a supervised experience;

(C) design and use a customized record-keeping system for the individual supervised experience;

(D) participate in youth leadership opportunities to create a well-rounded experience program in agriculture; and

(E) produce a challenging approach for a local program of activities in agriculture.

Range Ecology and Management

(1) The student develops an improved supervised agriculture experience program as it relates to agriculture, food, and natural resources. The student is expected to:

(A) plan, propose, conduct, and evaluate entrepreneurship; placement; exploratory; research, either experimental or analytical; improvement; supplementary; laboratory-based; or other identified, supervised agricultural experience as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to a supervised experience;

(C) design and use a customized record-keeping system for the individual supervised experience;

(D) participate in youth leadership opportunities to create a well-rounded experience program in agriculture; and

(E) produce a challenging approach for a local program of activities in agriculture.

(2) The student learns the employability characteristics of a successful employee. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the field of environmental and natural resources;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation in environmental and natural resources;

(C) demonstrate knowledge of personal and occupational health and safety practices in the workplace; and

(D) identify employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.

(3) The student develops an understanding of the rangeland ecosystem. The student is expected to:

(A) describe ecology, photosynthesis, energy flow, and climax vegetation;

(B) describe the impact of rangeland on the water cycle and water quality; and

(C) determine capabilities and limitations of rangelands.

(4) The student gains an understanding of rangeland as a dynamic, living, and changeable resource. The student is expected to:

(A) explain the relationship of rangeland to the environment;

(B) discuss the interrelationships of water, alternative use, carrying capacity, and population;

(C) identify and classify range plants and their importance in the rangeland ecosystem;

(D) explore the use of rangeland plants as alternative energy sources; and

(E) develop an understanding of the role of rangeland in water recharge and conservation.

(5) The student analyzes the biotic and abiotic components of a rangeland. The student is expected to:

(A) discuss abiotic components of rangeland with an emphasis on soil;

(B) determine abiotic components of rangeland with an emphasis on topography;

(C) understand the importance of classifying range sites by shape, soil types, and depth;

(D) identify important range plants; and

(E) recognize plant characteristics that impact rangeland ecology.

(6) The student develops an understanding of the dynamic process of a renewable rangeland resource. The student is expected to:

(A) determine range condition based on plant populations;

(B) compare and contrast rangeland condition trends; and

(C) describe ways and means to improve range conditions.

(7) The student applies rangeland ecology concepts as related to domestic livestock. The student is expected to:

(A) recognize plants beneficial to domestic livestock;

(B) identify plants poisonous to domestic livestock;

(C) describe how livestock use range plants; and

(D) select a proper mixture of domestic livestock appropriate for specific range sites.

(8) The student identifies methods of maintaining and improving rangeland for wildlife production. The student is expected to:

(A) identify plants beneficial to wildlife;

(B) recognize plants poisonous to wildlife;

(C) understand how wildlife species use range plants; and

(D) determine proper species of wildlife used to develop for specific range sites.

(9) The student develops an understanding of rangeland as it relates to worldwide concerns. The student is expected to:

(A) predict the effect of rangeland as recharge zones for aquifers;

(B) draw conclusions on the effect of rangeland on the carbon footprint of agriculture products;

(C) draw conclusions concerning the impact of rangeland on global warming; and

(D) develop an understanding of rangeland's role in energy production, including wind and ethanol production as well as fossil fuels.

Forestry and Woodland Ecosystems

(1) The student learns the employability characteristics of a successful employee. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the field of forestry and woodland ecosystems;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation in forestry and woodland ecosystems;

(C) demonstrate knowledge of personal and occupational safety practices in the workplace; and

(D) identify employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.

(2) The student describes the principles of forestry and woodland ecosystems. The student is expected to:

(A) describe the historical and economic significance of forestry;

(B) illustrate tree anatomy and growth;

(C) identify species of trees;

(D) identify forest and woodland soils;

(E) describe silviculture;

(F) define ecosystems;

(G) describe photosynthesis and respiration;

(H) describe watershed management;

(I) define succession; and

(J) compare forests and woodlands.

(3) The student demonstrates forestry biometrics skills. The student is expected to:

(A) calculate tree volume;

(B) estimate timber growth and yield;

(C) evaluate by cruising timber stands; and

(D) calculate quality and volume by scaling logs.

(4) The student performs forestry management skills. The student is expected to:

(A) identify forestry management options;

(B) define multiple-use possibilities; and

(C) demonstrate the control of destructive agents such as fire, insects, and disease.

(5) The student identifies softwood and hardwood forest management and utilization practices. The student is expected to:

(A) identify principles of forestry economics;

(B) research sources of forestry management assistance;

(C) identify harvesting practices and equipment;

(D) describe merchandising practices; and

(E) identify research in forestry and wood technology.

(6) The student describes the role of wood technology in forest product development. The student is expected to:

(A) compare timber manufacturing processes and products; and

(B) identify research and development issues in forestry and wood technology.

(7) The student applies cartographic skills to natural resource activities. The student is expected to:

(A) describe different types of maps;

(B) interpret map features and legends;

(C) interpret map scale and actual distance;

(D) identify direction from map;

(E) distinguish elevation and terrain features from topographic maps;

(F) use directional tools with maps to locate position;

(G) use land survey and coordinate systems;

(H) use a Geographic Information System to interface geospatial data; and

(I) interpret photos and images.

(8) The student identifies and distinguishes ethical practices in the field of natural resource systems. The student is expected to:

(A) identify and evaluate ethical guidelines;

(B) evaluate how advances in science and technology have raised concerns about ethical issues; and

(C) identify a national organization or institution that seeks to promote ethical behavior and analyze its success and impact.

(9) The student develops an improved supervised agriculture experience program as it relates to agriculture, food, and natural resources. The student is expected to:

(A) plan, propose, conduct, and evaluate entrepreneurship; placement; exploratory; research, either experimental or analytical; improvement; supplementary; laboratory-based; or other identified, supervised agricultural experience as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to a supervised experience;

(C) design and use a customized record-keeping system for the individual supervised experience;

(D) participate in youth leadership opportunities to create a well-rounded experience program in agriculture; and

(E) produce a challenging approach for a local program of activities in agriculture.

Principles and Elements of Floral Design

(1) The student identifies design principles and techniques in floral art and interiorscapes. The student is expected to:

(A) identify the aesthetic benefits and the history of floral art, particularly as it relates to current practice;

(B) classify and identify flowers and plants used in floral design; and

(C) identify design elements and principles.

(2) The student demonstrates floral design principles and techniques. The student is expected to:

(A) understand and implement the design process through the medium of floral materials;

(B) evaluate and prepare geometric floral designs using cut flowers;

(C) evaluate and prepare geometric floral designs using silk flowers;

(D) prepare corsages and boutonnieres; and

(E) prepare floral designs for specific occasions.

(3) The student develops and formulates ideas from the environment. The student is expected to:

(A) illustrate ideas for floral designs from direct observation, experiences, and imagination;

(B) compare and contrast the use of art elements such as color, texture, form, line, and space; and

(C) compare and contrast the art principles of art elements such as continuity, pattern, rhythm, balance, proportion, and unity in personal designs.

(4) The student makes informed judgments about personal designs and the designs of others. The student is expected to:

(A) interpret, evaluate, and justify artistic decisions in personal arrangements; and

(B) select and analyze original designs, portfolios, and floral exhibitions by peers and others to form precise conclusions about formal qualities, and historical and cultural contexts, intents, and meanings.

(5) The student demonstrates contemporary designs, business practices, specialty items, and creativity in the floral industry by developing floral design skills. The student is expected to:

(A) classify and identify specialty floral items;

(B) evaluate and appraise floral designs;

(C) prepare cost-effective designs;

(D) create specialty designs to expand artistic expression;

(E) demonstrate pricing and order-processing skills; and

(F) list service delivery options related to effectiveness.

(6) The student knows the management factors of floral enterprises. The student is expected to:

(A) use temperature, preservatives, and cutting techniques to increase keeping quality;

(B) identify tools, chemicals, and equipment used in floral design;

(C) fertilize, prune, and water tropical plants;

(D) manage pests; and

(E) demonstrate the technical skills for increasing the preservation of cut flowers and foliage.

(7) The student learns the employability characteristics of a successful employee. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the field of floral design and interior landscape development;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation in floral design and interior landscape development;

(C) demonstrate knowledge of personal and occupational health and safety practices in the workplace;

(D) identify employers' expectations, appropriate work habits, and good citizenship skills; and

(E) identify training, education, and certification requirements for occupational choice.

(8) The student develops an improved supervised agriculture experience program as it relates to agriculture, food, and natural resources. The student is expected to:

(A) plan, propose, conduct, and evaluate entrepreneurship; placement; exploratory; research, either experimental or analytical; improvement; supplementary; laboratory-based; or other identified, supervised agricultural experience as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to a supervised experience;

(C) design and use a customized record-keeping system for the individual supervised experience;

(D) participate in youth leadership opportunities to create a well-rounded experience program in agriculture; and

(E) produce a challenging approach for a local program of activities in agriculture.

Landscape Design and Turf Grass Management

(1) The student learns the employability skills of a successful employee in the modern workplace. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the field of landscape design and turf grass management, including how to search for and obtain employment, what qualifications are required for varying career fields, and how to advance in a position;

(B) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation in landscape design, construction, and maintenance;

(C) examine licensing, certification, and credentialing requirements to maintain compliance with industry requirements;

(D) demonstrate knowledge of personal and occupational health and safety practices in the industry; and

(E) identify employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.

(2) The student develops an improved supervised agriculture experience program as it relates to agriculture, food, and natural resources. The student is expected to:

(A) plan, propose, conduct, and evaluate entrepreneurship; placement; exploratory; research, either experimental or analytical; improvement; supplementary; laboratory-based; or other identified, supervised agricultural experience as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to a supervised experience;

(C) design and use a customized record-keeping system for the individual supervised experience;

(D) participate in youth leadership opportunities to create a well-rounded experience program in agriculture; and

(E) produce a challenging approach for a local program of activities in agriculture.

(3) The student identifies environmental, aesthetic, and financial benefits of landscaped sites. The student is expected to:

(A) assess soil characteristics and environmental conditions;

(B) complete a site analysis checklist;

(C) observe or operate graphics design equipment or software to produce a site sketch; and

(D) identify plants and structures used in designing landscapes.

(4) The student performs landscape business procedures. The student is expected to:

(A) interview potential clients;

(B) prepare cost estimates such as materials, labor, and administrative cost and service schedules; and

(C) execute service contracts.

(5) The student analyzes the cost and maintenance of tools, equipment, and structures used in the landscape industry. The student is expected to:

(A) identify, store, and maintain landscaping hand and power tools and equipment;

(B) prepare plant growing sites;

(C) install landscape plants and structures;

(D) select and install landscape irrigation systems; and

(E) perform turf grass services such as mowing, renovating, fertilizing, pesticide application, weed control, and watering.

(6) The student performs turf grass establishment and maintenance techniques. The student is expected to:

(A) identify, store, and maintain turf grass hand and power tools and equipment;

(B) identify different varieties of turf grasses and selected use;

(C) prepare a cost estimate for a turf grass site, including materials and labor;

(D) prepare turf grass sites for sodding or seeding;

(E) select the proper turf grass for a site;

(F) select the method of turf grass installation;

(G) select and install turf grass irrigation systems; and

(H) perform turf grass services such as mowing, renovating, fertilizing, pesticide application, weed control, and watering.

Horticulture Science

(1) The student learns the employability characteristics of a successful employee. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the field of horticulture;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation in horticulture;

(C) demonstrate knowledge of personal and occupational safety practices in the workplace; and

(D) identify employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.

(2) The student develops technical skills associated with the management and production of horticultural plants. The student is expected to:

- (A) classify horticultural plants based on physiology for taxonomic or other classifications;
- (B) manage the horticultural production environment;
- (C) propagate and grow horticultural plants;
- (D) create a design using plants that demonstrates an application of design elements and principles;
- (E) design and establish landscapes; and
- (F) describe the process of fruit, nut, and vegetable production.

(3) The student identifies structures and physiological processes used in plant production. The student is expected to:

- (A) examine unique plant properties to identify and describe functional differences in plant structures, including roots, stems, flowers, leaves, and fruit;
- (B) differentiate between monocots and dicots and male and female plants;
- (C) germinate and transplant seeds; and
- (D) demonstrate asexual propagation techniques.

(4) The student manages and controls common pests of horticultural plants. The student is expected to:

- (A) identify common horticultural pests;
- (B) demonstrate safe practices in selecting, applying, storing, and disposing of chemicals; and
- (C) develop a plan for integrated pest management.

(5) The student demonstrates marketing and management skills used in the operation of horticultural businesses. The student is expected to:

- (A) identify and maintain hand and power tools and equipment;
- (B) select appropriate tools and equipment;
- (C) demonstrate safe use of tools and equipment;
- (D) identify options and opportunities for business ownership; and
- (E) analyze the role of small business in free enterprise.

(6) The student develops an improved supervised agriculture experience program as it relates to agriculture, food, and natural resources. The student is expected to:

(A) plan, propose, conduct, and evaluate entrepreneurship; placement; exploratory; research, either experimental or analytical; improvement; supplementary; laboratory-based; or other identified, supervised agricultural experience as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to a supervised experience;

(C) design and use a customized record-keeping system for the individual supervised experience;

(D) participate in youth leadership opportunities to create a well-rounded experience program in agriculture; and

(E) produce a challenging approach for a local program of activities in agriculture.

Agricultural Mechanics and Metal Technologies

(1) The student learns the employability skills of a successful employee to meet current industry standards and society. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the field of power, structural, and technical agricultural systems, including how to search and obtain employment, what qualifications are required for varying career fields, and how to advance in a position;

(B) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation of power, structural, and technical agricultural systems;

(C) examine licensing, certification, and credentialing requirements to maintain compliance with industry requirements;

(D) demonstrate knowledge of personal and occupational health, safety, and first-aid practices in the industry; and

(E) identify employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.

(2) The student develops an improved supervised agriculture experience program as it relates to agriculture, food, and natural resources. The student is expected to:

(A) plan, propose, conduct, and evaluate entrepreneurship; placement; exploratory; research, either experimental or analytical; improvement; supplementary; laboratory-based; or other identified, supervised agricultural experience as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to a supervised experience;

(C) design and use a customized record-keeping system for the individual supervised experience;

(D) participate in youth leadership opportunities to create a well-rounded experience program in agriculture; and

(E) produce a challenging approach for a local program of activities in agriculture.

(3) The student follows operating instructions for tools and equipment to perform a given task. The student is expected to:

(A) select and use the appropriate hand and power tools to perform a given task, maintain tools, and store tools; and

(B) select and use measuring and marking devices.

(4) The student identifies and performs electric wiring skills. The student is expected to:

(A) identify principles of electric wiring and wiring terminology;

(B) perform and install electric wiring components and fixtures to comply with government regulations and applicable codes; and

(C) maintain electric motors.

(5) The student performs plumbing skills. The student is expected to:

(A) identify and select plumbing tools and fixtures;

(B) install plumbing equipment and fixtures to comply with government regulations and applicable codes; and

(C) maintain water systems.

(6) The student performs concrete construction skills. The student is expected to:

(A) project cost estimates for materials and construct forms; and

(B) reinforce, place, finish, and cure concrete.

(7) The student performs carpentry skills. The student is expected to:

- (A) identify materials used in agricultural construction;
- (B) identify elements of projected cost estimate and prepare a bid package for a planned project;
- (C) demonstrate basic carpentry skills; and
- (D) paint and protect with coatings.

(8) The student identifies fencing methods. The student is expected to:

- (A) select fencing materials; and
- (B) plan and install fences.

(9) The student performs appropriate cold and hot metal techniques. The student is expected to:

- (A) identify types of metal;
- (B) cut, file, shape, and drill metal;
- (C) select and operate oxy-fuel welding and cutting equipment to meet standards;
- (D) select and operate electric-arc welding equipment to meet standards; and
- (E) perform specialty welding and cutting techniques to meet standards.

(10) The student knows metal merging technology and processes relating to assembly of equipment in agricultural systems operations. The student is expected to:

- (A) select and maintain appropriate tools, equipment, and facilities; and
- (B) identify and determine properties, types, and uses of metal.

(11) The student plans and performs cost-effective construction techniques. The student is expected to:

- (A) analyze site, equipment, and permit requirements;
- (B) observe or operate computer-aided drafting design software;
- (C) develop, read, and interpret designs and sketches;
- (D) estimate material needs and costs;
- (E) measure, mark, and cut material; and
- (F) perform specialized nonmetallic fabrication techniques.

Agricultural Power Systems

(1) The student outlines the employability skills of a successful employee to meet current industry and societal standards. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the field of power, structural, and technical systems;

(B) apply competencies related to resources, information, interpersonal skills, problem solving, and critical thinking in power, structural, and technical systems;

(C) examine licensing, certification, and credentialing requirements to maintain compliance with industry requirements;

(D) demonstrate knowledge of personal and occupational health and safety practices in the workplace; and

(E) identify employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.

(2) The student develops an improved supervised agriculture experience program as it relates to agriculture, food, and natural resources. The student is expected to:

(A) plan, propose, conduct, and evaluate entrepreneurship; placement; exploratory; research, either experimental or analytical; improvement; supplementary; laboratory-based; or other identified, supervised agricultural experience as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to a supervised experience;

(C) design and use a customized record-keeping system for the individual supervised experience;

(D) participate in youth leadership opportunities to create a well-rounded experience program in agriculture; and

(E) produce a challenging approach for a local program of activities in agriculture.

(3) The student connects power generation to differing energy sources. The student is expected to:

(A) discuss benefits and detriments of petroleum and alternative energy sources;

(B) compare environmental impacts of varying energy sources;

(C) compare efficiency and characteristics of different energy sources; and

(D) discuss the efficiency of power generation systems that use various energy sources.

(4) The student selects the appropriate tool to perform a given task related to agricultural power systems. The student is expected to:

(A) select and identify standard tools, equipment, and safety procedures common to power and control applications;

(B) follow operating instructions of specialized tools and equipment such as micrometers, digital multimeters, and dynameters;

(C) set up and adjust tools and equipment such as dynameters, flow meters, torque wrenches, lathes, and mills;

(D) maintain and store tools and equipment common to power and control applications; and

(E) inventory tools and equipment in a service or maintenance facility.

(5) The student selects, operates, and maintains small engines. The student is expected to:

(A) describe principles of operation of internal combustion engines and related power systems and parallel them to shared operations and theories in multiple cylinder engines;

(B) disassemble and reassemble small engines;

(C) select, maintain, and troubleshoot small engines; and

(D) research small engine industry certifications.

(6) The student selects, operates, and maintains agricultural machines and equipment. The student is expected to:

(A) identify and select agricultural equipment for appropriate tasks such as the selection of tillage equipment to obtain a desired result;

(B) identify and maintain component materials on varying types of machines and equipment such as bearings, hydraulics, seals, chains, and drives;

(C) ensure the presence and function of safety systems and hardware on machinery and equipment such as guards and shields;

(D) calibrate metering, monitoring, and sensing equipment on various equipment such as tillage, harvest, transport, and haying; and

(E) perform pre-operation inspection and appropriate start-up procedures, identify causes of malfunctions and failures, perform scheduled preventive maintenance, and safely operate equipment.

(7) The student selects, operates, and maintains tractors and agricultural power systems. The student is expected to:

(A) select tractors based upon application and power requirements and describe or perform safe operation of tractors in various applications;

(B) maintain intake and exhaust systems, including shrouds, screens, filters, piping, after-coolers, air induction systems, manifolds, exhausts, and mufflers;

(C) select lubricants and apply appropriate lubrication as required by maintenance schedules on varying lubrication systems;

(D) identify and maintain varying fuel systems, power trains, and hydraulic systems used on farm tractors;

(E) explain charging, starting, operating, and igniting direct current electrical systems as well as troubleshoot simple problems with a digital multimeter;

(F) maintain steering and braking systems;

(G) maintain tires and tracks and describe the role of ballasting and traction in farm tractors; and

(H) explain the operation of and maintain liquid and air-cooling systems in tractors.

(8) The student monitors and controls electrical systems as related to agricultural machines and equipment. The student is expected to:

(A) use various meters and test equipment such as digital multimeters to collect data and troubleshoot electrical systems;

(B) employ appropriate techniques for applying devices, controls, and grounding in electrical systems;

(C) employ codes and regulations relevant to varying applications in electrical systems;

(D) select and apply electric controls such as motor controls, switches, circuit breakers, timers, sensors, and relays; and

(E) interpret data generated by electrical monitoring systems.

(9) The student implements control systems as related to agricultural machines and equipment. The student is expected to:

(A) decipher schematic drawings for electrical control systems;

(B) describe uses of various electrical control system components;

(C) install control system components such as motor controls, switches, circuit breakers, timers, sensors, and relays and properly use appropriate tools, procedures, and safety practices; and

(D) identify system performance problems and apply troubleshooting techniques using monitoring devices or troubleshooting devices.

(10) The student describes hydraulic controls and applications as related to agricultural machines and equipment. The student is expected to:

(A) describe the operation of open and closed center hydraulic systems;

(B) explain the purpose and function of hydraulic controls such as valves, motors, pumps, cylinders, manifolds, and meters; and

(C) create basic hydraulic circuits using a variety of hydraulic controls.

(11) The student describes additional control systems as related to agricultural machines and equipment. The student is expected to:

(A) explain the application of pneumatic systems and controls; and

(B) explain the application of water or other fluid control systems as they apply to power and control systems and their component controls.