Arizona Department of Education

Career and Technical Education Technical Standards

AGRISCIENCE 01.0000.00

An Industry Technical Standards Validation Committee identified and approved these standards on August 18, 2018. *The Arizona Career and Technical Education Quality Commission, the validating entity for the Arizona Skills Standards Assessment System and the end-of-program assessments and certificates, gave their endorsement to these standards on November 26, 2018.*

Note: Arizona's Professional Skills are taught as an integral part of the AgriScience program.

The Technical Skills Assessment for these standards is available SY2020–2021.

Note: In this document i.e. explains or clarifies the content and e.g. provides examples of the content that must be taught.

STANDARD 1.0 EXAMINE THE NATURE, SCOPE, AND ROLE OF AGRICULTURE IN THE SOCIETY AND THE ECONOMY

1.1 Investigate the impact of the agricultural industry on population, food, energy, and environment
1.2 Investigate the economic importance of products obtained from agriculture (i.e., animals, plants, technology, mechanics, etc.)
1.3 Examine how a stable agricultural sector supports a nation of food security
1.4 Differentiate between agricultural imports and exports
1.5 Examine the benefit of earning foreign exchange through the export of agricultural products
1.6 Investigate how the agriculture sector provides employment opportunities to the labor force

STANDARD 2.0 EXAMINE THE IMPACT OF TRENDS, TECHNOLOGIES, AND POLICIES ON AGRICULTURE

2.1 Identify the major milestones and technological advancements on agriculture and the impact to society (e.g., advances in mechanization, quality seed and selective breeding, improved resource management, higher quantity of food)
2.2 Describe the effects of genetic modification on agricultural production
2.3 Describe the effects of current farming methods on water resources, erosion, and soil fertility
2.4 Explain the effects of pesticides and fertilizers on water and the environment
2.5 Explain how legislation affects agricultural production (i.e., environmental, workforce, marketing, trade, animal welfare, biosecurity, taxes, water, etc.)
2.6 Analyze the impact of biotechnology on production, processing, storage, and preparation of food, fiber, and pharmaceuticals
2.7 Use scientific evidence to investigate controversial topics and make educated decisions (i.e., environmental issues, climate change, genetic engineering, soil degradation, etc.)
2.8 Investigate the use of data to solve problems in agricultural systems (i.e., geographic, economic, demographic, etc.)

STANDARD 3.0 EXAMINE THE USE OF SCIENTIFIC PROCESSES USED IN AGRICULTURE

3.1 Identify research methods used in agriculture
3.2 Describe and demonstrate the scientific process
3.3 Formulate predictions, questions, and hypotheses
3.4 Evaluate appropriate resources for research

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3.5 Demonstrate safe practices in the laboratory, classroom, and work situations
3.6 Design and conduct scientific investigations
3.7 Record observations, notes, sketches, questions, and ideas during an investigation
3.8 Generate data tables, charts, and graphs based on collected data
3.9 Analyze data, communicate results, conclusions, and propose further investigations

STANDARD 4.0 EXAMINE THE RELATIONSHIP OF THE ENVIRONMENT TO AGRICULTURE PRODUCTION AND SUSTAINABILITY

4.1 Identify agricultural products that can be converted to alternative energy sources
4.2 Analyze the use of renewable energy sources in agriculture (i.e., wind, solar, biofuels, etc.)
4.3 Compare and contrast production practices with regard to efficiency, sustainability, and economic viability (i.e., organic, naturally-raised systems, conventional agricultural production, etc.)
4.4 Investigate how alternative production systems affect production and environment (i.e., aquaculture, vertical farming, GPS plotting, seed spacing, etc.)
4.5 Identify municipal, industrial, and agricultural sources and uses of water
4.6 Evaluate how agriculture manages water use, waste water systems, and water recycling opportunities
4.7 Analyze environmental factors associated with animal and plant production including sanitation and economics
4.8 Describe the effect of agriculture on the food web cycle, or the natural interconnection of food chains

STANDARD 5.0 EXAMINE SOIL MANAGEMENT FOR PLANT AND ANIMAL PRODUCTION

5.1 Describe formation, properties, texture, structure, and composition of soil
5.2 Examine the relationship among soil characteristics, microflora, and environmental conditions
5.3 Analyze methods to control soil erosion
5.4 Analyze slope, erosion, and water movement in determining land capability, land use, and agricultural production
5.5 Formulate appropriate soil management practices on various sites

STANDARD 6.0 EXAMINE CELL BIOLOGY, STRUCTURES, AND PROCESSES

6.1 Differentiate among cells, organelles, tissues, and organs' systems
6.2 Describe the structure and function of DNA
6.3 Describe the process of creating proteins from DNA
6.4 Describe cellular processes (i.e., osmosis, mitosis, phagocytosis, meiosis, diffusion, etc.)
6.5 Examine the molecular basis of heredity and resulting genetic diversity
6.6 Define the essential macromolecules of life science (i.e., carbohydrates, proteins, lipids, nucleic acids, etc.)

STANDARD 7.0 ANALYZE PLANT SCIENCE PRINCIPLES

7.1 Describe plant anatomy and the functions of plant structures (e.g., root, stem, leaf, flower)
7.2 Classify plants according to taxonomic systems, use, structure, and life span
7.3 Describe basic factors in plant growth (e.g., light, water, climate, temperature, nutrients)
7.4 Apply knowledge of plant physiology and energy conversion to plant systems (e.g., photosynthesis, respiration, transpiration)
7.5 Describe plant life cycle stages (i.e., germination, root growth, pollination, fruit development, etc.)
7.6 Demonstrate plant germination, growth, and development
7.7 Investigate changes in growing conditions and the impact on plant growth and development (i.e., light, gravity, touch, water, heat, etc.)

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STANDARD 8.0 DEMONSTRATE CONCEPTS OF PLANT MANAGEMENT

8.1 Analyze the nutritional needs of plants

8.2 Research common nutrient deficiency symptoms and treatment options (i.e., fertilizers, soil amendments, crop rotation, etc.)

8.3 Prepare grow media for use in plant systems (i.e., soil, water, vermiculite, coconut core, etc.)

8.4 Analyze soil conditions to make nutritional decisions (i.e., pH meter, soil test kits, soil probes, etc.)

8.5 Implement a fertilization plan for specific plants or crops

8.6 Investigate methods for sexual reproduction of plants (i.e., cross-pollination, scarification, stratification, etc.)

8.7 Investigate methods for asexual reproduction of plants (i.e., propagation, grafting, layering, tissue culture, plant hormones, etc.)

8.8 Demonstrate plant propagation techniques (e.g., sexual and asexual)

8.9 Describe techniques to harvest, handle, and store crops according to current industry standards

8.10 Create a sustainable management plan for plant production

STANDARD 9.0 ANALYZE ANIMAL SCIENCE PRINCIPLES

9.1 Define common terminology related to animal science and production practices (i.e., gender, age, dehorning, castration, identification, tail docking, etc.)

9.2 Classify animals according to taxonomic classification systems and use (e.g., agricultural, companion)

9.3 Differentiate among large stock, small stock, and companion animals

9.4 Explain basic anatomy and external parts of production animals

9.5 Apply principles of comparative anatomy and physiology to use within animal systems (e.g., circulatory, endocrine, immune, integumentary, musculoskeletal, nervous, reproductive, respiratory, urinary)

9.6 Describe a livestock animal's digestive system (i.e., avian, modified digestion, ruminant, etc.)

9.7 Describe the basic principles of animal welfare (e.g., appropriate environment, facilities, food, healthcare, proper handling, water)

STANDARD 10.0 DEMONSTRATE CONCEPTS OF ANIMAL MANAGEMENT

10.1 Recognize animal behaviors to facilitate safely working with animals

10.2 Investigate the nature and properties of food, fiber, and by-products from animals

10.3 Differentiate between major wholesale/retail meat cuts of beef, pork, lamb, and poultry and compare the value of various meat cuts

10.4 Explore the use of alternative livestock in animal agriculture (i.e., antelope, elk, buffalo, alpacas, ostrich, deer, etc.)

10.5 Analyze the nutritional roles and needs of animals

10.6 Analyze feed rations to meet the nutritional needs of animals

10.7 Develop a plan to treat animal ailments

10.8 Differentiate among animal selection, reproduction, breeding, and genetics

10.9 Demonstrate animal selection based on reproduction, breeding, and genetics

10.10 Explore how animals are evaluated for breeding readiness and soundness

10.11 Create a sustainable reproduction management plan

10.12 Demonstrate proper methods to clean and disinfect animal equipment and facilities

10.13 Demonstrate proper use of animal medications following established withdrawal protocols

STANDARD 11.0 ANALYZE PRINCIPLES OF INTEGRATED PEST MANAGEMENT (IPM) IN PLANT AND ANIMAL SYSTEMS

11.1 Identify pests and signs of pest damage (i.e., parasites, rodents, weeds, insects, etc.)

11.2 Identify pest control methods used to manage pest damage (i.e., cultural, mechanical, biological, chemical, etc.)

11.3 Evaluate economic impact of pests on production

11.4 Discuss biosecurity measures utilized to protect the welfare of animals on a local, state, national, and global level

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11.5 Read and interpret pesticide labels

11.6 Investigate safe pesticide application practices

11.7 Apply pesticides safely according to good manufacturing practices (GMPs)

STANDARD 12.0 EXAMINE FOOD SAFETY AND PROCESSING PRACTICES

12.1 Investigate government agencies that impact agriculture and food production

12.2 Analyze food product labels

12.3 Evaluate food processing best practices (i.e., HACCP, quality assurance, food safety standards, etc.)

12.4 Develop a plan to prevent foodborne illness in agricultural products

STANDARD 13.0 APPLY PRACTICES AND PROCEDURES FOR PLANNING, BUILDING, AND MAINTAINING STRUCTURES

13.1 Identify legal land descriptions

13.2 Investigate techniques used to survey land

13.3 Create sketches and plans for structures

13.4 Determine structural requirements, specifications, and estimate costs for structures (i.e., bill of materials)

13.5 Follow architectural and mechanical plans to construct, maintain, and/or repair agricultural structures (i.e., material selection, site preparation and/or layout, plumbing, concrete/masonry, electrical wiring, wood fabrication)

13.6 Design animal, plant, and mechanical facilities including equipment

13.7 Manage basic facility maintenance, installation, or repair

STANDARD 14.0 DEMONSTRATE OPERATION OF TOOLS, EQUIPMENT, AND INSTRUMENTS

14.1 Demonstrate safe operating instructions and procedures as recommended by the manufacturer

14.2 Utilize service manuals to perform preventative maintenance and determine scheduled service on tools, equipment, and instruments, including small engines

14.3 Maintain hand tools and power equipment (i.e., hand saws, power saws, welders, leaf blowers, etc.)

14.4 Demonstrate a variety of metal fabrication, welding, soldering, cutting, and finishing processes (i.e., SMAW, GMAW, GTAW, fuel-oxygen, plasma arc torch, etc.)

14.5 Demonstrate a variety of wood fabrication and finishing processes

14.6 Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods

14.7 Utilize manufacturers' guidelines to diagnose, troubleshoot, and repair machinery, equipment, and power source systems (i.e., hydraulic, pneumatic, transmission, steering, suspension, etc.)

STANDARD 15.0 DEMONSTRATE AGRIBUSINESS MANAGEMENT, FINANCE, AND MARKETING SKILLS

15.1 Define basic business terminology (i.e., entrepreneurship/placement, capital, budget, solvent, management, assets, liability, economics, etc.)

15.2 Differentiate between macro- and micro-economics

15.3 Identify financial records important to business management

15.4 Use management software and information technology [i.e., spreadsheets, databases, presentation software, record-keeping software, electronic record book, agriculture experience tracker (AET), etc.]

15.5 Analyze business records and record-keeping procedures

15.6 Identify tax structure of agricultural business (i.e., property tax, intangible taxes, income taxes, etc.)

15.7 Apply the decision-making process for budgeting issues

15.8 Identify methods of obtaining capital resources

15.9 Explain the purposes and structures of contracts, leases, deeds, and insurance policies

15.10 Compare types of markets and influence factors (i.e., commodity markets, foreign markets, competition, etc.)

15.11 Identify methods of managing risk

15.12 Describe the purpose and importance of marketing

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15.13 Develop a marketing plan

15.14 Create a business plan

STANDARD 16.0 EXAMINE TECHNOLOGY TOOLS AND SYSTEMS USED TO ACCESS, MANAGE, INTEGRATE, AND CREATE INFORMATION AND SOLVE PROBLEMS

16.1 Use industry-relevant software and internet applications

16.2 Use collaborative and virtual meeting software

16.3 Analyze the benefits and limitations of emerging technology such as geospatial, online mapping systems, drones, and robotics

16.4 Explain the benefits of computer-based and mobile application equipment

16.5 Apply computer and other technologies to solve problems and increase efficiency [i.e., LabQuest, programmable logic controller (PLC), Geospatial Information System (GIS), Computer numeric control (CNC), Unmanned aircraft system (UAS), etc.]

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