

Instructional Framework



AgriScience

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This Instructional Framework identifies, explains, and expands the content of the standards/measurement criteria, and, as well, guides the development of multiple-choice items for the Technical Skills Assessment. This document corresponds with the Technical Standards endorsed on November 26, 2018.

Domain 1: Science of the Agricultural Industry	
Instructional Time: 35-45%	
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	<ul style="list-style-type: none"> • Production impact
1.2 Investigate the economic importance of products obtained from agriculture (i.e., animals, plants, technology, mechanics, etc.)	<ul style="list-style-type: none"> • Commodity • Dollars generated by Arizona Agriculture Industry
1.3 Examine how a stable agricultural sector supports a nation of food security	<ul style="list-style-type: none"> • Agriculture sustainability
1.4 Differentiate between agricultural imports and exports	<ul style="list-style-type: none"> • Import • Export
1.5 Examine the benefit of earning foreign exchange through the export of agricultural products	<ul style="list-style-type: none"> • Gross Domestic Product (GDP)
1.6 Investigate how the agriculture sector provides employment opportunities to the labor force	<ul style="list-style-type: none"> • Career exploration
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, and higher quantity of food)	<ul style="list-style-type: none"> • Evolution of agriculture • 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	<ul style="list-style-type: none"> • Genetically Modified Organisms (GMOs)

2.3 Describe the effects of current farming methods on water resources, erosion, and soil fertility	<ul style="list-style-type: none"> • Efficiency of water usage • Sustainability
2.4 Explain the effects of pesticides and fertilizers on water and the environment	<ul style="list-style-type: none"> • Overuse of products
2.5 Explain how legislation affects agricultural production (i.e., environmental, workforce, marketing, trade, animal welfare, biosecurity, taxes, water, etc.)	<ul style="list-style-type: none"> • Laws and economical changes • Agricultural issues
2.6 Analyze the impact of biotechnology on production, processing, storage, and preparation of food, fiber, and pharmaceuticals	<ul style="list-style-type: none"> • Food and Drug Administration (FDA) regulations
2.7 Use scientific evidence to investigate controversial topics and make educated decisions (i.e., environmental issues, climate change, genetic engineering, soil degradation, etc.)	<ul style="list-style-type: none"> • Agricultural issues • Pros and Cons
2.8 Investigate the use of data to solve problems in agricultural systems (i.e., geographic, economic, demographic, etc.)	<ul style="list-style-type: none"> • Urbanization: Rural vs. Urban
STANDARD 3.0 EXAMINE THE USE OF SCIENTIFIC PROCESSES USED IN AGRICULTURE	
3.1 Identify research methods used in agriculture	<ul style="list-style-type: none"> • Basic method and applied methods
3.2 Describe and demonstrate the scientific process	<ul style="list-style-type: none"> • Steps to scientific process
3.3 Formulate predictions, questions, and hypotheses	<ul style="list-style-type: none"> • Predictions, questions, and hypotheses
3.4 Evaluate appropriate resources for research	<ul style="list-style-type: none"> • Valid resources for research • Literature review
3.5 Demonstrate safe practices in the laboratory, classroom, and work situations	<ul style="list-style-type: none"> • Lab safety • Safety exam/survey
3.6 Design and conduct scientific investigations	<ul style="list-style-type: none"> • Procedures, materials, methods
3.7 Record observations, notes, sketches, questions, and ideas during an investigation	<ul style="list-style-type: none"> • Results
3.8 Generate data tables, charts, and graphs based on collected data	<ul style="list-style-type: none"> • Methods to display data • Results

3.9 Analyze data, communicate results, conclusions, and propose further investigations	<ul style="list-style-type: none"> • Identifying trend • Conclusion of experiments • Reflection on conclusion
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	<ul style="list-style-type: none"> • Green algae • Corn/Soy for ethanol
4.2 Analyze the use of renewable energy sources in agriculture (i.e., wind, solar, biofuels, etc.)	<ul style="list-style-type: none"> • Renewable energy
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.)	<ul style="list-style-type: none"> • Pros and Cons of organic, naturally raised, and conventional production
4.4 Investigate how alternative production systems affect production and environment (i.e., aquaculture, vertical farming, GPS plotting, seed spacing, etc.)	<ul style="list-style-type: none"> • Effects of aquaculture, vertical farming, GPS plotting, seed spacing
4.5 Identify municipal, industrial, and agricultural sources and uses of water	<ul style="list-style-type: none"> • Municipal sources of water • Industrial sources of water • Agriculture sources of water
4.6 Evaluate how agriculture manages water use, wastewater systems, and water recycling opportunities	<ul style="list-style-type: none"> • Use and management of water in agriculture
4.7 Analyze environmental factors associated with animal and plant production including sanitation and economics	<ul style="list-style-type: none"> • Factors of sanitation • Pollution
4.8 Describe the effect of agriculture on the web cycle	<ul style="list-style-type: none"> • Food Web • Carrying Capacity
STANDARD 6.0 EXAMINE CELL BIOLOGY, STRUCTURES, AND PROCESSES	
6.1 Differentiate among cells, organelles, tissues, and organs	<ul style="list-style-type: none"> • Plant vs. Animal Cells • Levels of organization: smallest to largest
6.2 Describe the structure and function of DNA	<ul style="list-style-type: none"> • Double helix • Heredity • RNA

6.3 Describe the process of creating proteins from DNA	<ul style="list-style-type: none"> • Transcription • Translation • Replication
6.4 Describe cellular processes (i.e., osmosis, mitosis, phagocytosis, meiosis, diffusion, etc.)	<ul style="list-style-type: none"> • Osmosis • Mitosis • Phagocytosis • Meiosis • Diffusion
6.5 Examine the molecular basis of heredity and resulting genetic diversity	<ul style="list-style-type: none"> • Punnett Squares • Dominance • Recessive • Sex-linked
6.6 Define the essential macromolecules of life science (i.e., carbohydrates, proteins, lipids, nucleic acids, etc.)	<ul style="list-style-type: none"> • Essential nutrients
STANDARD 12.0 EXAMINE FOOD SAFETY AND PROCESSING PRACTICES	
12.1 Investigate government agencies that impact agriculture and food production	<ul style="list-style-type: none"> • Food and Drug Administration (FDA) • Environmental Protection Agency (EPA) • United States Dept. of Agriculture (USDA) • Animal Plant Health Inspection Service (APHIS) • Department of Homeland Security (DHS) • Center for Disease Control (CDC)
12.2 Analyze food product labels	<ul style="list-style-type: none"> • Parts of a food label
12.3 Evaluate food processing best practices (i.e., HACCP, quality assurance, food safety standards, etc.)	<ul style="list-style-type: none"> • Hazard Analysis and Critical Control Points (HACCP) • Food Safety Standards
12.4 Develop a plan to prevent foodborne illness in agricultural products	<ul style="list-style-type: none"> • Factors that cause foodborne illnesses • Steps to prevent
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	<ul style="list-style-type: none"> • Products • Google Docs

16.2 Use collaborative and virtual meeting software	<ul style="list-style-type: none"> • Zoom • Skype • Facetime • Discussion boards
16.3 Analyze the benefits and limitations of emerging technology such as geospatial, online mapping systems, drones, and robotics	<ul style="list-style-type: none"> • Accuracy and efficiency of emerging technology
16.4 Explain the benefits of computer-based and mobile application equipment	<ul style="list-style-type: none"> • Pros and cons of computer-based and mobile 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.]	<ul style="list-style-type: none"> • Vernier LabQuest • Programmable logic controller (PLC) • Geospatial Information System (GIS) • Computer numeric control (CNC) • Unmanned aircraft system (UAS)

Domain 2: Plant & Animal Science

Instructional Time: 35-45%

STANDARD 5.0 EXAMINE SOIL MANAGEMENT FOR PLANT AND ANIMAL PRODUCTION

5.1 Describe formation, properties, texture, structure, and composition of soil	<ul style="list-style-type: none"> • Texture (sand, silt, clay) • Soil profile • Horizons
5.2 Examine the relationship among soil characteristics, microflora, and environmental conditions	<ul style="list-style-type: none"> • Physical characteristics of soil
5.3 Analyze methods to control soil erosion	<ul style="list-style-type: none"> • Methods to control erosion
5.4 Analyze slope, erosion, and water movement in determining land capability, land use, and agricultural production	<ul style="list-style-type: none"> • Land use factors
5.5 Formulate appropriate soil management practices on various sites	<ul style="list-style-type: none"> • Soil management practices

STANDARD 7.0 ANALYZE PLANT SCIENCE PRINCIPLES

7.1 Describe plant anatomy and the functions of plant structures (e.g., root, stem, leaf, and flower)	<ul style="list-style-type: none"> • Root • Stem
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	<ul style="list-style-type: none"> • Leaf • Flower
7.2 Classify plants according to taxonomic systems, use, structure, and life span	<ul style="list-style-type: none"> • Taxonomy, classification • Annual, perennial, biannual • Monocot vs. Dicot • Agronomic, ornamental, horticultural
7.3 Describe basic factors in plant growth (e.g., light, water, climate, temperature, and nutrients)	<ul style="list-style-type: none"> • Light • Water • Climate • Temperature • Nutrients
7.4 Apply knowledge of plant physiology and energy conversion to plant systems (e.g., photosynthesis, respiration, and transpiration)	<ul style="list-style-type: none"> • Photosynthesis • Respiration • Transpiration
7.5 Describe plant life cycle stages (i.e., germination, root growth, pollination, fruit development, etc.)	<ul style="list-style-type: none"> • Germination • Root Growth • Pollination • Fruit development
7.6 Demonstrate plant germination, growth, and development	<ul style="list-style-type: none"> • Demonstrate plant growth
7.7 Investigate changes in growing conditions and the impact on plant growth and development (i.e., light, gravity, touch, water, heat, etc.)	<ul style="list-style-type: none"> • Factors of plant growth • Experimentation
STANDARD 8.0 DEMONSTRATE CONCEPTS OF PLANT MANAGEMENT	
8.1 Analyze the nutritional needs of plants	<ul style="list-style-type: none"> • Nitrogen, Phosphorus, Potassium (N-P-K) • Macronutrients • Micronutrients
8.2 Research common nutrient deficiency symptoms and treatment options (i.e., fertilizers, soil amendments, crop rotation, etc.)	<ul style="list-style-type: none"> • Deficiency symptoms and treatment • Soil amendments • Fertilizer • Crop rotations
8.3 Prepare grow media for use in plant systems (i.e., soil, water, vermiculite, coconut coir, etc.)	<ul style="list-style-type: none"> • Soil • Water (Hydroponics) • Vermiculite

	<ul style="list-style-type: none"> • Coconut Coir
8.4 Analyze soil conditions to make nutritional decisions (i.e., pH meter, soil test kits, soil probes, etc.)	<ul style="list-style-type: none"> • Soil moisture • pH • Soil probes
8.5 Implement a fertilization plan for specific plants or crops	<ul style="list-style-type: none"> • Fertilization plan
8.6 Investigate methods for sexual reproduction of plants (i.e., cross-pollination, scarification, stratification, etc.)	<ul style="list-style-type: none"> • Cross-pollination • Scarification • Stratification
8.7 Investigate methods for asexual reproduction of plants (i.e., propagation, grafting, layering, tissue culture, plant hormones, etc.)	<ul style="list-style-type: none"> • Propagation • Grafting • Layering • Tissue culture • Plant hormones
8.8 Demonstrate plant propagation techniques (e.g., sexual and asexual)	<ul style="list-style-type: none"> • Sexual reproduction • Asexual reproduction
8.9 Describe techniques to harvest, handle, and store crops according to current industry standards	<ul style="list-style-type: none"> • Harvesting and storage techniques for local crops
8.10 Create a sustainable management plan for plant production	<ul style="list-style-type: none"> • Sustainable management plan
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.)	<ul style="list-style-type: none"> • Common animal terminology
9.2 Classify animals according to taxonomic classification systems and use (e.g., agricultural and companion)	<ul style="list-style-type: none"> • Taxonomic classification • Agricultural • Companion
9.3 Differentiate among large stock, small stock, and companion animals	<ul style="list-style-type: none"> • Large stock • Small stock • Companion animals
9.4 Explain basic anatomy and external parts of production animals	<ul style="list-style-type: none"> • External parts

<p>9.5 Apply principles of comparative anatomy and physiology to use within animal systems (e.g., musculoskeletal, epidermis, nervous, circulatory, respiratory, urinary, endocrine, and reproductive)</p>	<ul style="list-style-type: none"> • Musculoskeletal • Epidermis (Integumentary) • Nervous • Circulatory • Respiratory • Urinary • Endocrine • Reproductive • Immune
<p>9.6 Describe a livestock animal’s digestive system (i.e., ruminant, monogastric, lagomorphs, hind-quarter digestion, etc.)</p>	<ul style="list-style-type: none"> • Ruminant vs. Monogastric • Modified Monogastric • Avian
<p>9.7 Describe the basic principles of animal welfare (e.g., water, food, proper handling, healthcare, facilities, and appropriate environment)</p>	<ul style="list-style-type: none"> • Animal handling • Animal health care
<p>STANDARD 10.0 DEMONSTRATE CONCEPTS OF ANIMAL MANAGEMENT</p>	
<p>10.1 Recognize animal behaviors to facilitate safely working with animals</p>	<ul style="list-style-type: none"> • Temple Grandin • Fight or Flight
<p>10.2 Investigate the nature and properties of food, fiber, and by-products from animals</p>	<ul style="list-style-type: none"> • Animal by-products
<p>10.3 Differentiate between major wholesale/retail meat cuts of beef, pork, lamb, and poultry and compare the value of various meat cuts</p>	<ul style="list-style-type: none"> • Wholesale vs. Retail Cuts
<p>10.4 Explore the use of alternative livestock in animal agriculture (i.e., antelope, elk, buffalo, alpacas, ostrich, deer, etc.)</p>	<ul style="list-style-type: none"> • Wildlife management • Aquaculture
<p>10.5 Analyze the nutritional roles and needs of animals</p>	<ul style="list-style-type: none"> • Animal nutrition
<p>10.6 Analyze feed rations to meet the nutritional needs of animals</p>	<ul style="list-style-type: none"> • Feedstuffs • Pearson Square
<p>10.7 Develop a plan to treat animal ailments</p>	<ul style="list-style-type: none"> • Disease prevention/identification • Virus vs. Bacteria (Vaccinations vs. Antibiotics)
<p>10.8 Differentiate among animal selection, reproduction, breeding, and genetics</p>	<ul style="list-style-type: none"> • Understand different selection, breeding and genetic processes

10.9 Demonstrate animal selection based on reproduction, breeding, and genetics	<ul style="list-style-type: none"> • Pedigrees • Expected Progeny Differences (EPD) • Breeding programs
10.10 Explore how animals are evaluated for breeding readiness and soundness	<ul style="list-style-type: none"> • Breeding characteristics • Ages • Health • Weight • Nutrition
10.11 Create a sustainable reproduction management plan	<ul style="list-style-type: none"> • Breeding management plan
10.12 Demonstrate proper methods to clean and disinfect animal equipment and facilities	<ul style="list-style-type: none"> • Methods to clean and disinfect
10.13 Demonstrate proper use of animal medications following established withdrawal protocols	<ul style="list-style-type: none"> • Animal medication labels
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.)	<ul style="list-style-type: none"> • Agricultural pests and damage left to plants/animals
11.2 Identify pest control methods used to manage pest damage (i.e., cultural, mechanical, biological, chemical, etc.)	<ul style="list-style-type: none"> • Cultural • Mechanical • Biological • Chemical
11.3 Evaluate economic impact of pests on production	<ul style="list-style-type: none"> • Money lost • Pesticide usage
11.4 Discuss biosecurity measures utilized to protect the welfare of animals on a local, state, national, and global level	<ul style="list-style-type: none"> • Biosecurity measures
11.5 Read and interpret pesticide labels	<ul style="list-style-type: none"> • Pesticide labels
11.6 Investigate safe pesticide application practices	<ul style="list-style-type: none"> • Proper pesticide handling
11.7 Apply pesticides safely according to good manufacturing practices (GMPs)	<ul style="list-style-type: none"> • SDS procedures

Domain 3: Agricultural Business**Instructional Time: 10-20%****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.)	<ul style="list-style-type: none">• Business terminology• Entrepreneurship vs. Placement• Sole-proprietor vs. Corporation
15.2 Differentiate between macro- and micro-economics	<ul style="list-style-type: none">• Macroeconomics vs. Microeconomics
15.3 Identify financial records important to business management	<ul style="list-style-type: none">• Balance Sheet• Inventory
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.]	<ul style="list-style-type: none">• AET• Record keeping
15.5 Analyze business records and record-keeping procedures	<ul style="list-style-type: none">• Profit vs. Loss
15.6 Identify tax structure of agricultural business (i.e., property tax, intangible taxes, income taxes, etc.)	<ul style="list-style-type: none">• Property tax• Intangible taxes• Income tax
15.7 Apply the decision-making process for budgeting issues	<ul style="list-style-type: none">• Wants vs. Needs• Risk analysis
15.8 Identify methods of obtaining capital resources	<ul style="list-style-type: none">• Loans• Grants• Subsidies
15.9 Explain the purposes and structures of contracts, leases, deeds, and insurance policies	<ul style="list-style-type: none">• Liability• Risk management
15.10 Compare types of markets and influence factors (i.e., commodity markets, foreign markets, competition, etc.)	<ul style="list-style-type: none">• Commodity markets• Foreign markets• Competition
15.11 Identify methods of managing risk	<ul style="list-style-type: none">• Accept, Avoid, Transfer, Mitigate, Exploit
15.12 Describe the purpose and importance of marketing	<ul style="list-style-type: none">• Marketing and communications

15.13 Develop a marketing plan	<ul style="list-style-type: none"> • Marketing plan
15.14 Create a business plan	<ul style="list-style-type: none"> • Business plan`

Domain 4: Agricultural Mechanics Instructional Time: 5-10%	
STANDARD 13.0 APPLY PRACTICES AND PROCEDURES FOR PLANNING, BUILDING, AND MAINTAINING STRUCTURES	
13.1 Identify legal land descriptions	<ul style="list-style-type: none"> • Legal land descriptions • Township, section, baseline, meridian
13.2 Investigate techniques used to survey land	<ul style="list-style-type: none"> • Surveying Techniques: laser, manual, drone
13.3 Create sketches and plans for structures	<ul style="list-style-type: none"> • Sketches and plans for structures
13.4 Determine structural requirements, specifications, and estimate costs for structures (i.e., bill of materials)	<ul style="list-style-type: none"> • Bill of materials • Measurements
13.5 Follow architectural and mechanical plans to construct, maintain, and/or repair agricultural structures (e.g., material selection, site preparation and/or layout, plumbing, concrete/masonry, electrical wiring, and wood fabrication)	<ul style="list-style-type: none"> • Material selection • Site preparation and/or layout • Plumbing • Concrete/Masonry • Electrical wiring • Wood fabrication
13.6 Design animal, plant, and mechanical facilities including equipment	<ul style="list-style-type: none"> • Design livestock facilities • Landscape design
13.7 Manage basic facility maintenance, installation, or repair	<ul style="list-style-type: none"> • Facilities maintenance and repair
STANDARD 14.0 DEMONSTRATE OPERATION OF TOOLS, EQUIPMENT, AND INSTRUMENTS	
14.1 Demonstrate safe operating instructions and procedures as recommended by the manufacturer	<ul style="list-style-type: none"> • Owner's manual • Shop safety procedures
14.2 Utilize service manuals to perform preventative maintenance and determine scheduled service on tools, equipment, and instruments, including small engines	<ul style="list-style-type: none"> • Preventative maintenance

14.3 Maintain hand tools and power equipment (i.e., hand saws, power saws, welders, leaf blowers, etc.)	<ul style="list-style-type: none"> • Sharpening blades
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.)	<ul style="list-style-type: none"> • Metal fabrication processes
14.5 Demonstrate a variety of wood fabrication and finishing processes	<ul style="list-style-type: none"> • Wood fabrication processes
14.6 Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods	<ul style="list-style-type: none"> • Electrical systems diagnostics and repair • Basic electricity
14.7 Utilize manufacturers' guidelines to diagnose, troubleshoot, and repair machinery, equipment, and power source systems (i.e., hydraulic, pneumatic, transmission, steering, suspension, etc.)	<ul style="list-style-type: none"> • Machinery repair

