Agricultural Science and Technology Standards

FINAL

Approved on January 9, 2004

AGRICULTURAL SCIENCE AND TECHNOLOGY STANDARDS

Standard I. The agricultural science and technology teacher understands the foundations of agricultural education and applies procedures and practices to ensure the safety of all students in the classroom, laboratory, field, and supervised agricultural experience (SAE).

Standard II. The agricultural science and technology teacher knows how to advise and assist students in career planning and development, work with community and industry representatives to support the agricultural program, and promote student development through supervised agricultural experiences, leadership development, and student organizations (e.g., FFA).

Standard III. The agricultural science and technology teacher understands and applies principles of economics and business management in agricultural enterprises.

Standard IV. The agricultural science and technology teacher understands plant and soil science and applies principles and methods used in plant production and management.

Standard V. The agricultural science and technology teacher understands animal science and applies principles and methods used in animal production and management.

Standard VI. The agricultural science and technology teacher understands and applies principles and methods of agricultural mechanics, construction, and related technologies.

Standard VII. The agricultural science and technology teacher has a basic understanding of biotechnology and genetic engineering and understands the use of computers and related technologies in agricultural production and management.

Standard VIII. The agricultural science and technology teacher understands and applies knowledge of environmental systems, natural resource management, and the effects of agriculture on the environment.

Standard I. **The agricultural science and technology teacher understands the foundations of agricultural education and applies procedures and practices to ensure the safety of all students in the classroom, laboratory, field, and supervised agricultural experience (SAE).**

Teacher Knowledge: What Teachers Know

Teachers of Students in Grades 8–12

The beginning teacher knows and understands:

1.1k the philosophy and goals of agricultural education;

1.2k the scope of agriculture and its effects on society (e.g., the impact of mechanization on world agriculture);

1.3k significant historical events and current developments in agriculture and natural resource utilization;

1.4k concepts and terms used in agriculture and agricultural education;

1.5k sources of information about agriculture, agricultural education, and agricultural careers;

1.6k scientific principles and methods relevant to agriculture;

1.7k ethical and legal issues related to agricultural education (e.g., ethical treatment of animals, liability for accidental injury);

1.8k personal and occupational safety practices, including basic first aid, used in the agricultural classroom, lab, field, and SAE;

1.9k the proper use, storage, and disposal of hazardous materials (e.g., chemicals, petroleum products, biological waste products) used in the agricultural classroom, lab, field, and SAE;

1.10k sources of safety-related information (e.g., Material Safety Data Sheets, emergency response procedures); and

1.11k federal, state, and local safety regulations and agencies responsible for maintaining safety in the agricultural classroom, lab, field, and SAE.

Application: What Teachers Can Do

Teachers of Students in Grades 8–12

The beginning teacher is able to:

1.1s describe major areas of agricultural research and development;

1.2s apply procedures for selecting and maintaining equipment, materials, and technology used in the agricultural classroom, lab, field, and SAE;

1.3s instruct students in the proper and safe use of materials, tools, and instruments, and monitor students' behavior;

1.4s develop and implement a safety plan for the agricultural classroom, lab, field, and SAE;

1.5s apply strategies for incorporating safety training into the agricultural education program;

1.6s identify potential hazards in the agricultural classroom, lab, field, and SAE; and

1.7s apply procedures for responding to accidents, including first aid.

***Standard II*. The agricultural science and technology teacher knows how to advise and assist students in career planning and development, work with community and industry representatives to support the agricultural program, and promote student development through supervised agricultural experiences, leadership development, and student organizations (e.g., FFA).**

Teacher Knowledge: What Teachers Know	**Application: What Teachers Can Do**
Teachers of Students in Grades 8–12	***Teachers of Students in Grades 8–12***
The beginning teacher knows and understands:	The beginning teacher is able to:
2.1k characteristics and functions of agricultural advisory committees;	2.1s organize and work effectively with agricultural advisory committees;
2.2k career development and entrepreneurship opportunities in the field of agriculture/agribusiness;	2.2s apply strategies for career planning and development;
2.3k the characteristics of a successful worker in modern agriculture and the knowledge and skills necessary for various careers in agriculture;	2.3s coordinate supervised agricultural experience (SAE);
2.4k employers' expectations, appropriate work habits, and good citizenship skills relevant to agricultural employment;	2.4s assist students in planning, implementing, and managing their SAE;
2.5k procedures for applying for, obtaining, and maintaining employment in agriculture and related fields;	2.5s apply procedures for maintaining accurate records, assessing student progress, and evaluating the effectiveness of SAE;
2.6k goals and purposes of supervised agricultural experience (SAE) and relationships among the agricultural classroom, lab, field, and SAE;	2.6s apply strategies for encouraging student participation in student leadership development organizations;
2.7k legal and ethical issues related to SAE (e.g., child labor laws, validation issues);	2.7s advise and develop a basic program of activities for a student leadership development organization (e.g., FFA);
2.8k characteristics of various types of SAE (e.g., cooperative education, entrepreneurship, mentoring);	2.8s apply democratic principles to conduct effective meetings of a student leadership development organization (e.g., FFA, 4-H); and
2.9k characteristics, functions, and organizational structure of student leadership development organizations (e.g., FFA, 4-H);	2.9s plan, organize, and conduct career development events (CDEs) and leadership development events (LDEs).
2.10k roles and responsibilities of advisors to student leadership development organizations; and	

***Standard II*. The agricultural science and technology teacher knows how to advise and assist students in career planning and development, work with community and industry representatives to support the agricultural program, and promote student development through supervised agricultural experiences, leadership development, and student organizations (e.g., FFA).**

Teacher Knowledge: What Teachers Know ***Teachers of Students in Grades 8–12 (continued)*** 2.11k parliamentary procedure and strategies for conducting effective meetings of a student leadership development organization.	

Standard III. **The agricultural science and technology teacher understands and applies principles of economics and business management in agricultural enterprises.**

Teacher Knowledge: What Teachers Know	**Application: What Teachers Can Do**
Teachers of Students in Grades 8–12	***Teachers of Students in Grades 8–12***
The beginning teacher knows and understands:	The beginning teacher is able to:
3.1k key economic principles (e.g., risk, supply and demand, value added) in agricultural business;	3.1s apply knowledge of work-related and business-related ethics;
3.2k agriculture-related agencies (local, state, and federal) and major laws and regulations affecting agricultural businesses;	3.2s apply steps for decision making and problem solving in agricultural businesses;
3.3k the role of entrepreneurship in agriculture;	3.3s apply knowledge of economic principles and government policies and regulations to business-related decision making;
3.4k basic organizational structures in agricultural businesses;	3.4s describe types and characteristics of budgets used in agricultural businesses;
3.5k basic principles and methods of financial management in agricultural businesses (e.g., budgeting, obtaining credit, keeping records);	3.5s use appropriate computer hardware and software applications (e.g., spread-sheet, database, communications) for agriculture-related tasks;
3.6k global trends in food and fiber production, processing, distribution, and demand; and	3.6s apply strategies for managing a culturally diverse workforce and for ensuring respect for diversity in the workplace;
3.7k factors that influence the pricing and sale of agricultural goods and services.	3.7s recognize the impact of world markets on U.S. and Texas agriculture; and
	3.8s analyze factors that influence consumer behavior (e.g., socioeconomic status, culture, age, gender).

***Standard IV*. The agricultural science and technology teacher understands plant and soil science and applies principles and methods used in plant production and management.**

Teacher Knowledge: What Teachers Know

Teachers of Students in Grades 8–12

The beginning teacher knows and understands:

4.1k the nature and properties of soil, processes of soil formation, and the importance of various soil constituents for plant growth;

4.2k methods and procedures for improving the quality of soil (e.g., adding fertilizers, lime, and organic matter; mulching);

4.3k the importance of conserving soil, methods of soil conservation, and practices that reduce soil erosion (e.g., strip planting, contour plowing);

4.4k characteristics, advantages, and disadvantages of various methods of tillage and seedbed preparation;

4.5k the structure and function of plant parts (e.g., flowers, leaves, roots, stems);

4.6k physiological processes in plants (e.g., photosynthesis, respiration, transpiration, transport);

4.7k processes of plant reproduction and principles of plant genetics;

4.8k principles and methods used in the sexual and asexual propagation of plants;

4.9k the effects of various environmental factors (e.g., soil characteristics, light intensity, day length, temperature) on plant growth and development;

4.10k principles of plant production and management (e.g., soil preparation, water management, crop rotation);

4.11k principles and methods of disease, insect, and weed control (e.g., integrated pest management, chemical control, biological control);

Application: What Teachers Can Do

Teachers of Students in Grades 8–12

The beginning teacher is able to:

4.1s identify the components of soil, describe the physical and chemical properties of soils, and classify different types of soil;

4.2s apply knowledge of procedures for performing and interpreting basic soil tests (e.g., nutrient, organic content, pH) and for evaluating the suitability of different types of soil for production of various crops;

4.3s apply knowledge of different types and formulations of fertilizers and other soil treatments;

4.4s classify plants and identify distinguishing features of major plant groups (e.g., monocots and dicots);

4.5s apply knowledge of principles, methods, and techniques of selective breeding and hybridization of plants;

4.6s apply knowledge of techniques for propagating plants sexually (e.g., pollination, seed collection, germination) and asexually (e.g., cell cultures, budding, division);

4.7s identify types, varieties, characteristics, and uses of agriculturally important plants grown in Texas and the United States;

4.8s apply knowledge of methods and techniques used for crop production and management (e.g., selecting, planting, irrigating, fertilizing, pruning, harvesting, storing) and for propagating, transplanting, growing, and maintaining greenhouse and nursery plants;

4.9s demonstrate knowledge of common nutrient deficiencies, diseases, weeds, and insect pests that affect crops;

***Standard IV*. The agricultural science and technology teacher understands plant and soil science and applies principles and methods used in plant production and management.**

Teacher Knowledge: What Teachers Know	**Application: What Teachers Can Do**
Teachers of Students in Grades 8–12 (continued)	***Teachers of Students in Grades 8–12 (continued)***
4.12k basic methods for managing the greenhouse and nursery environment (e.g., controlling temperature, moisture, humidity);	4.10s demonstrate a basic knowledge of integrated pest management and the safe handling of pest management materials;
4.13k basic principles of landscape design and management;	4.11s apply knowledge of procedures for planning, establishing, and maintaining landscapes;
4.14k basic principles of floral design, including the preparation, handling, and storage of flowers;	4.12s apply knowledge of basic procedures for planning and creating floral designs; and
4.15k basic principles and procedures for aquaculture production systems; and	4.13s apply knowledge of basic USDA regulations and procedures for grading, packing, storing, and marketing edible plant products (e.g., fruits, nuts, vegetables).
4.16k basic principles of identifying and processing edible plant products, including relevant laws and regulations.	

Standard V. **The agricultural science and technology teacher understands animal science and applies principles and methods used in animal production and management.**

Teacher Knowledge: What Teachers Know	**Application: What Teachers Can Do**
Teachers of Students in Grades 8–12	***Teachers of Students in Grades 8–12***
The beginning teacher knows and understands:	The beginning teacher is able to:
5.1k the characteristics and uses of various breeds and types of animals of major economic importance in the United States;	5.1s analyze trends in the consumption of animal products (e.g., meat, poultry, fish, eggs, dairy products) in Texas and the United States and health issues related to the consumption of animal products;
5.2k the anatomy of major organs and organ systems (e.g., respiratory, digestive, skeletal, muscular) in various animals (e.g., cattle, horses, swine, poultry);	5.2s apply knowledge of animal nutrition (e.g., sources of nutrients, classes of feeds, feed additives) and feeding practices (e.g., formulating rations, issues of feed quality, feeding schedules);
5.3k physiological processes (e.g., digestion, respiration, circulation) in various animals;	5.3s apply principles of genetics (e.g., EPDs, progeny data, trait selection) to selective breeding of animals;
5.4k stages and processes of growth and development in various animals;	5.4s apply knowledge of natural and artificial animal breeding practices (e.g., controlling mating, artificial insemination) and current technologies used in animal reproduction (e.g., embryo transfer);
5.5k basic nutritional requirements of animals;	5.5s evaluate breeding animals using various data (e.g., performance testing, production records, progeny testing, visual appraisal);
5.6k basic principles of animal reproduction and selective breeding;	5.6s identify signs, symptoms, and effects of common animal diseases, disorders, parasites, and nutritional deficiencies;
5.7k guidelines for making decisions about purchasing, selling, and culling individual animals;	5.7s demonstrate general knowledge of animal management procedures (e.g., immunizing, taking vital signs, restraining, medicating, common surgical procedures);
5.8k common nutrient deficiencies, diseases, insect pests, and genetic disorders of animals and methods of disease control, treatment, and prevention;	5.8s apply knowledge of appropriate environmental conditions (e.g., bedding, space, sanitation) for various types of animal facilities;
5.9k the care and safe handling of animals throughout the life cycle, and legal and ethical aspects of animal care and well-being;	5.9s analyze factors affecting meat palatability, identify differences between wholesale and retail cuts of meat, and describe meat processing techniques;
5.10k normal and abnormal behavior in various animals and its relationship to animal management;	
5.11k different types, characteristics, and purposes of animal facilities (e.g., barns, feedlots);	

Standard V. **The agricultural science and technology teacher understands animal science and applies principles and methods used in animal production and management.**

Teacher Knowledge: What Teachers Know	**Application: What Teachers Can Do**
Teachers of Students in Grades 8–12 (continued)	***Teachers of Students in Grades 8–12 (continued)***
5.12k appropriate environmental conditions (e.g., lighting, temperature, humidity) for housing various animals and methods of environmental control; 5.13k environmental issues associated with animal facilities and basic procedures for managing animal waste and maintaining sanitation; 5.14k basic principles of livestock harvesting, including the preparation and grading of carcasses; and 5.15k basic principles of processing edible animal products (e.g., meat, poultry, fish, eggs, dairy products), including relevant laws and regulations.	5.10s apply knowledge of basic methods for processing milk and dairy products; 5.11s describe basic sanitation procedures for handling, processing, and packaging edible animal products; and 5.12s identify basic U.S. Department of Agriculture (USDA) regulations and procedures for inspecting, grading, packaging, and labeling edible animal products.

Standard VI. **The agricultural science and technology teacher understands and applies principles and methods of agricultural mechanics, construction, and related technologies.**

Teacher Knowledge: What Teachers Know	**Application: What Teachers Can Do**
Teachers of Students in Grades 8–12	***Teachers of Students in Grades 8–12***
The beginning teacher knows and understands:	The beginning teacher is able to:
6.1k safety regulations, policies, and basic procedures related to agricultural mechanics, construction, and related technologies;	6.1s identify and use personal safety equipment, and identify hazards and safety needs in the home and workplace;
6.2k basic terms and principles related to simple machines, force, work, power, and electronics (e.g., volts, watts, amperes) as they apply to agriculture;	6.2s identify and select common tools, machinery, and equipment used in agriculture, and demonstrate knowledge of techniques for their proper inspection, maintenance, and storage;
6.3k the design, components, and basic principles of operation of internal combustion engines and related power systems used in agriculture;	6.3s demonstrate knowledge of the safe and proper operation of agricultural tools, machinery, and equipment;
6.4k the design, components, and basic principles of operation of electric circuits, motors, sensors, and control devices;	6.4s service, troubleshoot, and maintain internal combustion engines, machinery and power equipment, and related systems (e.g., brake, hydraulic, cooling, lubricating, electronic);
6.5k basic principles and techniques for cutting, shaping, and joining metal for agricultural applications;	6.5s demonstrate knowledge of basic wiring procedures used in agriculture;
6.6k basic principles and techniques for planning and constructing agricultural structures and enclosures;	6.6s identify commonly used metals, their properties, and their uses in agriculture, and safely perform basic metalworking procedures (e.g., cutting, filing, shaping, drilling, soldering, welding);
6.7k the role of agricultural water supply and sanitation systems;	6.7s apply knowledge of basic procedures for planning construction of agricultural structures and enclosures (e.g., locating sites, drawing plans, estimating materials and costs);
6.8k basic principles of heating and cooling systems; and	6.8s apply knowledge of basic construction skills (e.g., carpentry, masonry, painting) used to build agricultural structures and enclosures; and
6.9k basic principles and techniques of land measurement, leveling, and irrigation systems.	6.9s apply knowledge of basic plumbing methods, tools, and materials.

Standard VII. **The agricultural science and technology teacher has a basic understanding of biotechnology and genetic engineering and understands the use of computers and related technologies in agricultural production and management.**

Teacher Knowledge: What Teachers Know	**Application: What Teachers Can Do**
Teachers of Students in Grades 8–12	***Teachers of Students in Grades 8–12***
The beginning teacher knows and understands:	The beginning teacher is able to:
7.1k basic applications of biotechnology in agriculture (e.g., cold tolerance and herbicide resistance in plants);	7.1s demonstrate an understanding of basic laboratory techniques used in biotechnology;
7.2k basic principles of cell biology;	7.2s apply basic principles of DNA fingerprinting to genome mapping and marker-assisted selection and identification of crops and livestock;
7.3k basic principles of tissue culture and genetic engineering;	7.3s access and use digital information databases (e.g., Dairy Herd Improvement Association database, pedigree records, production records, Internet resources);
7.4k social, economic, environmental, ethical, and legal issues in biotechnology;	7.4s apply appropriate technologies to crop production and management (e.g., measure crop yields, automatically monitor and control humidity in greenhouses and irrigation systems); and
7.5k the use of technological systems in agricultural record keeping (e.g., milk production records, breeding records, nutrient management); and	7.5s apply appropriate technologies to animal production and management (e.g., monitor production of milk and eggs, identify individual animals using chip implants, monitor and control temperature in barns, formulate livestock rations).
7.6k the use of technological systems in crop production and management (e.g., Global Positioning Systems [GPS], Geographic Information Systems [GIS]).	

Standard VIII. **The agricultural science and technology teacher understands and applies knowledge of environmental systems, natural resource management, and the effects of agriculture on the environment.**

Teacher Knowledge: What Teachers Know

Teachers of Students in Grades 8–12

The beginning teacher knows and understands:

8.1k basic ecological principles and concepts (e.g., habitat, carrying capacity, ecological succession);

8.2k laws, regulations, and ethical issues relating to the use and management of the environment and natural resource systems (e.g., landowner property rights, stewardship);

8.3k roles and responsibilities of government agencies and public service organizations in relation to environmental conservation and management (e.g., underground water districts, Natural Resource Conservation Service [NRCS], boards of conservation);

8.4k factors affecting the availability of natural resources and the effects of resource availability on agriculture;

8.5k the interdependence of agriculture and the environment;

8.6k the impacts of agriculture on land, air, and water resources and quality;

8.7k basic principles and methods related to land, water, and air management and conservation and the sustainable use of resources;

8.8k characteristics and management of agricultural ecosystems (e.g., cultivated land, rangeland, forest land, wetlands); and

8.9k basic principles and methods of agricultural recreation management (e.g., forest, fish, wildlife).

Application: What Teachers Can Do

Teachers of Students in Grades 8–12

The beginning teacher is able to:

8.1s apply basic knowledge of environmental systems and cycles;

8.2s apply knowledge of various types of renewable and nonrenewable natural resources (e.g., energy, land, water);

8.3s apply knowledge of methods of conservation (e.g., energy efficiency, use of alternative fuels, recycling, runoff control, erosion control);

8.4s develop basic environmental management plans (e.g., air, land, water);

8.5s analyze the importance of habitat conservation;

8.6s apply knowledge of agricultural sources of pollution and analyze costs and benefits of reducing pollution; and

8.7s apply knowledge of causes of soil erosion and analyze costs and benefits of reversing environmental degradation.