NEW YORK STATE TEACHER
CERTIFICATION EXAMINATIONS™

FIELD 068: AGRICULTURE
TEST DESIGN AND FRAMEWORK

September 2014

Authorized for Distribution by the New York State Education Department

This test design and framework document is designed to provide information about the content and format of a test for the New York State Teacher Certification Examinations™ (NYSTCE®) program. Education faculty and administrators at teacher preparation institutions may also find the information in this framework useful as they discuss the test with candidates. All test components may differ from those presented here. Furthermore, review of this framework, in whole or in part, does not guarantee an increased likelihood of success on any of the New York State Teacher Certification Examinations. The NYSTCE program is subject to change at the sole discretion of the New York State Education Department, and any changes will fully supersede the information presented in this document. As a reminder, candidates are responsible for contacting their certification officer(s) regarding any changes to the New York State Teacher Certification Examinations.

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TEST DESIGN

This test consists of selected-response items measuring content knowledge and one extended constructed-response item measuring pedagogical content knowledge. The constructed-response item is scenario-based and requires candidates to describe an instructional strategy to help students achieve a specific learning goal or an instructional intervention to address a specific learning difficulty and to provide a rationale for employing that instructional strategy or intervention.

The selected-response items count for 80% of the total test score and the constructed-response item counts for 20% of the total test score, as indicated in the table that follows. Each selected-response item counts the same toward the total test score. The percentage of the total test score derived from the constructed-response item is also indicated in the table that follows.

The total testing time is 195 minutes. Candidates are free to set their own pace during the test administration. The following estimates were used to determine the total test time:

- The constructed-response item is designed with the expectation of a response up to 60 minutes.

- The selected-response items are designed with the expectation of response time up to 135 minutes.

Further information regarding the content of each competency can be found in the test framework.

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Competency	Selected-Response		Constructed-Response	
	Approximate Number of Items	Approximate Percentage of Test Score	Number of Items	Approximate Percentage of Test Score
0001 Foundations of Agricultural Education	12	10%	--	--
0002 Agricultural Business	11	10%	--	--
0003 Animal Science	11	10%	--	--
0004 Plant Science	11	10%	--	--
0005 Food Systems, Science, and Safety	11	10%	--	--
0006 Genetics and Biotechnology	11	10%	--	--
0007 Agricultural Technology and Mechanics	11	10%	--	--
0008 Environmental Science and Natural Resource Management	12	10%	--	--
0009 Pedagogical Content Knowledge	--	--	1	20%
Total	**90**	**80%**	**1**	**20%**

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Foundations of Agricultural Education
Agricultural Business
Animal Science
Plant Science
Food Systems, Science, and Safety
Genetics and Biotechnology
Agricultural Technology and Mechanics
Environmental Science and Natural Resource Management
Pedagogical Content Knowledge

The New York State agriculture teacher has the knowledge and skills necessary to teach effectively in New York State public schools. The teacher has a deep understanding of concepts, principles, and methods related to agribusiness; animal, plant, and soil science; agricultural production systems; food science; agricultural technology; environmental science; and the sustainable management of natural resources. The teacher is committed to the agricultural education model, consisting of classroom and laboratory learning, participation in a Supervised Agricultural Experience (SAE), and membership and participation in the National FFA Organization (FFA), and understands how these elements complement each other to provide a total program approach to agricultural education.

COMPETENCY 0001—FOUNDATIONS OF AGRICULTURAL EDUCATION

<u>Performance Expectations</u>

The New York State agriculture teacher knows the agricultural education model and understands how classroom and laboratory learning, SAEs, and participation in FFA contribute to student learning. The teacher knows the place of agriculture in history and modern society and understands legal and ethical issues. The teacher has a deep understanding of safety issues in agricultural education and is able to provide information to students about agricultural careers and pathways for career development.

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<u>Performance Indicators</u>

    a. demonstrates an understanding of major historical developments in agriculture, career and technical education, and FFA

    b. demonstrates knowledge of the role of agriculture and related agricultural organizations in the world, including economic, environmental, social, legal, and ethical issues

    c. applies principles and practices for ensuring the safety of students in the classroom, laboratory, and SAE

    d. applies methods and principles of mathematics, science, and literacy in agriculture and agricultural education in accordance with state and national standards

    e. identifies the diversity of career pathways in agriculture and the skills, knowledge, and aptitudes necessary for college and career readiness

    f. demonstrates an understanding of types, characteristics, and goals of SAEs and how they contribute to the overall agricultural education program

    g. demonstrates an understanding of the roles of teachers in helping students select and complete their SAEs, including tracking their progress, evaluating their success, and helping them use their SAE to further their career goals

    h. demonstrates an understanding of the purposes and goals of State and National FFA Organizations and the role of local FFA chapters in helping students develop leadership, personal growth, and career success

    i. demonstrates knowledge of the organizational structure of local, state, and national FFA, roles of student officers in a local FFA chapter, and the use of parliamentary procedure in an FFA meeting

    j. demonstrates an understanding of the roles of the advisor to an FFA chapter and strategies for assisting students in developing a Program of Activities (POA), encouraging participation in community service projects, and facilitating students' participation in FFA Career Development Events (CDEs) at the local, regional, state, and national levels

    k. demonstrates knowledge of total program development, including the importance of the role of an advisory board in assisting in the development, support, and partnership of key community agricultural leaders

COMPETENCY 0002—AGRICULTURAL BUSINESS

<u>Performance Expectations</u>

The New York State agriculture teacher understands the factors, principles, methods, and skills that apply to managing an agricultural enterprise, including budgeting, risk management, record keeping, effective communication, the use of technology, laws and legal issues, and marketing.

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Performance Indicators

    a. applies business management principles, functions (e.g., leading, controlling), and skills (e.g., time management skills, teamwork skills) to agricultural enterprises

    b. demonstrates knowledge of the various types of business ownership and the steps involved in developing a business plan

    c. applies knowledge of financial and risk management in business, including accounting principles, credit management, insurance, budgeting, record keeping, and the optimal allocation of business assets

    d. applies principles, methods, and techniques of communicating effectively in an agricultural enterprise

    e. demonstrates knowledge of economic principles and concepts (e.g., competition, supply and demand, opportunity costs) and their application to agricultural enterprises

    f. identifies factors of production (e.g., land, labor, capital, management) used in agricultural enterprises and strategies used in agricultural production planning (e.g., forecasting)

    g. demonstrates knowledge of concepts, principles, and skills for marketing agricultural products locally, regionally, nationally, and globally

    h. applies knowledge of the use of technology in agricultural record keeping, production, and information management

    i. recognizes environmental, social, legal, and ethical issues in agriculture and government agencies, laws, and policies affecting agricultural enterprises

COMPETENCY 0003—ANIMAL SCIENCE

Performance Expectations

The New York State agriculture teacher understands the importance of following sound practices of animal care and management and understands the science (e.g., anatomy, physiology, reproduction, nutrition, behavior) of production and companion animals. The teacher demonstrates knowledge of how environmental, social, legal, and ethical issues affect animal management and understands appropriate practices for the care and handling of animals.

Performance Indicators

    a. demonstrates knowledge of animal classification, the uses of various species and breeds of animals, and principles for evaluating and selecting animals

    b. demonstrates knowledge of animal anatomy and physiology and how they interrelate

    c. demonstrates an understanding of animal behaviors and their importance in safely handling, caring for, and managing animals

    d. demonstrates knowledge of animal reproduction (e.g., anatomy and physiology, breeding cycles, reproductive behavior) and breeding practices

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    e.   demonstrates knowledge of animal nutrition (e.g., nutrients and their function, nutrient sources, nutrient requirements in various species through the life cycle), characteristics of feed types (e.g., roughages, concentrates, complete ration), and feeding practices for production and companion animals

    f.   applies principles of effective animal health care and veterinary practices, including knowledge of types, causes, symptoms, treatment, control, and prevention of common animal diseases and parasites

    g.   demonstrates knowledge of environmental factors affecting animal production (e.g., types and characteristics of housing, temperature, light) and practices for handling animal wastes (e.g., lagoon systems) and minimizing contamination of the environment

    h.   demonstrates an understanding of environmental, social, legal, and ethical issues (e.g., animal welfare, Concentrated Animal Feeding Operations [CAFOs]) in animal care and management

COMPETENCY 0004—PLANT SCIENCE

Performance Expectations

The New York State agriculture teacher understands the importance of following sound practices of plant care and management and understands the science (e.g., anatomy, physiology, reproduction, nutrition) of agronomic and horticultural plants. The teacher demonstrates knowledge of the characteristics, science, and management of soil or other growing media. The teacher demonstrates knowledge of environmental, social, legal, and ethical issues related to plant science.

Performance Indicators

    a.   recognizes plant classification and characteristics of types (e.g., field, tree, forage, vegetable, ornamental) of plants grown in New York State

    b.   demonstrates knowledge of plant anatomy (e.g., cells, tissues) and physiology (e.g., photosynthesis, respiration, transport) and how they interrelate

    c.   demonstrates an understanding of asexual and sexual reproduction in plants, environmental factors that affect plant reproduction and growth (e.g., soil moisture, light, tropisms), and methods of plant propagation

    d.   applies knowledge of plant nutrition (e.g., nutrients and their functions, nutrient sources, deficiency symptoms) and types, formulations, and safe uses of fertilizers

    e.   demonstrates knowledge of major plant diseases (e.g., types, characteristics, causes, symptoms, treatments) and pests (e.g., types, characteristics, detection) and methods for their prevention and control, including integrated pest management

    f.   demonstrates knowledge of constituents (e.g., sand, clay, silt), characteristics (e.g., texture, structure), and properties (e.g., fertility, drainage) of soil types and how the physical characteristics of soil affect land use classification and selection of crops

g. demonstrates an understanding of soil management and conservation practices (e.g., low-till, no-till, cover cropping), soil water control (e.g., drainage, mulching, irrigation), and methods of soil testing (e.g., nutrients, pH)

h. demonstrates knowledge of methods, equipment, and techniques for production and management of crops (e.g., field, forage, vegetable, fruit, nut) using various systems (e.g., greenhouse, agronomic, landscape, hydroponic, nursery)

i. demonstrates knowledge of techniques, equipment, and facilities for safe production, harvesting, handling, and processing of plant products

j. demonstrates an understanding of environmental, social, legal, and ethical issues affecting plant science and crop production

COMPETENCY 0005—FOOD SYSTEMS, SCIENCE, AND SAFETY

Performance Expectations

The New York State agriculture teacher understands food systems, the science and techniques of food processing, and issues related to food safety. The teacher demonstrates knowledge of types and sources of contaminants, how food is inspected and graded, and practices to ensure food safety. The teacher understands the relationship between food and nutrition and how agricultural products are processed, preserved, and stored.

Performance Indicators

a. demonstrates knowledge of the composition and nutritional value of various foods and food groups and their importance in the human diet

b. demonstrates knowledge of criteria used to evaluate, assess, and grade meat, eggs, vegetables, and other food products

c. demonstrates knowledge of contaminants that can affect food safety (e.g., microbes, heavy metals, pesticide residues), sources of contamination, and effects on consumers of ingesting contaminated food

d. demonstrates an understanding of practices for ensuring food safety in producing, processing, handling, and distributing food, including quality-assurance procedures such as Good Agricultural Practices (GAP) and Hazard Analysis & Critical Control Points (HACCP)

e. demonstrates knowledge of methods and techniques for harvesting, storing, processing, and preserving food products to extend shelf life, reduce deterioration, and control ripening

f. demonstrates knowledge of basic methods and techniques used in food production (e.g., dairy products, fermented products, maple syrup)

g. demonstrates knowledge of government agencies, laws, regulations, and policies relating to food quality, food safety, and product labeling

h. demonstrates an understanding of environmental, social, legal, and ethical issues related to food systems, science, and safety

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COMPETENCY 0006—GENETICS AND BIOTECHNOLOGY

<u>Performance Expectations</u>

The New York State agriculture teacher understands genetics, evolution, and selection processes and their application to animal and plant breeding. The teacher understands fundamental biotechnology methods, applications, and issues and demonstrates knowledge of the role of biotechnology in agriculture.

<u>Performance Indicators</u>

    a. demonstrates an understanding of cell division and the differences between meiosis and mitosis and their products

    b. demonstrates an understanding of the structure and function of DNA, RNA, genes, and chromosomes

    c. demonstrates an understanding of the principles of Mendelian genetics and inheritance (e.g., random assortment of traits, dominant and recessive traits) and the application of those principles to genotype and phenotype variation in plants and animals

    d. demonstrates an understanding of natural and artificial selection, mutation, and genetic drift and the application of those principles to selective breeding in plants and animals

    e. demonstrates knowledge of the history of and environmental, social, legal, and ethical issues in biotechnology

    f. demonstrates an understanding of basic methods and techniques used in biotechnology (e.g., gel electrophoresis, gene sequencing, gene cutting and splicing, recombination cloning)

    g. demonstrates knowledge of the applications of biotechnology in agriculture

COMPETENCY 0007—AGRICULTURAL TECHNOLOGY AND MECHANICS

<u>Performance Expectations</u>

The New York State agriculture teacher understands how technology and mechanical principles apply to agricultural tools and equipment. The teacher understands the characteristics and uses of tools and equipment, how to service and repair them, and how to operate equipment and use tools safely. The teacher applies design and measurement principles in agricultural contexts. The teacher is knowledgeable about the use of computer-based agricultural technologies.

<u>Performance Indicators</u>

    a. applies technological and mechanical principles in agriculture

    b. demonstrates knowledge of tools and equipment and methods for servicing, maintaining, troubleshooting, and repairing agricultural equipment, small engines, and power systems

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c. identifies hazards associated with the operation of tools and agricultural equipment, safety procedures that should be followed, and methods for safely operating equipment

d. applies knowledge of principles, tools, and techniques used in designing and fabricating for agricultural purposes

e. demonstrates knowledge and techniques of construction, electrical, plumbing, and power systems in various agricultural contexts

f. demonstrates knowledge of current and emerging technologies in agriculture (e.g., precision agricultural technologies, biofuels, sustainable energy)

COMPETENCY 0008—ENVIRONMENTAL SCIENCE AND NATURAL RESOURCE MANAGEMENT

Performance Expectations

The New York State agriculture teacher understands the interrelationships between ecological systems, natural resource management, and agricultural activities. The teacher understands sources and effects of agricultural pollution, methods for mitigating the effects of pollution, and laws and agencies that deal with pollution. The teacher understands the use of renewable and nonrenewable resources, including energy, the causes of habitat loss, and how to manage and conserve natural resources through the practice of sustainable agriculture and positive land stewardship.

Performance Indicators

a. demonstrates an understanding of the characteristics of different types of ecosystems, including aquatic ecosystems, and the effects of agriculture on these ecosystems

b. demonstrates an understanding of ecological principles (e.g., niche, ecosystem, succession, energy flow, watersheds) and their application to agriculture

c. demonstrates an understanding of the cycling of energy, water, nitrogen, and other substances and the relevance of this cycling to agriculture

d. demonstrates knowledge of urban ecosystems (e.g., plants that are suitable for urban landscapes) and the benefits of urban forests to urban ecosystems

e. demonstrates knowledge of land management policies, including recreational, forest, and multiple-use management, causes of habitat loss and reduction of biodiversity in New York State, strategies for conserving and replacing habitat, and principles and practices used in forest management

f. demonstrates knowledge of sources of point and nonpoint pollution and strategies for mitigating the negative effects of pollution on the environment

g. identifies environmental agencies, laws, regulations, and public policies that impact agricultural operations

h. identifies sources and types of renewable and nonrenewable natural resources; how they are produced, processed, and used; and strategies for the management and conservation of natural resources

i. demonstrates an understanding of the effects of fossil fuel use on the environment (e.g., climate change, acid rain) and costs and benefits of renewable sources of energy (e.g., solar, wind, biological) that may serve as alternatives to fossil fuels

j. applies an understanding of sustainable agricultural practices, the sustainable use of natural resources in agriculture, and strategies for ensuring profitability of agricultural enterprises employing sustainable production methods

k. demonstrates an understanding of environmental, social, legal, and ethical issues related to environmental science and natural resource management

COMPETENCY 0009—PEDAGOGICAL CONTENT KNOWLEDGE

Performance Expectations

The New York State agriculture teacher effectively applies pedagogical content knowledge across multiple content domains to design instruction to help students achieve a specific learning goal. The teacher applies knowledge of how students learn to develop effective instructional strategies that will facilitate development of students' skills and their achievement of learning goals. The teacher understands methods of effective assessment of student learning and how to apply assessment results to improve instructional strategies and methods.

Performance Indicators

a. demonstrates knowledge of developmentally appropriate learning goals related to a specified agricultural topic, as well as the skills and conceptual understanding necessary for students to achieve learning goals

b. provides a logical rationale for including a particular learning goal in an instructional unit devoted to the specified agricultural topic

c. applies knowledge of methods for assessing student readiness (e.g., knowledge, development, motivation) for learning the concepts and skills associated with a particular learning goal

d. describes in detail an appropriate and effective instructional strategy or activity designed to promote students' achievement of a particular learning goal, including the use of appropriate agriculture-related resources and media

e. provides a clear and logical explanation of how the strategy or activity supports a particular learning goal and fosters students' knowledge and skills related to the learning goal

f. provides a clear and logical explanation of how the content, strategy, and/or activity fully incorporates the total agricultural program model (i.e., classroom, FFA, SAE)