
NEW YORK STATE TEACHER CERTIFICATION EXAMINATIONS™

FIELD 118: TECHNOLOGY EDUCATION TEST DESIGN AND FRAMEWORK

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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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FIELD 118: TECHNOLOGY EDUCATION TEST DESIGN

This test consists of selected-response items and one extended constructed-response item measuring pedagogical and 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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TEST DESIGN**

Competency	Selected-Response		Constructed-Response	
	Approximate Number of Items	Approximate Percentage of Test Score	Number of Items	Approximate Percentage of Test Score
0001 Fundamentals of Technology and Engineering Education	18	16%	--	--
0002 Technological and Engineering Design	18	16%	--	--
0003 Manufacturing, Construction, and Materials	16	14%	--	--
0004 Information and Communication	13	12%	--	--
0005 Transportation and Energy	15	13%	--	--
0006 Biotechnology and Environmental Quality	10	9%	--	--
0007 Pedagogical Content Knowledge	--	--	1	20%
Total	90	80%	1	20%

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Fundamentals of Technology and Engineering Education
Technological and Engineering Design
Manufacturing, Construction, and Materials
Information and Communication
Transportation and Energy
Biotechnology and Environmental Quality
Pedagogical Content Knowledge

The New York State Technology Education educator has the knowledge and skills necessary to teach effectively in New York State public schools. The teacher has a deep understanding of concepts, principles, methods, and skills related to the technology education discipline, including knowledge of the history of the discipline and the relevance of the discipline in a global society. The teacher has a strong foundation in principles and concepts of technological and engineering design, materials, manufacturing, construction, information and communication, transportation, energy, biotechnology, and environmental quality. The teacher understands the interrelationships between technology, engineering, science, and mathematics and knows that technology also involves creative design and problem solving. The teacher is able to plan, design, implement, and evaluate developmentally appropriate learning experiences aligned with national and New York State standards that effectively address the needs of all students.

COMPETENCY 0001—FUNDAMENTALS OF TECHNOLOGY AND ENGINEERING EDUCATION

Performance Expectations

The New York State Technology Education teacher understands the interrelationships between technology, engineering, science, and mathematics and applies principles central to these disciplines to technological systems. The teacher understands the history of technology; factors that influence the development and use of technology; and the interrelationships and resulting impacts among technology, culture, and society. The teacher understands the relevance of technology education and knows how the discipline has evolved over time.

Performance Indicators

- a. analyzes the interrelationships between technology, engineering, science, mathematics, and other disciplines
- b. recognizes the role of creativity and innovation in technological literacy

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- c. analyzes factors (e.g., economic, environmental, ethical, political, social) that influence the evolution of technology and recognizes the impacts of technology and how technology affects individuals, society, and the environment
- d. analyzes the relationship between technological innovation and financial competition and how innovation and competition can lead to marketable goods and services
- e. identifies the role of technology education and analyzes its relevance in developing college and career readiness among students
- f. applies instructional strategies to develop college and career readiness among students and identifies career areas, employment opportunities, and job specialties in modern technology-related fields
- g. demonstrates knowledge of the history and philosophy of technology education, including the factors influencing the emergence of technology and engineering education as a discipline
- h. demonstrates knowledge of recent transitions in technology education by describing and integrating engineering education concepts and content
- i. analyzes relationships between materials, manufacturing and construction, information and communication, transportation, energy, and biotechnology and environmental quality systems and processes
- j. demonstrates knowledge of the New York State Learning Standards for Mathematics, Science, and Technology; the New York State P–12 Learning Standards; the ITEEA Standards for Technological Literacy; and the applications of these standards to instruction in technology education
- k. applies knowledge of laboratory maintenance, management, and safety in technology education classrooms and laboratory environments

COMPETENCY 0002—TECHNOLOGICAL AND ENGINEERING DESIGN

Performance Expectations

The New York State Technology Education teacher understands design, research, and troubleshooting techniques and their application to the development and maintenance of products and services. The teacher applies a variety of tools and techniques in the design process, including the use of computer technology. The teacher understands systems, the systems approach, and their components and methods for maintaining and troubleshooting systems.

Performance Indicators

- a. applies problem-solving techniques to design, create, test, and maintain products and services
- b. identifies the role of modeling, prototyping, iteration, optimization, and performance testing during design and applies computer technology, as appropriate, to achieve design goals

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- c. applies research techniques, including the scientific method, literature review, experimentation, data collection, and data analysis, to reach conclusions
- d. applies principles related to technological systems, including the systems approach to technology (e.g., input, process, output, feedback) and resources needed to develop, maintain, and troubleshoot systems
- e. incorporates technological and engineering design, systems modeling, and problem-solving approaches in the instructional process

COMPETENCY 0003—MANUFACTURING, CONSTRUCTION, AND MATERIALS

Performance Expectations

The New York State Technology Education teacher understands manufacturing and construction tools, processes, and systems. The teacher understands manufacturing and construction systems and processes and applies principles of design, technology, engineering, science, and mathematics to manufacturing and construction projects. The teacher understands material properties, processes used to extract and process raw materials, and methods used to measure and select materials that are most suitable for a specified task. The teacher analyzes materials by applying principles of technology, engineering, science, and mathematics. The teacher understands how to select appropriate materials and apply proper material-processing techniques.

Performance Indicators

- a. describes characteristics of manufacturing and construction tools (e.g., lathe, front-end loader) and selects appropriate tools to complete a specified task
- b. identifies tools and procedures used to extract raw materials from their natural environment and analyzes trade-offs associated with using renewable and nonrenewable materials
- c. demonstrates working knowledge of material-processing tools, equipment, and techniques
- d. analyzes manufacturing and construction processes and systems (e.g., forming, excavating) and selects appropriate processes to complete a specified task
- e. applies principles of manufacturing and construction to meet project specifications, human needs, environmental and occupational health regulations, legal requirements, and code regulations
- f. applies knowledge of planning, scheduling, quality assurance, and cost estimating to manufacturing and construction systems
- g. demonstrates knowledge of existing and emerging manufacturing and construction technologies (e.g., micro- and nanofabrication, robotics, computer-aided manufacturing)
- h. applies knowledge of structural systems, structural components, and structural loads and stresses to complete design projects

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- i. identifies material characteristics and properties (e.g., density, tensile strength, molecular structure) and applies procedures to analyze material properties
- j. applies procedures for selecting and designing with materials (e.g., wood, ceramics, composites) most suitable for a defined task according to factors such as cost, performance, and availability
- k. analyzes characteristics of materials management (e.g., storage, inspection, labeling, monitoring, disposal)

COMPETENCY 0004—INFORMATION AND COMMUNICATION

Performance Expectations

The New York State Technology Education teacher uses a variety of methods to research, organize, and communicate information and understands the underlying technologies associated with communications. The teacher understands information and communication systems and processes and applies principles of design, technology, engineering, science, and mathematics to information and communication projects.

Performance Indicators

- a. applies knowledge of techniques, tools, and resources associated with effective graphic design and imaging to create and edit textual and visual content
- b. applies knowledge of techniques, tools, and resources associated with audio and imaging technology to design and create a variety of existing and emerging communication media
- c. applies knowledge of techniques used to create, analyze, and interpret technical drawings, graphs, and tables to communicate designs, data, and ideas
- d. identifies and applies appropriate technologies used in electronic communication to encode, transmit, receive, store, and decode information

COMPETENCY 0005—TRANSPORTATION AND ENERGY

Performance Expectations

The New York State Technology Education teacher understands the methods used to analyze and improve transportation networks. The teacher identifies, describes, and analyzes the characteristics of transportation systems. The teacher understands transportation systems and processes and applies principles of design, technology, engineering, science, and mathematics to transportation projects. The teacher solves problems related to the generation, storage, transmission, and conversion of energy and understands how a variety of mechanical and electrical systems function. The teacher understands the dynamics of energy systems and processes and applies principles of design, technology, engineering, science, and mathematics to energy projects.

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Performance Indicators

- a. analyzes the characteristics of different types of transportation systems (e.g., land, air, marine) and applies principles related to these systems to solve transportation problems
- b. identifies characteristics of subsystems within a vehicle (e.g., propulsion, control, suspension) and describes their function
- c. applies principles used to design and plan transportation networks, including methods used to measure, evaluate, and improve the performance of existing transportation networks
- d. demonstrates knowledge of disciplines related to transportation (e.g., logistics, navigation, storage) and their associated technologies
- e. identifies and applies existing and emerging technologies to transportation systems (e.g., intermodal transportation networks, global positioning systems [GPS], intelligent transportation systems [ITS])
- f. identifies sources and forms of energy and applies concepts of force, work, power, efficiency, and energy conservation to analyze technological systems and processes
- g. analyzes a variety of mechanical systems (e.g., pneumatic, hydraulic, rotary) and devices (e.g., actuator, lever, pulley) and applications of these systems and devices
- h. analyzes a variety of electrical systems (e.g., analog and digital circuits, motors, transformers) and solves problems involving current, voltage, resistance, and power
- i. identifies and applies existing and emerging technologies related to energy systems (e.g., wind turbines, photovoltaic cells, lasers)
- j. analyzes, selects, and applies appropriate energy generation, storage, transmission, and conversion technologies for a specific objective

COMPETENCY 0006—BIOTECHNOLOGY AND ENVIRONMENTAL QUALITY

Performance Expectations

The New York State Technology Education teacher understands the fundamental characteristics, tools, and processes used to maintain and improve biotechnology and environmental quality systems. The teacher demonstrates knowledge of the interrelationships between biotechnology; environmental quality; and economic, legal, ethical, and safety concerns. The teacher understands biotechnology and environmental quality systems and processes and applies principles of design, technology, engineering, science, and mathematics to biotechnology and environmental quality projects.

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Performance Indicators

- a. applies knowledge of biotechnology, including techniques and processes that use living organisms to make or modify products, to improve plants and animals, or to develop microorganisms for a specific purpose
- b. identifies and analyzes characteristics of agricultural technologies, including technologies that aid in planting, growing, maintaining, and harvesting plants and animals
- c. identifies and analyzes characteristics of medical technologies, including technologies associated with the development of prosthetics, vaccines, pharmaceuticals, and genetic engineering
- d. demonstrates knowledge of tools, techniques, and processes to monitor pollutants, remediate polluted regions, and control further pollution and identifies characteristics of technologies designed to improve environmental quality
- e. analyzes legal, economic, ethical, and safety concerns that influence the development and operation of technologies related to biotechnology and environmental quality

COMPETENCY 0007—PEDAGOGICAL CONTENT KNOWLEDGE

Performance Expectations

The New York State Technology Education teacher effectively applies pedagogical content knowledge to design instruction that helps 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 utilizes appropriate technology education resources to develop effective learning environments while promoting technological literacy among students. The teacher understands and applies methods of effective assessment of student learning.

Performance Indicators

- a. identifies a developmentally appropriate learning goal related to a specified technology education topic and aligned with the New York State Learning Standards for Mathematics, Science, and Technology
- b. identifies the skills and conceptual understanding necessary for students to achieve the stated learning goal
- c. provides a logical rationale for including the learning goal in an instructional unit devoted to the specified technology education topic
- d. describes in detail an appropriate and effective instructional strategy or activity designed to promote students' achievement of the learning goal and describes learning environments that promote technological literacy through the use of appropriate technology education resources
- e. provides a clear and logical explanation of how the strategy or activity supports the learning goal and fosters students' knowledge and skills related to the learning goal

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- f. applies knowledge of methods for assessing student learning and achievement of the learning goal
- g. incorporates technological design, systems modeling, and problem-solving approaches in the instructional process