Draft

Kansas Licensure Standards for Technology & Engineering Education Preparation Programs

Grades 6-12

"Learner(s)" is defined as children including those with disabilities or exceptionalities, who are gifted, and students who represent diversity based on ethnicity, race, socioeconomic status, gender, language, religion, and geographic origin.

Standard 1: Content Knowledge. The teacher of technology and engineering education demonstrates an understanding of the Nature and Characteristics of Technology and Engineering.

Function 1: The teacher demonstrates an understanding of the nature and characteristics of Technology and Engineering.

Content Knowledge (CK)

1.1.1 CK The teacher understands technology and engineering education, technological and engineering literacy, and the characteristics and scope of technology–its role in human adaptation to the natural world, its development, direction, commercialization, and rate of growth.

1.1.2 CK The teacher understands the relationships among technologies and the influences and connections with other disciplines (e.g., STEM) –integration, interactions, interrelationships, technological development, technology transfer, invention and innovation, knowledge protection and patents, and advancements.

1.1.3 CK The teacher understands the concepts presented within the universal systems model and how it is utilized within each technological area.

1.1.4 CK The teacher understands the development of inventions and innovations – their influences and outcomes.

Professional Skills (PS)

1.1.5 PS The teacher communicates solutions verbally or by constructing physical, graphic, or mathematical models.

1.1.6 PS The teacher applies knowledge and skills regarding diverse technological systems to solve practical problems.

Standard 2: Content Knowledge: The teacher of technology and engineering education demonstrates an understanding of the Core Concepts of Technology and Engineering and how to Integrate Knowledge, Technologies, and Practices.

Function 1: The teacher demonstrates an understanding of the core concepts of Technology and Engineering.

Content Knowledge (CK)

2.1.1 CK The teacher knows technological and engineering systems as interrelated components (e.g., inputs, processes, outputs, and feedback) that are designed collectively to achieve desired goals.

2.1.2 CK The teacher knows technology and engineering resources (or inputs), including tools and machines, materials, capital, knowledge, energy, time, and people.

2.1.3 CK The teacher understands the development of criteria, constraints, and opportunities during the design process and how these factors affect solutions.

2.1.4 CK The teacher understands the core concepts of technology–systems, resources, requirements, optimization and tradeoffs, processes, and controls.

Professional Skills (PS)

2.1.5 PS The teacher applies the universal systems model within the learning environment.

2.1.6 PS The teacher applies optimization as an iterative process or methodology of designing or making a product, process, or system that is functional, efficient, safe, and effective.

Function 2: The teacher demonstrates an understanding of how to integrate knowledge, technologies, and practices.

Content Knowledge (CK)

2.2.1 CK The teacher understands and can apply interdisciplinary knowledge (e.g., STEM) to develop technological products that serve the needs of all students.

2.2.2 CK The teacher knows impacts of technological and engineering systems.

2.2.3 CK The teacher understands how advancements in knowledge, technologies, and practices may impact or enhance the iterative process of innovation.

Professional Skills (PS)

2.2.4 PS The teacher develops and uses curricula that encourage students to see, question, and interpret technological ideas from diverse perspectives.

2.2.5 PS The teacher applies mathematical and scientific principles as they relate to technological systems.

Standard 3: Content Knowledge. The teacher of technology and engineering education demonstrates an understanding of the History and Impact of Technology and its Relationship with Society.

Function 1: The teacher will demonstrate an understanding of impacts of technology.

Content Knowledge (CK)

3.1.1 CK The teacher knows the impact of technology and engineering on social institutions (e.g., the family, community interaction).

3.1.2 CK The teacher understands the positive and negative impacts of technology, in development, production, and use (e.g., intended/unintended, desirable/undesirable).

3.1.3 CK The teacher understands ways to decrease the negative impact of technological systems and processes (e.g. by reducing resource inputs, reducing waste, recycling), and knows how to evaluate trade-offs with respect to different approaches.

3.1.4 CK The teacher knows how to assess and evaluate how technologies alter human interactions, health, and capabilities.

Professional Skills (PS)

3.1.5 PS The teacher identifies the positive and negative effects of technology on social institutions and the environment.

3.1.6 PS The teacher creates activities that clarify the relationship between technology, social institutions and the environment.

Function 2: The teacher will demonstrate an understanding of the history of technology.

Content Knowledge (CK)

3.2.1 CK The teacher understands critical changes in technology and its influence throughout the different periods of human history (e.g. the Iron Age, the Industrial Revolution, and the Information Age).

3.2.2 CK The teacher understands the influence that significant technological inventions and innovations have had on human history and on today's world.

3.2.3 CK The teacher understands how to use past and present technological developments to discover trends and to predict possible future developments and their effects.

Professional Skills (PS)

3.2.4 PS The teacher develops and uses technology-based activities to help students understand technology as a knowledge base that is historical, current, and futuristic in nature.

3.2.5 PS The teacher demonstrates how technology has been a powerful force in reshaping the social, cultural, political, and economic landscapes throughout history.

Function 3: The teacher will demonstrate an understanding of influence of society on technological development.

Content Knowledge (CK)

3.3.1 CK The teacher understands the role of society and how various factors (e.g. marketing, economics, environment) affect invention, innovation, and technology development.
3.3.2 CK The teacher understands how the use of technology, is influenced by society's needs and wants, its values and interests, as well as its demands and acceptance of technology.
3.3.3 CK The teacher understands current issues and trends related to various areas of technology.

Professional Skills (PS)

3.3.4 PS The teacher identifies the positive and negative effects of technology on the individual and society.
3.3.5 PS The teacher creates activities that clarify the relationship between technology and society.

Standard 4: Content Knowledge: The teacher of technology and engineering education demonstrates an understanding of Design in Technology and Engineering Education.

Function 1: The teacher demonstrates an understanding of engineering design and problem solving.

Content Knowledge (CK)

4.1.1 CK The teacher understands the analytical nature of design–implementing the steps of the design process, design requirements, optimization, and use of designing product and system development.

4.1.2 CK The teacher understands the engineering design and problem-solving processes.

4.1.3 CK The teacher understands the development, implementation, communication, and documentation of iterative design processes and the analysis/evaluation of specific design requirements (i.e., criteria and constraints).

4.1.4 CK The teacher knows how to apply the design process to systems and problems in various technological areas (e.g. power and energy, transportation, communication technologies, manufacturing, and construction).

Professional Skills (PS)

4.1.5 PS The teacher is able to sketch solutions, make technical drawings, and use CAD (computer-aided design or computer-assisted design) to create two- and three-dimensional drawings.

4.1.6 PS The teacher constructs a model or prototype of a product or system and makes necessary adjustments.

4.1.7 PS The teacher is able to test and evaluate designs in relation to pre-established criteria and constraints, using conceptual, physical, and/or mathematical models at various intervals of the design process in order to check design, note potential improvements, and redefine as needed.

4.1.8 PS The teacher documents their process by developing a portfolio to illustrate the process used to design a solution to a given problem.

4.1.9 PS The teacher evaluates and communicates through presentation the observations, processes, and results of the entire design process.

Standard 5: Content Knowledge: The teacher of technology and engineering education demonstrates an understanding of Applying, Maintaining, and Assessing Technological Products and Systems.

Function 1: The teacher demonstrates an understanding of applying, maintaining, and assessing technological systems and products associated with Energy, Power, and Transportation.

Content Knowledge (CK)

5.1.1 CK The teacher knows how to apply mathematical and scientific principles to solve problems involving power, energy, and transportation concepts (e.g. harnessing, transfer, circuitry, loss, transmission, and conversion of power and energy).

5.1.2 CK The teacher understands energy utilization systems (e.g. internal combustion, external combustion, electric motors, hybrid systems).

5.1.3 CK The teacher differentiates various forms of energy (e.g. mechanical, electrical, thermal, chemical, nuclear, etc.) and understands their applications.

5.1.4 CK The teacher understands the relationship between energy, power, and transportation systems, including their infrastructure, processes, and efficiency.

5.1.5 CK The teacher how energy is classified, measured, controlled, and applied to technological systems, ensuring optimization and sustainability.

5.1.6 CK The teacher understands the characteristics and interrelationships of transportation modes, systems and subsystems (e.g. infrastructures, propulsion, suspension, control, and guidance), and logistical systems and operations (e.g. receiving, storing, loading, moving, unloading).

5.1.7 CK The teacher understands safety rules and regulations associated with power, energy, and transportation technologies.

Professional Skills (PS)

5.1.8 PS The teacher develops, produces, and documents solutions to problems in energy, power, and transportation systems using appropriate tools and methodologies.

5.1.9 PS The teacher knows how to use, assess, and maintain products and systems associated with energy, power, and transportation.

5.1.10 PS The teacher implements and maintains safe practices and procedures associated with energy, power, and transportation.

5.1.11 PS The teacher establishes and maintains a safe standards-compliant laboratory environment, reflecting state and national program guidelines for energy, power, and transportation systems.

5.1.12 PS The teacher develops, implements, and maintains a safety plan that includes orientation of all students to safety practices and documentation of their performance, evaluation of facilities and recommendations for improvement, and communicates the value and performance of prudent safety practices.

Function 2: The teacher demonstrates an understanding of applying, maintaining, and assessing technological systems and products associated with Materials, Manufacturing, and the Built Environment.

Content Knowledge (CK)

5.2.1 CK The teacher understands and knows how to integrate math and science concepts such as static and dynamic loads and how they produce forces (e.g. compression, tension, torsion) that affect stability and failure in a structure.

5.2.2 CK The teacher knows how to operate, maintain, and organize equipment associated with materials, manufacturing, and the Built Environment in a technology and engineering education laboratory.

5.2.3 CK The teacher knows the variety and properties of materials used in the manufacture of products or construction of structures and can use selection criteria and information to determine the best material for manufacturing purposes.

5.2.4 CK The teacher understands the components of a manufacturing or construction system associated with enterprise, research and development, finance, production planning, production, quality control, and marketing.

5.2.5 CK The teacher understands manufacturing systems and processes (e.g. flexible, continuous, batch, custom production) and construction systems and processes, (e.g. on-site and prefabricated techniques, residential, commercial, and civil construction).

5.2.6 CK The teacher understands gathering processes (e.g. harvesting, drilling, and mining) to obtain raw materials, primary processing, (e.g.), and secondary processing methods (e.g. casting and molding, forming, assembling).

5.2.7 CK The teacher understands the numerous constraints on structural designs, such as building codes, cost, and function associated with construction.

5.2.8 CK The teacher understands state and federal laws, industrial safety rules and regulations, liability issues and legal responsibilities relating to safety in the materials, manufacturing, and the Built Environment learning environment.

Professional Skills (PS)

5.2.9 PS The teacher is able to design a product, design and build tooling, sequence operations, and produce the product.

5.2.10 PS The teacher knows how to use, assess, and maintain products and systems associated with materials, manufacturing, and the Built Environment.

5.2.11 PS The teacher instructs students in organizing and managing manufacturing enterprises and construction projects, including all aspects from research and development to marketing and selling.

5.2.12 PS The teacher develops, uses, and maintains a system for equipment maintenance, ordering of laboratory equipment and supplies, and providing for safe and orderly materials handling and storage.

5.2.13 PS The teacher demonstrates safe practices and procedures associated with materials, manufacturing, and the Built Environment.

5.2.14 PS The teacher establishes and maintains a safe standards-compliant laboratory environment, reflecting state and national program guidelines for materials, manufacturing, and the Built Environment.

5.2.15 PS The teacher develops, implements, and maintains a safety plan that includes orientation of all students to safety practices and documentation of their performance,

evaluation of facilities and recommendations for improvement, and communicates the value and performance of prudent safety practices.

Function 3: The teacher demonstrates an understanding of applying, maintaining, and assessing technological systems and products associated with Information and Communication Technologies.

Content Knowledge (CK)

5.3.1 CK The teacher understands concepts, terminology, and processes related to audio, video, electronic, telecommunications, data, technical, photographic, computer technologies, and graphic communications as applied to communication systems.

5.3.2 CK The teacher knows how to evaluate, use, and maintain communication products and systems.

5.3.3 CK The teacher knows how to design and plan an effective message for a given communication system, both digitally and physically.

5.3.4 CK The teacher understands operating systems, software applications, communication devices, and networking components and structures (e.g. LAN, MAN, WAN) in the information or communication technology classroom/laboratory.

5.3.5 CK The teacher understands legal and ethical issues, digital citizenship, and safety rules and regulations regarding the use of communication and information technologies (e.g. copyright, privacy, security).

Professional Skills (PS)

5.3.6 PS The teacher uses communication systems equipment including those associated with graphic design, photography, printing, technical drawing, electronic communication, telecommunication, digital/photo imaging, and computer technology.

5.3.7 PS The teacher knows how to use, assess, and maintain products and systems associated with information and communication technologies.

5.3.8 PS The teacher uses computers and calculations to access, retrieve, organize, process, maintain, interpret, and evaluate information in order to communicate.

5.3.9 PS The teacher demonstrates safe practices and procedures associated with information and communication technologies.

5.3.10 PS The teacher establishes and maintains a safe standards-compliant laboratory environment, reflecting state and national program guidelines for information and communication technologies.

5.3.11 PS The teacher develops, implements, and maintains a safety plan that includes orientation of all students to safety practices and documentation of their performance, evaluation of facilities and recommendations for improvement, and communicates the value and performance of prudent safety practices.

Function 4: The teacher demonstrates an understanding of applying, maintaining, and assessing technological systems and products associated with Computation, Automation, Robotics, and Emerging Technologies.

Content Knowledge (CK)

5.4.1 CK The teacher knows principles of computational thinking (i.e., decomposition, pattern recognition, abstraction, and algorithm design) that help solve technological and engineering problems.

5.4.2 CK The teacher understands automation and robotic systems, including their physical, mechanical, technical, and programmable components.

5.4.3 CK The teacher understands artificial intelligence (AI) technologies, their applications, and associated ethical implications.

5.4.4 CK The teacher understands legal and ethical issues, and safety rules and regulations regarding the use of computation, automation, robotics, and emerging technologies.

Professional Skills (PS)

5.4.5 PS The teacher develops, produces, and documents solutions to problems in computation, automation, robotics and emerging technology using appropriate tools and methodologies.

5.4.6 PS The teacher knows how to use, assess, and maintain products and systems associated with computation, automation, robotics, and emerging technologies.

5.4.7 PS The teacher demonstrates safe practices and procedures associated with computation, automation, robotics, and emerging technologies.

5.4.8 PS The teacher establishes and maintains a safe standards-compliant laboratory environment, reflecting state and national program guidelines for computation, automation, robotics, and emerging technologies.

5.4.10 PS The teacher develops, implements, and maintains a safety plan that includes orientation of all students to safety practices and documentation of their performance, evaluation of facilities and recommendations for improvement, and communicates the value and performance of prudent safety practices.

Standard 6: Pedagogy. The teacher of technology and engineering education demonstrates an understanding of the pedagogical foundations associated with teaching technology and engineering education.

Function 1: The teacher demonstrates an understanding of curriculum and assessment associated with teaching technology and engineering education.

Content Knowledge

6.1.1 CK The teacher understands the state and national curricular models for technology and engineering education and the sequencing of courses associated with the developmental level of students.

6.1.2 Understands how to select and adapt appropriate materials and activities as well as plan instruction to promote technological and engineering literacy.

6.1.3 Understands how to select, create, and modify appropriate assessments to inform instruction and evaluate student learning in technology and engineering.

Professional Skills

6.1.4 PS The teacher discusses, develops, and implements programs and curricular materials reflecting state and national curricular models for technology and engineering education and sequences courses appropriately to the developmental level of students.

6.1.5 PS The teacher effectively uses appropriate educational or instructional technology to develop and present instructional material.

6.1.6 PS The teacher selects and uses appropriate instructional strategies and assessment practices in teaching various technology and engineering education programs.

Function 2: The teacher demonstrates an understanding of learning experiences and methodologies associated with teaching technology and engineering education.

Content Knowledge

6.2.1 CK The teacher understands educational principles and practices relating to technology and engineering education.

6.2.2 CK The teacher knows how to design, conduct, manage, and assess laboratory/field experiences related to technology and engineering education.

Professional Skills

6.2.3 PS The teacher is able to teach multidisciplinary activities and project-based learning.

6.2.4 PS The teacher facilitates the discovery of individual talents, aptitudes, interests, and potentials related to technology-based careers by providing “real world” learning opportunities.

6.2.5 PS The teacher provides students opportunities to develop the knowledge, skills, and dispositions necessary for success in post-secondary education, business, and/or industry.

Function 3: The teacher demonstrates an understanding of how to meet the needs of every student in their classroom.

Content Knowledge

6.3.1 CK The teacher understands the needs and challenges faced by all students in the technology and engineering education program.

6.3.2 Understands how to create a nurturing and supportive learning environment using knowledge of social and emotional principles, student behavior, organizational skills, and classroom management.

6.3.3 Understands how to differentiate instruction that effectively addresses a variety of student need.

Professional Skills

6.3.4 PS The teacher provides classroom and laboratory learning experiences in technology-related subjects that are appropriate for every student, regardless of gender, race, ethnicity, or special needs.

Function 4: The teacher demonstrates an understanding of laboratory design, maintenance, and management.

Content Knowledge

6.4.1 CK The teacher demonstrates knowledge, including the application of computers and media related to the design, organization, and management of technology and engineering education facilities to accommodate current and future multidisciplinary activities and project-based learning.

6.4.2 CK The teacher can operate and maintain technology and engineering education laboratory equipment.

6.4.3 CK The teacher knows about the environmental factors contributing to the safety, health, and educational performance in the technology and engineering education learning environment (e.g. lighting, climate control, air quality, organization and placement of equipment).

Professional Skills

6.4.4 PS The teacher develops, uses, and maintains a system for equipment maintenance, ordering of laboratory equipment and supplies, and providing for safe and orderly materials handling and storage (e.g. material safety data sheets).

6.4.5 PS The teacher organizes facilities to accommodate current/future multidisciplinary, project-based, and STEM learning activities.

Standard 7: Professional Responsibility: The teacher of technology and engineering education demonstrates an understanding of the profession, safety, funding, opportunities for students, and how it fits into contexts outside the classroom.

Function 1: The teacher demonstrates an understanding of the technology and engineering education profession.

Content Knowledge (CK)

7.1.1 CK The teacher knows about the technology and engineering education professional organizations and the benefits, resources, and opportunities for lifelong learning and development of technical and pedagogical skills they provide.

7.1.2 CK The teacher understands the historical evolution of the discipline.

7.1.3 CK Understands collaborative relationships of technology and engineering education to other academic subject areas.

Professional Skills (PS)

7.1.4 PS The teacher participates in professional organizations associated with technology and engineering education—their publications, resources, and opportunities for professional development.

7.1.5 PS The teacher creates and uses interdisciplinary learning experiences allowing students to integrate knowledge, skills, and methods of inquiry from several subject areas focusing on the practical application of that knowledge.

Function 2: The teacher demonstrates an understanding of principles and practices that ensure the safety of students in technology and engineering education classrooms and laboratories.

Content Knowledge (CK)

7.2.1 CK The teacher knows about general safety procedures related to tools, equipment, materials, and processes found in the technology and engineering education-learning environment.

7.2.2 CK The teacher understands state and federal laws, liability issues, and legal responsibilities relating to safety in the technology and engineering education learning environment.

Professional Skills (PS)

7.2.3 PS The teacher establishes and maintains a safe standards-compliant laboratory environment, reflecting state and national program guidelines for technology and engineering education.

7.2.4 PS The teacher develops, implements, and maintains a safety plan that includes orientation of all students to safety practices and documentation of their performance, evaluation of facilities and recommendations for improvement, and communicates the value and performance of prudent safety practices.

7.2.5 PS The teacher demonstrates safe practices and procedures with all tools, equipment, machines, systems, and procedures associated with technology & engineering education.

Function 3: The teacher demonstrates an understanding of professional contexts (e.g., organizational, advisory, governmental) and relevant platforms to promote technology and engineering programs beyond the classroom.

Content Knowledge (CK)

7.3.1 CK The teacher knows how to use public relations strategies to promote technology and engineering education.

7.3.2 CK: The teacher will demonstrate an understanding of the purpose, structure, and formation of an advisory board in technology and engineering education.

Professional Skills (PS)

7.3.3 PS The teacher develops and implements public relations strategies to promote technology and engineering education.

7.3.4 PS: The teacher identifies local professionals and stakeholders, facilitates advisory board meetings.

7.3.5 PS: The teacher facilitates advisory board meetings to gather insights and align program goals with industry needs.

7.3.6 PS: The teacher evaluates and incorporates feedback from the advisory board to enhance curriculum and instructional practices.

Function 4: The teacher demonstrates an understanding education content, opportunities, and resources for students both inside and outside of technology and engineering classrooms for professional growth and college and career readiness.

Content Knowledge (CK)

7.4.1 CK The teacher knows the current knowledge, skills, and dispositions needed for success in post-secondary education, business, and/or industry.

7.4.2 CK The teacher is aware of local, state, and/or national practices for college and career readiness.

7.4.3 CK The teacher is aware of current and future career opportunities in technology and engineering related fields.

7.4.4 CK The teacher is aware of technology and engineering education related student organizations and their activities and opportunities for leadership development.

Professional Skills (PS)

7.4.5 PS The teacher serves as an effective advisor to a technology and engineering student organization.

7.4.6 PS The teacher communicates and provides students with experiences to learn about future education and career opportunities.

Function 5: The teacher demonstrates an understanding of fiscal management and funding strategies available in technology and engineering education.

Content Knowledge (CK)

7.5.1 CK: The teacher will demonstrate an understanding of grants and government programs to acquire funding for machines, tools, and materials.

7.5.2 CK: The teacher will demonstrate an understanding of budget management principles and financial accountability in educational settings.

Professional Skills (PS)

7.5.3 PS: The teacher develops proposals and applications for educational funding opportunities.

7.5.4 PS: The teacher leverages partnerships with local businesses, industry, and community organizations to secure financial and material resources.