Career Essentials: *Assessments*

Engineering Technology Blueprint

This Blueprint contains the subject matter content for the Career Essentials - Assessment.

Note: To fully prepare for the Engineering Technology SkillsUSA Championships contest, refer to the current year's SkillsUSA Championships Technical Standard, now included with your SkillsUSA Professional Membership. If you need help in accessing this benefit, contact the SkillsUSA Customer Care Team at 844-875-4557 or customercare@skillsusa.org

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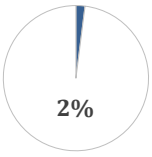
Standards and Competencies

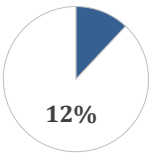
Competencies are weighted throughout the assessment. The percent shown is the weight of the competency. There are 50 questions per assessment.

Integrate knowledge of basic engineering principles into technical writing and presentations following the guidelines the contest technical committee has established



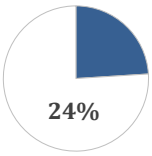
- Apply engineering knowledge in the areas of force, work, rate, resistance, energy, power, force transformers, momentum, waves and vibrations, energy converters, transducers, radiation, optical systems

Transform existing systems into conceptual models



- Transform conceptual models into determinable models
- Use determinable models to obtain system specifications
- Select optimum specifications and create physical models
- Apply the results from physical models to create real target systems
- Critically review real target systems and personal performance
- Design effective and usable IT-based solutions and integrate them into the user environment
- Assist in the creation of an effective project plan
- Identify and evaluate current and emerging technologies and assess their applicability to address the users' needs

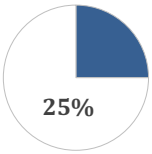
Create an effective project



- Brainstorm project ideas following a problem-solving process.
- Implement benchmarking
- Discuss continuous improvement
- Explain cause and effect relationships
- Apply knowledge of customer satisfaction
- Demonstrate how to collect data
- Apply decision-making skills
- Define and describe a process
- Empower team members
- Recognize methods of idea generation
- Prioritize tasks
- Reach consensus amongst the team
- Display teamwork during the competition
- Have equal team participation

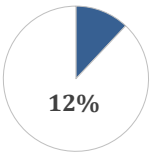
- Show positive group dynamics
- Define team roles

Developing/identifying opportunities



- Identify and define the opportunity
- Identify the customer
- Identify the customer's needs
- State the problem or areas of improvement within the identified opportunity clearly and concisely
- Quantify the opportunity with data
- Show data gathered from research
- Identify opportunity for improvement
- Make decisions based on facts, not opinions
- Show how the team determined the cause(s) of the problem and gained an understanding of the variation that occurs in the process
- Diagram and perform a thorough assessment of the possible causes
- Develop various solutions
- Show alternative approaches or changes that would improve the situation
- Show the analysis used to select the most beneficial solution to implement
- Define milestones
- Recommend a plan to implement the solution(s)
- Use analytical decision making by making full use of flow charts, bar graphs, cause and effect diagrams, Pareto diagrams, etc.
- Describe a method to standardize or institutionalize the process

Write a problem statement

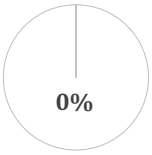


- Define the problem
- Define the customer
- Explain the customer expectations
- Describe the product or service
- Discuss how the product or service fulfills the customer's expectations
- List the needed data
- Reflect on how the process can be improved
- Describe how the improved process will meet or exceed the customer's expectations

Design and deliver a presentation that discusses the problems and processes of the local institution

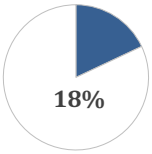
- Make the presentation clear and concise
- Use graphics effectively to clarify presentation topics
- Use time wisely while presenting

Design and develop a presentation that is the result of findings from the on-site problem and process



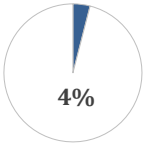
- Make the presentation clear and concise
- Use graphics effectively to clarify presentation topics
- Use time wisely while presenting

Deliver the presentation in a professional manner, meeting the standards outlined by the technical committee



- Explain the topic using displays or practical operations
- Demonstrate an effective and pleasing delivery style
- Use verbal illustrations and examples effectively
- Make a formal and effective introduction to the presentation that clearly identifies the scope of the presentation
- Pronounce words in a clear and understandable manner
- Use a variety of verbal techniques including modulation of voice, changing volume, varied inflection, modifying tempo and verbal enthusiasm
- Demonstrate poise and self-control while presenting
- Demonstrate good platform development and personal confidence
- Communicate the primary points of the speech in a compact and complete manner
- Tie organizational elements together with an effective ending
- Complete the speech within the time limits set by competition requirements
- Develop storyboards for the presentation outlining the process

Demonstrate teamwork skills



- Work collaboratively with other team members.
- Honor the contributions and strengths of others.
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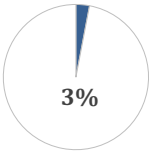
- Honor personal commitments and responsibilities to the team.
- Foster positive and collaborative working relationships with others.

Project a professional self-image through attire and grooming



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COMMITTEE-IDENTIFIED ACADEMIC SKILLS

The SkillsUSA national technical committee has identified that the following academic skills are embedded in the Engineering Technology Design training program and assessment:

Math Skills

- Use fractions to solve practical problems.
- Use proportions and ratios to solve practical problems.
- Simplify numerical expressions.
- Use scientific notation.
- Solve practical problems involving percentages.
- Solve single variable algebraic expressions.
- Solve multiple variable algebraic expressions.
- Measure angles.
- Find surface area and perimeter of two-dimensional objects.
- Find volume and surface area of three-dimensional objects.
- Apply transformations (rotate or turn, reflect or flip, translate or slide, and dilate or scale) to geometric figures.
- Construct three-dimensional models.
- Apply Pythagorean Theorem.
- Make predictions using knowledge of probability.
- Make comparisons, predictions and inferences using graphs and charts.
- Organize and describe data using matrices.
- Graph linear equations.
- Solve problems using proportions, formulas and functions.
- Find the slope of a line.
- Use laws of exponents to perform operations.
- Solve quadratic equations.
- Solve practical problems involving complementary, supplementary and congruent angles.
- Solve problems involving symmetry and transformation.
- Use measures of interior and exterior angles of polygons to solve problems.
- Find arc length and the area of a sector.

Science Skills

- Plan and conduct a scientific investigation.
- Use knowledge of the particle theory of matter.
- Describe and recognize elements, compounds, mixtures, acids, bases and salts.
- Describe and recognize solids, liquids and gases.
- Describe characteristics of types of matter based on physical and chemical properties.
- Use knowledge of physical properties (shape, density, solubility, odor, melting point, boiling point, color).
- Describe and use the Periodic Table — symbols, atomic number, atomic mass, chemical families (groups), and periods.
- Use knowledge of classification of elements as metals, metalloids and nonmetals.
- Use knowledge of potential and kinetic energy.
- Use knowledge of mechanical, chemical and electrical energy.
- Use knowledge of heat, light and sound energy.
- Use knowledge of temperature scales, heat and heat transfer.
- Use knowledge of sound and technological applications of sound waves.

- Use knowledge of the nature and technological applications of light.
- Use knowledge of speed, velocity and acceleration.
- Use knowledge of Newton's laws of motion.
- Use knowledge of work, force, mechanical advantage, efficiency and power.
- Use knowledge of simple machines, compound machines, powered vehicles, rockets and restraining devices.
- Use knowledge of principles of electricity and magnetism.
- Use knowledge of static electricity, current electricity and circuits.
- Use knowledge of magnetic fields and electromagnets.
- Use knowledge of motors and generators.

Language Arts Skills

- Provide information in conversations and in group discussions.
- Provide information for oral presentations.
- Demonstrate use of verbal communication skills: word choice, pitch, feeling, tone and voice.
- Demonstrate use of nonverbal communication skills: eye contact, posture and gestures using interviewing techniques to gain information.
- Organize and synthesize information for use in written and oral presentations.
- Demonstrate knowledge of appropriate reference materials.
- Demonstrate narrative writing.
- Demonstrate informational writing.

CONNECTIONS TO NATIONAL STANDARDS

State-level academic curriculum specialists identified the following connections to national academic standards.

Math Standards

- Numbers and operations
- Algebra
- Geometry
- Measurement
- Data analysis and probability
- Problem-solving
- Reasoning and proof
- Communication
- Connections
- Representation

***Source**: NCTM Principles and Standards for School Mathematics. For more information, visit: www.nctm.org.*

Science Standards

- Understands the structure and properties of matter.
- Understands the sources and properties of energy.

- Understands forces and motion.
- Understands the nature of scientific knowledge.
- Understands the nature of scientific inquiry.
- Understands the scientific enterprise.

Language Arts Standards

- Students read a wide range of print and nonprint texts to build an understanding of texts, of themselves and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction, nonfiction, classic and contemporary works.
- Students apply a wide range of strategies to comprehend, interpret, evaluate and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, and graphics).
- Students adjust their use of spoken, written and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.
- Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language and genre to create, critique, and discuss print and nonprint texts.
- Students conduct research on issues and interests by generating ideas and questions and by posing problems. They gather, evaluate and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.
- Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
- Students use spoken, written and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).

Source: *IRA/NCTE Standards for the English Language Arts. To view the standards, visit: www.ncte.org/standards.*