

# Inventions and Innovations

**8456 6 weeks**

**8454 9 weeks**

**8485 12 weeks**

**8464 18 weeks**

**8461 36 weeks**

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## Acknowledgments

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## Course Description

**Suggested Grade Level:** 6 or 7 or 8

Students make models of significant inventions that have advanced society. After studying these developments, they explore contemporary technological problems facing them, their community, or the world and apply a systematic procedures to invent new products or innovations as solutions.

*Note: Completer sequences and certifications do not apply.*

# Task Essentials Table

- Tasks/competencies designated by plus icons (+) in the left-hand column(s) are essential
- Tasks/competencies designated by empty-circle icons (○) are optional
- Tasks/competencies designated by minus icons (−) are omitted
- Tasks marked with an asterisk (\*) are sensitive.

Task Number	8485	8464	8461	8456	8454	Tasks/Competencies
Exploring Inventions and Innovations						
39	+	+	+	+	+	Explain the importance of technology in the development of society.
40	+	+	+	+	+	Describe inventions that have affected society.
41	+	+	+	+	+	Research the areas of the designed world.
42	+	+	+	+	+	Explain how inventions and innovations relate to the development of new products, processes, and systems.
43	○	+	+	○	○	Identify the purpose of patents and copyrights.
Exploring Design and Creativity						
44	+	+	+	+	+	Describe the engineering design process.
45	+	+	+	+	+	Explain the characteristics of the engineering design process.
46	+	+	+	+	+	Explain the impact of the criteria and constraints for a design.
47	+	+	+	○	+	Develop designs for presenting to the class.
Applying the Design Process						
48	+	+	+	+	+	Demonstrate safe use of a minimum of five tools and/or pieces of equipment.
49	+	+	+	+	+	Demonstrate various types of measuring.

50	+	+	+	+	+	Create sketches and drawings.
51	+	+	+	+	+	Develop designs for a given problem.
52	+	+	+	+	+	Evaluate a product design with the goal of innovation.
53	○	+	+	○	○	Design an improvement for an existing product.
54	+	+	+	○	+	Produce a model, or prototype, of a design.
55	○	○	+	○	○	Produce a presentation.
Forming a Production Company						
56	○	○	+	○	○	Simulate the formation of a business or a company.
57	○	○	+	○	○	Identify personnel required to operate the business or company.
58	○	○	+	○	○	Develop advertising techniques to market a product.
59	○	○	+	○	○	Calculate profit or loss.
Applying Production Management						
60	+	+	+	+	+	Participate as part of a cooperative team.
61	+	+	+	+	+	Gather information about a potential invention or innovation.
62	+	+	+	+	+	Illustrate ideas for developing an invention or innovation.
63	+	+	+	+	+	Conduct market research on an invention or innovation.
64	+	+	+	+	+	Develop a production plan to create a model of an invention or an innovation.
65	+	+	+	+	+	Prepare working drawings to support the production of the invention or innovation model.

66	+	+	+	+	+	Construct a model or a prototype of an invention and/or innovation.
67	+	+	+	+	+	Evaluate the model through assessment, or the prototype through testing.
68	+	+	+	+	+	Participate in a production system of the chosen model.

Legend: + Essential ○ Non-essential - Omitted

## Curriculum Framework

### Exploring Inventions and Innovations

#### Task Number 39

**Explain the importance of technology in the development of society.**

#### Definition

Explanation should include the difference between an invention and an innovation, what impact the various inventions and innovations have had on society, and evaluating the consequences of technology.

#### Process/Skill Questions

- What is the definition of *technology*?
- Is technology good or bad?
- How is an invention different from an innovation?
- What are some famous inventions?
- What are the desirable and undesirable impacts of an invention or an innovation?
- What are expected and unexpected consequences of an invention or an innovation?

#### ITEEA National Standards

##### 1. The Characteristics and Scope of Technology

## **2. The Core Concepts of Technology**

## **3. The Relationships Among Technologies and the Connections Between Technology and Other Fields**

## **4. The Cultural, Social, Economic, and Political Effects of Technology**

## **5. The Effects of Technology on the Environment**

## **6. The Role of Society in the Development and Use of Technology**

## **7. The Influence of Technology on History**

### **TSA Competitive Events**

#### **Challenging Technology Issues**

#### **Essays on Technology**

#### **Inventions and Innovations**

#### **Prepared Speech**

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## **Task Number 40**

### **Describe inventions that have affected society.**

#### **Definition**

Description should include inventions throughout history that have extended human potential and examples of ways in which inventions and innovations have impacted society, politics, and culture.

#### **Process/Skill Questions**

- How has technology changed society?
- What inventions have changed aspects of society, such as transportation and communication?
- What do you think the most influential invention is?

#### **ITEEA National Standards**

- 1. The Characteristics and Scope of Technology**
- 2. The Core Concepts of Technology**
- 3. The Relationships Among Technologies and the Connections Between Technology and Other Fields**
- 4. The Cultural, Social, Economic, and Political Effects of Technology**
- 5. The Effects of Technology on the Environment**
- 6. The Role of Society in the Development and Use of Technology**
- 7. The Influence of Technology on History**

## **TSA Competitive Events**

**Essays on Technology**

**Inventions and Innovations**

**Prepared Speech**

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## **Task Number 41**

**Research the areas of the designed world.**

### **Definition**

Research should include the seven areas of the designed world:

- Medical Technologies
- Agricultural and Related Biotechnologies
- Energy and Power Technologies
- Information and Communication Technologies
- Transportation Technologies
- Manufacturing Technologies
- Construction Technologies

### **Process/Skill Questions**

- What is the definition of a spinoff?

- What inventions are spinoffs of the seven areas?
- How do the seven areas overlap?

## **ITEEA National Standards**

### **1. The Characteristics and Scope of Technology**

#### **14. Medical Technologies**

#### **15. Agricultural and Related Biotechnologies**

#### **16. Energy and Power Technologies**

#### **17. Information and Communication Technologies**

#### **18. Transportation Technologies**

#### **19. Manufacturing Technologies**

#### **20. Construction Technologies**

### **3. The Relationships Among Technologies and the Connections Between Technology and Other Fields**

#### **6. The Role of Society in the Development and Use of Technology**

#### **7. The Influence of Technology on History**

## **TSA Competitive Events**

### **Biotechnology**

### **Environmental Engineering**

### **Essays on Technology**

### **Medical Technology**

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## **Task Number 42**

**Explain how inventions and innovations relate to the development of new products, processes, and systems.**



## **Definition**

Description should include needs, wants, supply and demand, and marketing.

## **Process/Skill Questions**

- What do humans need in order to survive on another planet?
- What is the difference between needs and wants?
- What effect does marketing and supply and demand have on invention and innovation?

## **ITEEA National Standards**

**1. The Characteristics and Scope of Technology**

**2. The Core Concepts of Technology**

**4. The Cultural, Social, Economic, and Political Effects of Technology**

**6. The Role of Society in the Development and Use of Technology**

## **TSA Competitive Events**

**Essays on Technology**

**Inventions and Innovations**

**Prepared Speech**

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## **Task Number 43**

**Identify the purpose of patents and copyrights.**

## **Definition**

Identification should include types of

- patents
- copyright
- trademarks
- intellectual property.

## **Process/Skill Questions**

- What items do we commonly use that have patents?
- What effect does copyright have regarding music download? Graphic use? Software licenses?
- What is intellectual property?

## **ITEEA National Standards**

### **2. The Core Concepts of Technology**

### **3. The Relationships Among Technologies and the Connections Between Technology and Other Fields**

### **6. The Role of Society in the Development and Use of Technology**

## **TSA Competitive Events**

### **Community Service Video**

### **Inventions and Innovations**

### **Mass Production**

### **Promotional Marketing**

### **STEM Animation**

### **Video Game Design**

### **Website Design**

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# **Exploring Design and Creativity**

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## **Task Number 44**

**Describe the engineering design process.**

### **Definition**

Description should include the following steps of the engineering design process, with emphasis on defining problems and brainstorming solutions:

- Define the problem
- Research
- Brainstorm
- Choose the best solution and design
- Build/create
- Test and evaluate
- Redesign/rebuild
- Communicate results

### **Process/Skill Questions**

- What process do designs go through before a product is produced?
- Why should a group brainstorm ideas to solve a problem or invent something?
- When in the process does feedback occur?

### **ITEEA National Standards**

#### **1. The Characteristics and Scope of Technology**

#### **10. The Role of Troubleshooting, Research and Development, Invention and Innovation, and Experimentation in Problem Solving**

#### **2. The Core Concepts of Technology**

#### **8. The Attributes of Design**

### **TSA Competitive Events**

#### **Biotechnology**

#### **Construction Challenge**

#### **Dragster**

#### **Flight**

#### **Mass Production**

#### **Problem Solving**

#### **Structural Engineering**

## **Task Number 45**

### **Explain the characteristics of the engineering design process.**

#### **Definition**

Explanation should include that design is a creative planning process. Planning and design are not linear, but occur in a cycle that leads to improvements of products and systems. The design process has multiple outcomes and solutions.

#### **Process/Skill Questions**

- How can you learn from failed designs?
- What is an example of a failed design that resulted in success?
- What kind of feedback can you get from a failed design?

#### **ITEEA National Standards**

**10. The Role of Troubleshooting, Research and Development, Invention and Innovation, and Experimentation in Problem Solving**

**2. The Core Concepts of Technology**

**8. The Attributes of Design**

**9. Engineering Design**

#### **TSA Competitive Events**

**Biotechnology**

**Construction Challenge**

**Dragster**

**Flight**

**Mass Production**

**Prepared Speech**

**Problem Solving**

**Structural Engineering**

**System Control Technology**

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## **Task Number 46**

**Explain the impact of the criteria and constraints for a design.**

### **Definition**

Explanation should include that the criteria and constraints lead to tradeoffs in order to optimize the design.

### **Process/Skill Questions**

- What are criteria? Constraints?
- Why do criteria and constraints lead to tradeoffs?
- How would you optimize a design?
- What role does mathematics play in optimization?

### **ITEEA National Standards**

**10. The Role of Troubleshooting, Research and Development, Invention and Innovation, and Experimentation in Problem Solving**

**2. The Core Concepts of Technology**

**8. The Attributes of Design**

**9. Engineering Design**

### **TSA Competitive Events**

**Biotechnology**

**Construction Challenge**

**Dragster**

**Flight**

**Mass Production**

**Problem Solving**

**Structural Engineering**

**System Control Technology**

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## **Task Number 47**

### **Develop designs for presenting to the class.**

#### **Definition**

Development should include documentation of

- identifying the problem
- defining the goal
- brainstorming possible solutions
- assessing alternatives for the best solutions.

Designs should be presented to the class.

#### **Process/Skill Questions**

- How can brainstorming help a team develop a design?
- Why is it necessary to identify the problem and define the goal?
- What is the role of criteria and constraints in design?

#### **ITEEA National Standards**

**1. The Characteristics and Scope of Technology**

**8. The Attributes of Design**

**9. Engineering Design**

#### **TSA Competitive Events**

**Biotechnology**

**Construction Challenge**

**Dragster**

**Flight**

**Problem Solving**

**System Control Technology**

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## **Applying the Design Process**

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### **Task Number 48**

**Demonstrate safe use of a minimum of five tools and/or pieces of equipment.**

#### **Definition**

Demonstration should include following Occupational Safety and Health Administration (OSHA) safety regulations and teacher's classroom safety policies in the safe and proper use of tools and equipment.

#### **Process/Skill Questions**

- Why is it important to use safe practices in the workplace?
- What are some examples of safe practices in the workplace?
- What is the proper care and maintenance of tools, materials, and equipment?

#### **ITEEA National Standards**

**12. Use and Maintain Technological Products and Systems**

**9. Engineering Design**

## **TSA Competitive Events**

**Dragster**

**Problem Solving**

**Structural Engineering**

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## **Task Number 49**

### **Demonstrate various types of measuring.**

#### **Definition**

Demonstration may include using a ruler, thermometer, micrometer, and Volt-Ohm-Milliammeter (VOM). Measuring may include U.S. customary, metric, and other ways of measuring distance, angles, volume, area, and weight.

#### **Process/Skill Questions**

- How do you apply each step of the problem-solving process?
- How can each member of the team be involved in production?
- What materials and tools are needed to make the product?
- How will the result be evaluated?

#### **ITEEA National Standards**

##### **12. Use and Maintain Technological Products and Systems**

##### **7. The Influence of Technology on History**

##### **8. The Attributes of Design**

##### **9. Engineering Design**

## **TSA Competitive Events**

**Construction Challenge**

**Dragster**

**Flight**



## **Problem Solving**

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### **Task Number 50**

#### **Create sketches and drawings.**

##### **Definition**

Creating of sketches and drawings may include using pencil, graph paper, T-square, triangle, protractor, and computer design software.

##### **Process/Skill Questions**

- Why is sketching important?
- What is the difference between a sketch and a drawing?

##### **ITEEA National Standards**

**12. Use and Maintain Technological Products and Systems**

**8. The Attributes of Design**

**9. Engineering Design**

##### **TSA Competitive Events**

**Construction Challenge**

**Dragster**

**Flight**

**Mass Production**

**Problem Solving**

**Structural Engineering**

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## **Task Number 51**

### **Develop designs for a given problem.**

#### **Definition**

Development should include documentation of each step in the design process.

#### **Process/Skill Questions**

- How can brainstorming help a team develop a design?
- Why is it necessary to identify the problem and define the goal?
- Why is documentation of each step important?

#### **ITEEA National Standards**

**1. The Characteristics and Scope of Technology**

**8. The Attributes of Design**

**9. Engineering Design**

#### **TSA Competitive Events**

**Biotechnology**

**Construction Challenge**

**Dragster**

**Flight**

**Problem Solving**

**System Control Technology**

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## **Task Number 52**

### **Evaluate a product design with the goal of innovation.**

#### **Definition**

Evaluation should include considering criteria and constraints, whether the design meets the goal, and how the design can be improved.

### **Process/Skill Questions**

- How well does the item meet the goal?
- How well does the item meet criteria?
- How well does the item overcome constraints?
- Can the design be improved? Why, or why not?

### **ITEEA National Standards**

#### **13. Assess the Impact of Products and Systems**

#### **2. The Core Concepts of Technology**

#### **9. Engineering Design**

### **TSA Competitive Events**

**Dragster**

**Flight**

**Mass Production**

**System Control Technology**

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## **Task Number 53**

### **Design an improvement for an existing product.**

#### **Definition**

Design should be considered for level of creativity, engineering, and appearance. Design should be completed by each student, keeping documentation that could be used in a presentation.

#### **Process/Skill Questions**

- What is something you use that you think can be improved?
- Why does this item need improvement?
- How would you improve the item?

## **ITEEA National Standards**

### **1. The Characteristics and Scope of Technology**

#### **11. Apply the Design Processes**

#### **12. Use and Maintain Technological Products and Systems**

### **2. The Core Concepts of Technology**

#### **8. The Attributes of Design**

#### **9. Engineering Design**

## **TSA Competitive Events**

### **Inventions and Innovations**

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## **Task Number 54**

### **Produce a model, or prototype, of a design.**

#### **Definition**

Production should include

- using detailed drawings (e.g., paper and pencil, computer-aided design)
- building a simple model
- reviewing your model for possible problems
- researching options for building a prototype
- producing your prototype.

#### **Process/Skill Questions**

- What are the differences between a mock-up, a working model, and a prototype?
- What is the difference between a model and a prototype?
- What is rapid prototyping?
- What materials and tools did you need?
- What steps did you follow to plan the production?
- How well did the product meet the goal?

## **ITEEA National Standards**

**11. Apply the Design Processes**

**12. Use and Maintain Technological Products and Systems**

**13. Assess the Impact of Products and Systems**

**19. Manufacturing Technologies**

**TSA Competitive Events**

**Dragster**

**Flight**

**Mass Production**

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## **Task Number 55**

**Produce a presentation.**

**Definition**

Production should include a presentation of the design process for a product.

**Process/Skill Questions**

- What are the characteristics of a quality presentation?
- How well does the presentation communicate the information?
- What methods were used to develop the presentation?
- How does the audience influence the content of the presentation?

**ITEEA National Standards**

**12. Use and Maintain Technological Products and Systems**

**13. Assess the Impact of Products and Systems**

**17. Information and Communication Technologies**

**TSA Competitive Events**

**Biotechnology**

**Construction Challenge**

**Environmental Engineering**

**Inventions and Innovations**

**Medical Technology**

**STEM Animation**

**Video Game Design**

**Website Design**

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## **Forming a Production Company**

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### **Task Number 56**

**Simulate the formation of a business or a company.**

#### **Definition**

Simulation should include

- a vision and mission
- a product or service
- operating capital
- budget
- personnel
- marketing
- facility
- distribution.

#### **Process/Skill Questions**

- How does each of these components affect the success of the company or business?

- Why are the vision and mission important?
- How is operating capital acquired?

## **ITEEA National Standards**

### **19. Manufacturing Technologies**

#### **3. The Relationships Among Technologies and the Connections Between Technology and Other Fields**

#### **4. The Cultural, Social, Economic, and Political Effects of Technology**

#### **5. The Effects of Technology on the Environment**

#### **6. The Role of Society in the Development and Use of Technology**

#### **7. The Influence of Technology on History**

## **TSA Competitive Events**

### **Mass Production**

### **Tech Bowl**

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## **Task Number 57**

### **Identify personnel required to operate the business or company.**

#### **Definition**

Identification should include roles of owners, officers, administrators, and employees.

#### **Process/Skill Questions**

- What education and training are required for the various positions necessary to operate a business or company?
- What roles do officers play?
- What are the implications of the hierarchy of business or company personnel?

## **ITEEA National Standards**

## **19. Manufacturing Technologies**

### **7. The Influence of Technology on History**

#### **TSA Competitive Events**

##### **Mass Production**

##### **Tech Bowl**

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## **Task Number 58**

### **Develop advertising techniques to market a product.**

#### **Definition**

Development should include

- building public awareness of, and interest in the invention or innovation
- using the "marketing mix" components (i.e., product, price, place, promotion)
- identifying target market
- projecting sales
- selecting advertising methods.

#### **Process/Skill Questions**

- What are various methods of advertising?
- What elements constitute effective advertising?

#### **ITEEA National Standards**

##### **13. Assess the Impact of Products and Systems**

##### **17. Information and Communication Technologies**

##### **19. Manufacturing Technologies**

#### **TSA Competitive Events**

##### **Mass Production**



## Task Number 59

### Calculate profit or loss.

#### Definition

Calculation should determine the amount of money remaining after all expenses are paid.

#### Process/Skill Questions

- What is the definition of *profit*?
- What is the difference between gross and net profit?
- If a product's price is increased, should there be an improvement in the product? Explain.
- What are ways production costs can be lowered?

#### ITEEA National Standards

##### 19. Manufacturing Technologies

##### 4. The Cultural, Social, Economic, and Political Effects of Technology

#### TSA Competitive Events

#### Mass Production

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## Applying Production Management

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## Task Number 60

### Participate as part of a cooperative team.

#### Definition

Participation should take place in a design team or enterprise system.

### **Process/Skill Questions**

- Why is it useful to organize and use teams?
- Why are job descriptions for each member important?
- How do communication and cooperation within a team help meet goals and objectives?

### **ITEEA National Standards**

#### **19. Manufacturing Technologies**

##### **4. The Cultural, Social, Economic, and Political Effects of Technology**

##### **6. The Role of Society in the Development and Use of Technology**

### **TSA Competitive Events**

#### **Biotechnology**

#### **Chapter Team**

#### **Construction Challenge**

#### **Environmental Engineering**

#### **Geospatial Technology (Virginia only)**

#### **Inventions and Innovations**

#### **Leadership Strategies**

#### **Mass Production**

#### **Problem Solving**

#### **Structural Engineering**

#### **System Control Technology**

#### **Tech Bowl**

#### **Website Design**

## **Task Number 61**

### **Gather information about a potential invention or innovation.**

#### **Definition**

Gathering should include researching, brainstorming, surveying, and sketching.

#### **Process/Skill Questions**

- What purpose does gathering information serve in production management?
- Where will you find the information to solve the problem?

#### **ITEEA National Standards**

**3. The Relationships Among Technologies and the Connections Between Technology and Other Fields**

**4. The Cultural, Social, Economic, and Political Effects of Technology**

**5. The Effects of Technology on the Environment**

**6. The Role of Society in the Development and Use of Technology**

**7. The Influence of Technology on History**

**9. Engineering Design**

#### **TSA Competitive Events**

**Inventions and Innovations**

**Mass Production**

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## **Task Number 62**

### **Illustrate ideas for developing an invention or innovation.**

#### **Definition**

Illustration should result in basic designs and visual representations.

### **Process/Skill Questions**

- What are the elements of design?
- What are various methods of illustration?

### **ITEEA National Standards**

#### **19. Manufacturing Technologies**

#### **8. The Attributes of Design**

#### **9. Engineering Design**

### **TSA Competitive Events**

#### **Inventions and Innovations**

#### **Mass Production**

#### **Technical Design**

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## **Task Number 63**

### **Conduct market research on an invention or innovation.**

#### **Definition**

Conducting market research should determine

- attitudes toward the development and use of a product
- environmental vs. economic concerns
- selling potential.

### **Process/Skill Questions**

- What methods of research were used to acquire data?
- What are the questions necessary to obtain the required data?
- What criteria can be used to determine the segment of the population to be surveyed?

### **ITEEA National Standards**

**13. Assess the Impact of Products and Systems**

**17. Information and Communication Technologies**

**19. Manufacturing Technologies**

**4. The Cultural, Social, Economic, and Political Effects of Technology**

**5. The Effects of Technology on the Environment**

**TSA Competitive Events**

**Promotional Marketing**

**Technical Design**

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## **Task Number 64**

**Develop a production plan to create a model of an invention or an innovation.**

### **Definition**

Plan should include

- budget
- timeline
- materials
- tools
- tasks
- procedures
- personnel.

### **Process/Skill Questions**

- What materials are needed to produce the product?
- What tools and equipment are needed to produce the product?
- What tasks and procedures will be performed?
- Who will perform each task?
- What is included in a budget?
- What are the consequences of a budget overrun?

## **ITEEA National Standards**

**10. The Role of Troubleshooting, Research and Development, Invention and Innovation, and Experimentation in Problem Solving**

**11. Apply the Design Processes**

**12. Use and Maintain Technological Products and Systems**

**13. Assess the Impact of Products and Systems**

**19. Manufacturing Technologies**

**8. The Attributes of Design**

**9. Engineering Design**

## **TSA Competitive Events**

**Inventions and Innovations**

**Mass Production**

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## **Task Number 65**

**Prepare working drawings to support the production of the invention or innovation model.**

### **Definition**

Preparation should result in all information needed to construct the model to the correct dimensions and to assemble the model.

### **Process/Skill Questions**

- What is the value of a drawing?
- What are the common types of technical drawings?
- What is the difference between artistic and technical drawings?

## **ITEEA National Standards**

## **8. The Attributes of Design**

## **9. Engineering Design**

## **TSA Competitive Events**

### **Inventions and Innovations**

### **Mass Production**

### **Technical Design**

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## **Task Number 66**

### **Construct a model or a prototype of an invention and/or innovation.**

#### **Definition**

Construction should include a model that can be assessed or a prototype that can be tested.

#### **Process/Skill Questions**

- What information can be gained from a model?
- What information can be gained from a prototype?
- How can a model or prototype be tested?

#### **ITEEA National Standards**

### **10. The Role of Troubleshooting, Research and Development, Invention and Innovation, and Experimentation in Problem Solving**

### **19. Manufacturing Technologies**

## **9. Engineering Design**

## **TSA Competitive Events**

### **Biotechnology**

**Environmental Engineering**

**Mass Production**

**Medical Technology**

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## **Task Number 67**

**Evaluate the model through assessment, or the prototype through testing.**

### **Definition**

Evaluation should be based on

- physical testing
- experimentation
- criteria
- appropriateness of materials
- processes
- market research
- trends.

Components will be determined by data collected throughout the process.

### **Process/Skill Questions**

- What do you do when the evaluation produces negative results?
- What influenced your selection of evaluation methods?
- What is an example of physical testing?
- What is an example of market research?

### **ITEEA National Standards**

**11. Apply the Design Processes**

**12. Use and Maintain Technological Products and Systems**

**13. Assess the Impact of Products and Systems**

**19. Manufacturing Technologies**



## **9. Engineering Design**

### **TSA Competitive Events**

**Biotechnology**

**Dragster**

**Flight**

**Mass Production**

**Medical Technology**

**Structural Engineering**

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## **Task Number 68**

### **Participate in a production system of the chosen model.**

#### **Definition**

Participation should include explaining individual roles in the system, including how each role is vital to the production system.

#### **Process/Skill Questions**

- How would you get a particular job in a production system?
- How does a production system work?
- What happens if a job is not done in the system?

#### **ITEEA National Standards**

**17. Information and Communication Technologies**

**19. Manufacturing Technologies**

**6. The Role of Society in the Development and Use of Technology**

### **TSA Competitive Events**

Community Service Video

Mass Production

Promotional Marketing

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## SOL Correlation by Task

39	Explain the importance of technology in the development of society.	English: 6.6, 7.6, 8.6 History and Social Science: CE.8, CE.9, CE.11, USI.2, USI.4, USI.8 Science: 6.8, LS.11, LS.12, PS.8d, PS.9e
40	Describe inventions that have affected society.	English: 6.6, 7.6, 8.6 History and Social Science: CE.11, USI.2, USI.4, USI.8, USII.8, USII.9 Science: 6.8, LS.11, LS.12, PS.8d, PS.9e
41	Research the areas of the designed world.	English: 6.6, 6.9, 7.6, 7.9, 8.6, 8.9 History and Social Science: CE.1, USI.1, USII.1, USII.6, USII.8, USII.9, WG.1 Science: 6.1, LS.1, PS.1
42	Explain how inventions and innovations relate to the development of new products, processes, and systems.	English: 6.6, 7.6, 8.6 History and Social Science: CE.1, CE.11, USI.2, USI.4, USI.8, USII.1, USII.8, USII.9, WG.1 Mathematics: 8.4
43	Identify the purpose of patents and copyrights.	English: 6.6, 7.6, 8.6 History and Social Science: CE.6, CE.9, CE.11
44	Describe the engineering design process.	English: 6.4, 6.6, 7.4, 7.6, 8.4, 8.6 History and Social Science: CE.1, USII.1, WG.1

		Mathematics: 6.5, 6.6, 7.2, 7.3, 7.4, 8.4, 8.6, 8.9, 8.10, 8.12, 8.14  Science: 6.1, LS.1, PS.1
45	Explain the characteristics of the engineering design process.	English: 6.6, 7.6, 8.6  History and Social Science: CE.1, USII.1, WG.1  Science: 6.1, LS.1, PS.1
46	Explain the impact of the criteria and constraints for a design.	English: 6.6, 7.6, 8.6  History and Social Science: CE.1, USII.1
47	Develop designs for presenting to the class.	English: 6.7, 7.7, 8.7  History and Social Science: CE.1  Science: 6.1, LS.1, PS.1
48	Demonstrate safe use of a minimum of five tools and/or pieces of equipment.	English: 6.6, 7.6, 8.6  History and Social Science: CE.1, CE.4  Science: 6.1, LS.1, PS.1
49	Demonstrate various types of measuring.	Mathematics: 6.2, 6.7, 6.9, 7.3, 7.4, 7.5, 8.5, 8.6, 8.9  Science: 6.1, LS.1, PS.1
50	Create sketches and drawings.	Mathematics: 6.2, 6.8, 6.9, 7.3, 7.4, 7.5, 8.5, 8.6, 8.7, 8.8, 8.9  Science: 6.1, PS.1
51	Develop designs for a given problem.	English: 6.6, 7.6, 8.6  History and Social Science: CE.1  Science: 6.1, LS.1, PS.1
52	Evaluate a product design with the goal of innovation.	English: 6.6, 7.6, 8.6, 8.7
53	Design an improvement for an existing product.	English: 6.6, 7.6, 8.6
54	Produce a model, or prototype, of a design.	English: 6.1, 6.2, 7.1, 7.2, 8.1, 8.2  History and Social Science: CE.1

		Mathematics: 6.2, 6.8, 6.9, 7.3, 7.4, 7.5, 8.5, 8.6, 8.7, 8.8, 8.9  Science: 6.1, LS.1, PS.1
55	Produce a presentation.	History and Social Science: CE.1, USII.1  Science: LS.1, PS.1
56	Simulate the formation of a business or a company.	History and Social Science: CE.1, CE.9, CE.11, CE.12, CE.14  Mathematics: 6.5, 6.6, 7.2, 7.3, 8.4
57	Identify personnel required to operate the business or company.	History and Social Science: CE.1, CE.9, CE.11, CE.12, CE.14
58	Develop advertising techniques to market a product.	History and Social Science: CE.1, CE.9, CE.11, CE.12, CE.14  Mathematics: 6.5, 6.6, 6.13, 7.2, 7.3, 7.11, 7.12, 8.4, 8.13, 8.14
59	Calculate profit or loss.	History and Social Science: CE.1, CE.9, CE.11, CE.12, CE.14  Mathematics: 6.5, 6.6, 6.13, 7.2, 7.3, 8.4
60	Participate as part of a cooperative team.	English: 6.1, 7.1, 8.1  History and Social Science: CE.1, CE.4, CE.14  Science: 6.1, LS.1, PS.1
61	Gather information about a potential invention or innovation.	English: 6.6, 6.9, 7.6, 7.9, 8.6, 8.9  History and Social Science: CE.1, CE.4, CE.14  Mathematics: 6.5, 6.6, 6.10, 7.9, 8.12, 8.13  Science: 6.1, LS.1, PS.1
62	Illustrate ideas for developing an invention or innovation.	History and Social Science: CE.1  Mathematics: 6.7, 7.3, 7.4, 7.5, 8.5, 8.6, 8.7, 8.8, 8.10  Science: 6.1, LS.1, PS.1
63	Conduct market research on an invention or innovation.	English: 6.9, 7.9, 8.9

		History and Social Science: CE.11, USII.1
64	Develop a production plan to create a model of an invention or an innovation.	English: 6.7, 7.7, 8.7  History and Social Science: CE.1  Mathematics: 6.5, 6.7, 7.2, 7.3, 7.4, 7.5, 7.6, 8.6, 8.8, 8.9, 8.10
65	Prepare working drawings to support the production of the invention or innovation model.	Mathematics: 6.2, 6.5, 6.7, 6.8, 6.9, 7.2, 7.3, 7.4, 7.5, 8.6, 8.7, 8.8, 8.9  Science: 6.1, LS.1, PS.1
66	Construct a model or a prototype of an invention and/or innovation.	Mathematics: 6.2, 6.5, 6.7, 6.8, 7.2, 7.3, 7.4, 7.5, 8.6, 8.7, 8.8, 8.9  Science: 6.1, LS.1, PS.1
67	Evaluate the model through assessment, or the prototype through testing.	History and Social Science: CE.1, USII.1  Mathematics: 6.2, 6.5, 6.6, 6.10, 7.9, 8.12, 8.13  Science: 6.1, LS.1, PS.1
68	Participate in a production system of the chosen model.	History and Social Science: CE.1

## Teacher Resources

- **Admiral Richard E. Byrd Middle School Technology Education Website** This website provides a wide array of resources for middle school Technology and Engineering Education students and teachers. <https://goo.gl/H7T1Ak>
- **Alice** This website provides free resources for learning programming in a 3D environment. <http://www.alice.org/index.php>
- **Autodesk** This is free software for use in education (e.g., Fusion, Inventor, Autocad). <http://www.autodesk.com/education/free-software/featured>
- **Autodesk Homestyler** This is a free online architecture/home design program. <http://www.homestyler.com/>
- **Code.org** This website provides free resources and programs for coding. <https://code.org/>
- **Condé Systems** This is a good resource for dye sublimation needs. <http://www.conde.com/>
- **Edheads** This website provides engaging learning activities, including manufacturing, engineering design, simple machines, crime scene investigation, and surgery. <http://www.edheads.org>
- **Gimp** This resource provides free downloadable image manipulation software. In addition, there are many Gimp tutorials available on YouTube. <https://www.gimp.org/>

- **Google Sketchup** This is simple, yet powerful, 3D modeling software. There are both free and paid versions available; there is free Pro software for educators. <http://www.sketchup.com/>
- **Khan Academy** This is a free resource for learning just about anything, from calculus to JavaScript. <https://www.khanacademy.org/>
- **Nimbus Screenshot and Screencast** This is a free screen capture tool that allows you to capture a full web page or any part. In addition, you can edit screenshots, record screencasts, and record video from your screen. It is available for Chrome, Firefox, Android, and PC. <http://nimbus.everhelper.me/screenshot.php>
- **Planner 5D** This is an online architecture/home design program. Both free and paid options are available. <https://planner5d.com/>
- **Remind** This free resource can be used to send quick, simple messages to any device. <https://www.remind.com/>
- **Scratch** This resource offers free block-based programming language that can create games, animations, etc. <https://scratch.mit.edu/>
- **Thingiverse** This MakerBot resource offers downloadable 3D designs, design challenges, resources, and lessons for educators. <http://www.thingiverse.com/>
- **Whitebox Learning** This resource offers a standards-based STEM learning system for grades 6-12. Completely web-based, students can use the website to design, analyze, and simulate their designs from a web browser. They can also compete with other students throughout their district. This resource requires a subscription. <https://www.whiteboxlearning.com>

# Appendix: Credentials and Career Cluster Information

Industry Credentials: Only apply to 36-week courses

- College and Work Readiness Assessment (CWRA+)

<b>Career Cluster: Science, Technology, Engineering and Mathematics</b>	
<b>Pathway</b>	<b>Occupations</b>
<b>Engineering and Technology</b>	<b>Aerospace Engineer</b> <b>Aerospace Engineering Technician</b> <b>Agricultural Engineer</b> <b>Architect</b> <b>Assembler</b> <b>Biomedical Engineer</b> <b>Chemical Engineer</b> <b>Civil Engineer</b> <b>Civil Engineering Technician</b> <b>Commercial and Industrial Designer</b> <b>Computer Hardware Engineer</b> <b>Computer Programmer</b> <b>Computer Software Engineer</b> Electrical Drafter <b>Electrical Engineer</b> <b>Electrical Engineering Technician</b> <b>Electro-Mechanical Technician</b> <b>Electronics Engineering Technician</b> <b>Engineer</b> <b>Engineering Manager</b> <b>Engineering Technician</b> <b>Environmental Engineer</b> <b>Human Factors Engineer</b> <b>Industrial Engineer</b> <b>Industrial Engineering Technician</b> <b>Landscape Architect</b> <b>Machine Setter, Operator</b> <b>Manufacturing Systems Engineer</b> <b>Marine Engineer</b> <b>Materials Engineer</b> <b>Mechanical Drafter</b> <b>Mechanical Engineer</b> <b>Mechanical Engineering Technician</b> <b>Network and Computer Systems Administrator</b> <b>Network Systems and Data Communication Analyst</b> <b>Nuclear Engineer</b> <b>Petroleum Engineer</b>

<b>Career Cluster: Science, Technology, Engineering and Mathematics</b>	
<b>Pathway</b>	<b>Occupations</b>
	<b>Power Systems Engineer</b> <b>Production, Planning, Expediting Clerk</b> <b>Project Manager</b> <b>Quality Engineer</b> <b>Quality Technician</b> <b>Statistician</b> <b>Stockroom, Warehouse, or Storage Yard Stock Clerk</b> <b>Systems Analyst</b> <b>Technical Writer</b> <b>Telecommunications Specialist</b> <b>Transportation Manager</b>
<b>Science and Mathematics</b>	<b>Animal Nutritionist</b> <b>Animal Scientist</b> <b>Atmospheric Scientist</b> <b>Biologist</b> <b>Botanist</b> <b>Ecologist</b> <b>Economist</b> <b>Environmental Scientist</b> <b>Geoscientist</b> <b>Hydrologist</b> <b>Materials Scientist</b> <b>Oceanographer</b> <b>Plant Biologist</b> <b>Plant Breeder and Geneticist</b> <b>Plant Pathologist</b> <b>Research Chemist</b> <b>Secondary School Teacher</b> <b>Technical Writer</b> <b>Toxicologist</b> <b>Veterinarian</b> <b>Veterinary Assistant</b>