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.

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<td>Produce a presentation.</td>
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**Forming a Production Company**

|   |   |   |   |   |   | Simulate the formation of a business or a company. |
|   |   |   |   |   |   | Identify personnel required to operate the business or company. |
|   |   |   |   |   |   | Develop advertising techniques to market a product. |
|   |   |   |   |   |   | Calculate profit or loss. |

**Applying Production Management**

|   |   |   |   |   |   | Participate as part of a cooperative team. |
|   |   |   |   |   |   | Gather information about a potential invention or innovation. |
|   |   |   |   |   |   | Illustrate ideas for developing an invention or innovation. |
|   |   |   |   |   |   | Conduct market research on an invention or innovation. |
|   |   |   |   |   |   | Develop a production plan to create a model of an invention or an innovation. |
|   |   |   |   |   |   | Prepare working drawings to support the production of the invention or innovation model. |
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

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

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

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
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
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

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
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

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

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 mode, 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
Forming a Production Company

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

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
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
Tech Bowl
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

Applying Production Management

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

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

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
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?
TEA 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

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
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
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
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
### SOL Correlation by Task

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<td>Explain the importance of technology in the development of society.</td>
<td>6.6, 7.6, 8.6</td>
<td>CE.8, CE.9, CE.11, USI.2, USI.4, USI.8</td>
<td>6.8, LS.11, LS.12, PS.8d, PS.9e</td>
</tr>
<tr>
<td>40</td>
<td>Describe inventions that have affected society.</td>
<td>6.6, 7.6, 8.6</td>
<td>CE.11, USI.2, USI.4, USI.8, USII.8, USII.9</td>
<td>6.8, LS.11, LS.12, PS.8d, PS.9e</td>
</tr>
<tr>
<td>41</td>
<td>Research the areas of the designed world.</td>
<td>6.6, 6.9, 7.6, 7.9, 8.6, 8.9</td>
<td>CE.1, USI.1, USII.1, USII.6, USII.8, USII.9, WG.1</td>
<td>6.1, LS.1, PS.1</td>
</tr>
<tr>
<td>42</td>
<td>Explain how inventions and innovations relate to the development of new products, processes, and systems.</td>
<td>6.6, 7.6, 8.6</td>
<td>CE.1, CE.11, USI.2, USI.4, USI.8, USII.1, USII.8, USII.9, WG.1</td>
<td>Mathematics: 8.4</td>
</tr>
<tr>
<td>43</td>
<td>Identify the purpose of patents and copyrights.</td>
<td>6.6, 7.6, 8.6</td>
<td>CE.6, CE.9, CE.11</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>Describe the engineering design process.</td>
<td>6.4, 6.6, 7.4, 7.6, 8.4, 8.6</td>
<td>CE.1, USII.1, WG.1</td>
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<tr>
<td>Page</td>
<td>Task Description</td>
<td>Subjects</td>
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</tbody>
</table>
| 45   | Explain the characteristics of the engineering design process. | 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 |
| 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 |
| 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 |
| 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, LS.1, PS.1 |
| 51   | Develop designs for a given problem. | English: 6.6, 7.6, 8.6  
History and Social Science: CE.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 |
<p>| 55 | Produce a presentation. | History and Social Science: CE.1, USII.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 |
| 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 |
| 59 | Calculate profit or loss. | History and Social Science: CE.1, CE.9, CE.11, CE.12, CE.14 |
| 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 |</p>
<table>
<thead>
<tr>
<th></th>
<th>Develop a production plan to create a model of an invention or an innovation.</th>
<th>History and Social Science: CE.11, USII.1</th>
<th>English: 6.7, 7.7, 8.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>Prepare working drawings to support the production of the invention or innovation model.</td>
<td>Mathematics: 6.2, 6.5, 6.7, 6.8, 6.9, 7.2, 7.3, 7.4, 7.5, 7.6, 8.6, 8.7, 8.8, 8.9</td>
<td>Science: 6.1, LS.1, PS.1</td>
</tr>
<tr>
<td>65</td>
<td>Construct a model or a prototype of an invention and/or innovation.</td>
<td>Mathematics: 6.2, 6.5, 6.7, 6.8, 7.3, 7.4, 7.5, 8.6, 8.7, 8.8, 8.9</td>
<td>Science: 6.1, LS.1, PS.1</td>
</tr>
<tr>
<td>66</td>
<td>Evaluate the model through assessment, or the prototype through testing.</td>
<td>History and Social Science: CE.1, USII.1</td>
<td>Mathematics: 6.2, 6.5, 6.6, 6.10, 7.9, 8.12, 8.13</td>
</tr>
<tr>
<td>67</td>
<td>Participate in a production system of the chosen model.</td>
<td>History and Social Science: CE.1</td>
<td></td>
</tr>
</tbody>
</table>

**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](https://goo.gl/H7T1Ak)
- **Alice** This website provides free resources for learning programming in a 3D environment. [http://www.alice.org/index.php](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](http://www.autodesk.com/education/free-software/featured)
- **Autodesk Homestyler** This is a free online architecture/home design program. [http://www.homestyler.com/](http://www.homestyler.com/)
- **Code.org** This website provides free resources and programs for coding. [https://code.org/](https://code.org/)
- **Condé Systems** This is a good resource for dye sublimation needs. [http://www.conde.com/](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](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/](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 is 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+)

<p>| Career Cluster: Science, Technology, Engineering and Mathematics |
|-----------------|------------------|
| Pathway         | Occupations      |
| Engineering and Technology | Aerospace Engineer  |
|                 | Aerospace Engineering Technician  |
|                 | Agricultural Engineer  |
|                 | Architect  |
|                 | Assembler  |
|                 | Biomedical Engineer  |
|                 | Chemical Engineer  |
|                 | Civil Engineer  |
|                 | Civil Engineering Technician  |
|                 | Commercial and Industrial Designer  |
|                 | Computer Hardware Engineer  |
|                 | Computer Programmer  |
|                 | Computer Software Engineer  |
|                 | Electrical Drafter  |
|                 | Electrical Engineer  |
|                 | Electrical Engineering Technician  |
|                 | Electro-Mechanical Technician  |
|                 | Electronics Engineering Technician  |
|                 | Engineer  |
|                 | Engineering Manager  |
|                 | Engineering Technician  |
|                 | Environmental Engineer  |
|                 | Human Factors Engineer  |
|                 | Industrial Engineer  |
|                 | Industrial Engineering Technician  |
|                 | Landscape Architect  |
|                 | Machine Setter, Operator  |
|                 | Manufacturing Systems Engineer  |
|                 | Marine Engineer  |
|                 | Materials Engineer  |
|                 | Mechanical Drafter  |
|                 | Mechanical Engineer  |
|                 | Mechanical Engineering Technician  |
|                 | Network and Computer Systems Administrator  |
|                 | Network Systems and Data Communication Analyst  |
|                 | Nuclear Engineer  |
|                 | Petroleum Engineer  |</p>
<table>
<thead>
<tr>
<th>Pathway</th>
<th>Occupations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Systems Engineer</td>
<td></td>
</tr>
<tr>
<td>Production, Planning, Expediting Clerk</td>
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<tr>
<td>Project Manager</td>
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<tr>
<td>Quality Engineer</td>
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<tr>
<td>Quality Technician</td>
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<tr>
<td>Statistician</td>
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<tr>
<td>Stockroom, Warehouse, or Storage Yard Stock Clerk</td>
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<tr>
<td>Systems Analyst</td>
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<tr>
<td>Technical Writer</td>
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<tr>
<td>Telecommunications Specialist</td>
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<tr>
<td>Transportation Manager</td>
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<tr>
<td>Animal Nutritionist</td>
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<tr>
<td>Animal Scientist</td>
<td></td>
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<tr>
<td>Atmospheric Scientist</td>
<td></td>
</tr>
<tr>
<td>Biologist</td>
<td></td>
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<tr>
<td>Botanist</td>
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<tr>
<td>Ecologist</td>
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<tr>
<td>Economist</td>
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<tr>
<td>Environmental Scientist</td>
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<tr>
<td>Geoscientist</td>
<td></td>
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<tr>
<td>Hydrologist</td>
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<tr>
<td>Materials Scientist</td>
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<tr>
<td>Oceanographer</td>
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<tr>
<td>Plant Biologist</td>
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<tr>
<td>Plant Breeder and Geneticist</td>
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<tr>
<td>Plant Pathologist</td>
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<tr>
<td>Research Chemist</td>
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<tr>
<td>Secondary School Teacher</td>
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<tr>
<td>Technical Writer</td>
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<tr>
<td>Toxicologist</td>
<td></td>
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<tr>
<td>Veterinarian</td>
<td></td>
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<tr>
<td>Veterinary Assistant</td>
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