

Technological Systems

8477 6 weeks

8457 9 weeks

8486 12 weeks

8463 18 weeks

8462 36 weeks

Table of Contents

Acknowledgments.....	1
Course Description.....	2
Task Essentials Table.....	2
Curriculum Framework.....	5
Exploring Technological Systems	5
Designing Technological Systems	14
Solving Technological Problems	15
Evaluating Technological Systems	24
SOL Correlation by Task.....	27
Green Building Infusion Units.....	30
Teacher Resources	30
Appendix: Credentials and Career Cluster Information.....	32

Acknowledgments

The components of this instructional framework were developed by the following curriculum development team members:

Steven Colwell, Queens Lake Middle School, York County Public Schools
David Curry, Admiral Richard E. Byrd Middle School, Frederick County Public Schools
Paul Jacobs, T. Benton Gayle Middle School, Stafford County Public Schools

Ethan Longenecker, Admiral Richard E. Byrd Middle School, Frederick County Public Schools
Charlene McCray, Spotsylvania Middle School, Spotsylvania County Public Schools
Jeffrey Puckett, Hickory Middle School, Chesapeake City Public Schools
Debra Shapiro, Forest Glen Middle School, Suffolk Public Schools

Correlations to the Virginia Standards of Learning were reviewed and completed by:

Vickie L. Inge, Mathematics Committee Member, Virginia Mathematics and Science Coalition
Anne F. Markwith, New Teacher Mentor, Gloucester County Public Schools
Cathy Nichols-Cocke, PhD, Fairfax High School, Fairfax County Public Schools
Caroline C. Wheeler, M.T., Secondary English

The framework was edited and produced by the CTE Resource Center:

Robin A. Jedlicka, Writer/Editor
Kevin P. Reilly, Administrative Coordinator

Dr. Lynn Basham, Specialist for Technology Education
Office of Career, Technical, and Adult Education
Virginia Department of Education

Dr. Tricia S. Jacobs, CTE Coordinator of Curriculum and Instruction
Office of Career, Technical, and Adult Education Services
Virginia Department of Education

Copyright © 2017

Course Description

Suggested Grade Level: 7 or 8

Students combine resources and techniques to create systems, attaining comprehension of how technological systems work. Students will explore, design, analyze, and evaluate technological systems. By simulating systems and assessing their impacts, students gain insight into how to approach the problems and opportunities of a technological world. Students will also explore technology-oriented careers.

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	8486	8463	8462	8477	8457	Tasks/Competencies
Exploring Technological Systems						
39	+	+	+	+	+	Explain technology.
40	+	+	+	+	+	Analyze the core concepts of technology.
41	+	+	+	+	+	Define <i>system</i> .
42	+	+	+	+	+	Analyze the Universal Systems Model.
43	+	+	+	+	+	Analyze systems of the designed world, using the Universal Systems Model.
44	+	+	+	+	+	Analyze a specific product/process/system, using the Universal Systems Model.
45	+	+	+	+	+	Distinguish the subsystems within a given system.
46	+	+	+	+	+	Explain the potential technological impacts of products and systems.
47	+	+	+	+	+	Explain the influences of technology on history.
48	+	+	+	+	+	Demonstrate safe use of a minimum of seven tools and/or pieces of equipment.
49	+	+	+	+	+	Demonstrate the process for changing inputs to outputs in any system (Universal Systems Model).
Designing Technological Systems						

50	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	Distinguish the characteristics/properties of materials and families of materials.
51	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Design a model of a product or process, using computer-aided design systems.
Solving Technological Problems (Six weeks must choose one task, nine weeks must choose two tasks, 12 weeks must choose three tasks, and 18 weeks must choose five tasks.)						
52	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	Maintain a design portfolio/engineer's notebook.
53	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	Design an information or communication system to solve a problem.
54	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	Explain the coding system used for microcontrollers.
55	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	Demonstrate the use of a micro-controlled system.
56	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	Design a manufacturing system to solve a problem.
57	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	Design a construction system to solve a problem.
58	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	Design a transportation system to solve a problem.
59	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	Design an energy and power system to solve a problem.
60	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	Design an agricultural and related biotechnologies system to solve a problem.
61	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	Design a medical technology system to solve a problem.

Evaluating Technological Systems						
62	○	+	+	○	○	Analyze the cause of a failure or a problem in a technological system.
63	+	+	+	+	+	Assess the impact of technological systems on individuals, resources, society, and the environment.
64	+	+	+	+	+	Research careers related to technological systems.

Legend: ⊕ Essential ○ Non-essential ⊖ Omitted

Curriculum Framework

Exploring Technological Systems

Task Number 39

Explain technology.

Definition

Explanation should include the usefulness of technology, the development of technology, human creativity and motivation, and product demand.

Process/Skill Questions

- How does technology affect your daily routines?
- How does supply and demand affect the development of technology?
- What technologies have become obsolete during your lifetime?

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

TSA Competitive Events

Debating Technological Issues

Essays on Technology

Prepared Speech

Task Number 40

Analyze the core concepts of technology.

Definition

Analysis should include systems, resources, problem solving, and impacts.

Process/Skill Questions

- What is a technological system?
- What are the resources required for any technological system?
- How do specifications and limitations affect a technological system?
- How are resources changed into useful products?
- What are some ways to control technological systems?

ITEEA National Standards

1. The Characteristics and Scope of Technology

2. The Core Concepts of Technology

TSA Competitive Events

Biotechnology

Debating Technological Issues

Environmental Engineering

Essays on Technology

Problem Solving

System Control Technology

Task Number 41

Define *system*.

Definition

Definition should include the concept of interrelated parts working together to accomplish a goal.

Process/Skill Questions

- What is the difference between natural and technological systems?
- What are some examples of technological systems? Natural systems?
- What are some examples of simple systems?

Task Number 42

Analyze the Universal Systems Model.

Definition

Analysis should include

- inputs (e.g., people, materials, time, capital, energy, equipment, information)
- processes (e.g., management, production)
- outputs (e.g., intended, unintended)
- feedback (e.g., open-loop, closed-loop).

Process/Skill Questions

- What is the difference between open- and closed-loop feedback?
- How does feedback change your process?
- What is an example of a production process?

Task Number 43

Analyze systems of the designed world, using the Universal Systems Model.

Definition

Analysis should include using the systems model to analyze areas of the designed world that include

- information and communication
- manufacturing
- construction
- transportation
- energy and power
- agricultural and biotechnology
- medical technology.

Process/Skill Questions

- Why do we analyze technological systems?
- How does the systems model (input, process, output, feedback) help us evaluate technological systems?
- How do innovations come from analyzing technological systems?
- How will knowledge in other fields of study aid in technological advancement?
- What is a subsystem? What are some examples of subsystems?

ITEEA National Standards

2. The Core Concepts of Technology

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

TSA Competitive Events

Biotechnology

Inventions and Innovations

Mass Production

Medical Technology

Task Number 44

Analyze a specific product/process/system, using the Universal Systems Model.

Definition

Analysis should include inputs, processes, outputs, and feedback of a specific product/process/system.

Process/Skill Questions

- What are the intended and unintended outs for the product/process/system?
- Does the system use open- or closed-loop feedback? Explain.
- How does the product/process/system convert inputs into outputs?

Task Number 45

Distinguish the subsystems within a given system.

Definition

Distinguishing should include direct and indirect relationships between systems and subsystems.

Process/Skill Questions

- What other systems are directly dependent on your given system?
- What other systems are indirectly dependent on your given system?
- What is subsystem within an airplane? School bus? School system? Government?

Task Number 46

Explain the potential technological impacts of products and systems.

Definition

Explanation should include economic, environmental, and social consequences of technological endeavors, including

- planned impacts
- desired impacts
- undesired impacts
- unplanned impacts.

Process/Skill Questions

- How would you design and use instruments to collect data?
- How is collected data used to identify trends?
- How do technological trends affect product development and society?

ITEEA National Standards

13. Assess the Impact of Products and Systems

TSA Competitive Events

Biotechnology

Challenging Technology Issues

Environmental Engineering

Inventions and Innovations

Medical Technology

Prepared Speech

Task Number 47

Explain the influences of technology on history.

Definition

Explanation should include the forces that shape the selection and use of technology and the changes it has caused in the development of civilization.

Process/Skill Questions

- How has the development of inventions and innovations affected history?
- How has technology impacted the labor market?
- How have advances in technology changed the way resources are gathered, processed, and used?
- How has the merging of technology and scientific knowledge affected history?

ITEEA National Standards

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

5. The Effects of Technology on the Environment

7. The Influence of Technology on History

TSA Competitive Events

Challenging Technology Issues

Essays on Technology

Prepared Speech

Tech Bowl

Task Number 48

Demonstrate safe use of a minimum of seven 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

- What are examples of the importance of safety in everyday life?
- What hazards are present in your lab?

- How do proper safety practices and procedures prevent accidents?
- Why is a person's attitude toward safety important?

ITEEA National Standards

12. Use and Maintain Technological Products and Systems

TSA Competitive Events

Dragster

Flight

Mass Production

Problem Solving

Structural Engineering

Task Number 49

Demonstrate the process for changing inputs to outputs in any system (Universal Systems Model).

Definition

Demonstration should include changing inputs to outputs by separating, adding, forming, or changing the structure of the materials.

Process/Skill Questions

- What are the types of processes used in technological systems?
- What are some materials that can be altered?
- How can altering or changing material solve a problem?
- How is a closed-loop system different from an open-loop system?

ITEEA National Standards

12. Use and Maintain Technological Products and Systems

13. Assess the Impact of Products and Systems

14. Medical Technologies

15. Agricultural and Related Biotechnologies

16. Energy and Power Technologies

17. Information and Communication Technologies

18. Transportation Technologies

19. Manufacturing Technologies

2. The Core Concepts of Technology

20. Construction 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

Biotechnology

Construction Challenge

Dragster

Electrical Applications

Flight

Mass Production

System Control Technology

Video Game Design

Designing Technological Systems

Task Number 50

Distinguish the characteristics/properties of materials and families of materials.

Definition

Distinction should be made by identifying characteristics/properties, and by testing materials.

Process/Skill Questions

- What are some material properties?
- How would you test the strengths of materials?
- What are renewable materials?

ITEEA National Standards

12. Use and Maintain Technological Products and Systems

13. Assess the Impact of Products and Systems

2. The Core Concepts of Technology

TSA Competitive Events

Inventions and Innovations

Mass Production

Tech Bowl

Task Number 51

Design a model of a product or process, using computer-aided design systems.

Definition

Design includes a selection of the following:

- Sketching
- Simulations
- Drawings
- Prototypes

Design may be accomplished using proprietary software, if available

Process/Skill Questions

- How does modeling assist in the design process?
- What is the meaning of the acronym CADD? What are its uses?
- How can drawings generate ideas in the design process?
- What are the criteria and constraints used when designing a product?

ITEEA National Standards

11. Apply the Design Processes

9. Engineering Design

TSA Competitive Events

Dragster

Mass Production

Solving Technological Problems

(Six weeks must choose one task, nine weeks must choose two tasks, 12 weeks must choose three tasks, and 18 weeks must choose five tasks.)

Task Number 52

Maintain a design portfolio/engineer's notebook.

Definition

Maintenance should include organizing and updating

- sketches
- notes
- reports
- presentations
- projects
- rough drafts
- student performance, including self-assessment
- data collected
- daily logs.

Process/Skill Questions

- What are the key elements of a portfolio?
- What is the importance of creating a portfolio?
- What are some reasons to maintain a paper trail?

ITEEA National Standards

11. Apply the Design Processes

13. Assess the Impact of Products and Systems

TSA Competitive Events

Career Prep

Construction Challenge

Environmental Engineering

Geospatial Technology (Virginia only)

Video Game Design

Task Number 53

Design an information or communication system to solve a problem.

Definition

Design should include using available resources and the problem-solving process to define and establish an information or communication system, adhering to project parameters.

Process/Skill Questions

- What is coding?
- What is the value of coding in today's world?
- What is a microcontroller?
- What are the minimum elements required in an effective communication system?
Information system?

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

17. Information and Communication Technologies

8. The Attributes of Design

9. Engineering Design

TSA Competitive Events

STEM Animation

Video Game Design

Website Design

Task Number 54

Explain the coding system used for microcontrollers.

Definition

Explanation should include the language used, whether it is symbol based or language based, and a basic explanation of syntax.

Process/Skill Questions

- What is symbol-based coding called?
- What does syntax mean?
- Why does syntax matter when coding?

TSA Competitive Events

Microcontroller Design

Task Number 55

Demonstrate the use of a micro-controlled system.

Definition

Demonstration should include use of sensors.

Process/Skill Questions

- How would you make a robot do what you want it to do?
 - Why is timing important in coding?
 - How does a line of code begin?
-

Task Number 56

Design a manufacturing system to solve a problem.

Definition

Design should include using available resources and the problem-solving process to define and establish a manufacturing system, adhering to project parameters.

Process/Skill Questions

- What are the minimum elements required in a manufacturing system?
- What is a manufacturing system?
- What are different methods of manufacturing?
- How are manufacturing systems used to solve a problem?

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

Environmental Engineering

Task Number 57

Design a construction system to solve a problem.

Definition

Design should include using available resources and the problem-solving process to define and establish a construction system, adhering to project parameters.

Process/Skill Questions

- What is a construction system?
- What are different methods of construction?
- How are construction systems used to solve a problem?

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

20. Construction Technologies

8. The Attributes of Design

9. Engineering Design

TSA Competitive Events

Construction Challenge

Environmental Engineering

Structural Engineering

Task Number 58

Design a transportation system to solve a problem.

Definition

Design should include using available resources and the problem-solving process to define and establish a transportation system, adhering to project parameters.

Process/Skill Questions

- What is a transportation system?
- What are different methods of transportation?
- How are transportation systems used to solve a problem?

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

18. Transportation Technologies

8. The Attributes of Design

9. Engineering Design

TSA Competitive Events

Dragster

Flight

Geospatial Technology (Virginia only)

Task Number 59

Design an energy and power system to solve a problem.

Definition

Design should include using available resources and the problem-solving process to define and establish an energy and power system, adhering to project parameters.

Process/Skill Questions

- What is an energy and power system?
- What are different sources of energy and power systems?
- How are energy and power systems used to solve a problem?

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

16. Energy and Power Technologies

8. The Attributes of Design

9. Engineering Design

TSA Competitive Events

Construction Challenge

Electrical Applications

System Control Technology

Task Number 60

Design an agricultural and related biotechnologies system to solve a problem.

Definition

Design should include using available resources and the problem-solving process to define and establish an agricultural and related biotechnologies system, adhering to project parameters.

Process/Skill Questions

- What is an agricultural and related biotechnologies system?
- What are possible uses of an agricultural and related biotechnologies system?
- How are agricultural and related biotechnologies systems used to solve a problem?

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

15. Agricultural and Related Biotechnologies

8. The Attributes of Design

9. Engineering Design

TSA Competitive Events

Biotechnology

Environmental Engineering

Medical Technology

Task Number 61

Design a medical technology system to solve a problem.

Definition

Design should include using available resources and the problem-solving process to define and establish a medical technology system, adhering to project parameters.

Process/Skill Questions

- What are medical technology systems?
- What are the uses of medical technology systems?
- How are medical technology systems used to solve a problem?

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

8. The Attributes of Design

9. Engineering Design

TSA Competitive Events

Biotechnology

Electrical Applications

Medical Technology

System Control Technology

Evaluating Technological Systems

Task Number 62

Analyze the cause of a failure or a problem in a technological system.

Definition

Analysis should include

- using troubleshooting and feedback to determine the cause of the failure or the problem
- developing potential solutions.

Process/Skill Questions

- How would you anticipate, identify, and fix potential problems in a system?
- What resources might you use to fix a problem?
- What feedback might you get to identify a problem?

ITEEA National Standards

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

9. Engineering Design

TSA Competitive Events

Electrical Applications

Mass Production

System Control Technology

Video Game Design

Website Design

Task Number 63

Assess the impact of technological systems on individuals, resources, society, and the environment.

Definition

Assessment should include

- collecting performance data on economic, environmental, and social consequences of a technological system
- determining if the outputs were
 - planned or unplanned
 - desired or undesired.

Process/Skill Questions

- How does technology affect people and society?
- How does the use of different resources affect a system?
- How does data assist in making informed choices relating to technology?
- What are examples of anticipated and unanticipated impacts technology has on society?
- What ethical issues relate to the selection and use of technology?

ITEEA National Standards

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

TSA Competitive Events

Biotechnology

Environmental Engineering

Geospatial Technology (Virginia only)

Medical Technology

System Control Technology

Task Number 64

Research careers related to technological systems.

Definition

Research should include using the career clusters to select technology-related careers for further investigation.

Process/Skill Questions

- What resources do you use to search for career information?
- What educational background would you need to qualify for specific jobs?
- What types of technological systems jobs are available in your area?

ITEEA National Standards

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

Career Prep

SOL Correlation by Task

39	Explain technology.	English: 6.6, 7.6, 8.6 Science: 6.1, LS.1, PS.1
40	Analyze the core concepts of technology.	English: 6.6, 7.6, 8.6 History and Social Science: CE.1, USII.1 Science: 6.1, LS.1, PS.1
41	Define <i>system</i> .	English: 6.4, 7.4, 8.4
42	Analyze the Universal Systems Model.	History and Social Science: USII.1
43	Analyze systems of the designed world, using the Universal Systems Model.	History and Social Science: USI.1, USI.8, USII.1, USII.8, USII.9 Science: 6.2, 6.9, PS.6, PS.10
44	Analyze a specific product/process/system, using the Universal Systems Model.	

45	Distinguish the subsystems within a given system.	
46	Explain the potential technological impacts of products and systems.	English: 6.6, 7.6, 8.6 History and Social Science: CE.1, CE.14, USII.8, USII.9 Science: 6.9
47	Explain the influences of technology on history.	History and Social Science: USI.8, USII.4, USII.8, USII.9
48	Demonstrate safe use of a minimum of seven tools and/or pieces of equipment.	English: 6.6, 7.6, 8.6 Science: 6.1, LS.1, PS.1
49	Demonstrate the process for changing inputs to outputs in any system (Universal Systems Model).	
50	Distinguish the characteristics/properties of materials and families of materials.	English: 6.6, 7.6, 8.6 History and Social Science: USI.8, USII.8, USII.9 Science: PS.2, PS.4
51	Design a model of a product or process, using computer-aided design systems.	Mathematics: 6.2, 6.8, 6.9, 7.4, 7.5, 8.6, 8.7, 8.8, 8.9 Science: 6.1, LS.1, PS.1
52	Maintain a design portfolio/engineer's notebook.	History and Social Science: CE.1, CE.4, CE.14
53	Design an information or communication system to solve a problem.	English: 6.2, 6.6, 7.2, 7.6, 8.2, 8.6 History and Social Science: CE.1 Mathematics: 7.2, 7.3, 8.3, 8.4, 8.14 Science: 6.1, LS.1, PS.1
54	Explain the coding system used for microcontrollers.	English: 6.6, 7.6, 8.6
55	Demonstrate the use of a micro-controlled system.	
56	Design a manufacturing system to solve a problem.	English: 6.2, 6.6, 7.2, 7.6, 8.2, 8.6 History and Social Science: CE.1, WHI.1 Mathematics: 6.6, 6.11, 8.3, 8.14, 8.17

		Science: 6.1, LS.1, PS.1
57	Design a construction system to solve a problem.	English: 6.2, 6.6, 7.2, 7.6, 8.2, 8.6 History and Social Science: CE.1, WHI.1 Mathematics: 6.6, 7.2, 7.3, 8.3, 8.14, 8.17 Science: 6.1, LS.1, PS.1
58	Design a transportation system to solve a problem.	English: 6.2, 6.6, 7.2, 7.6, 8.2, 8.6 History and Social Science: USI.1, USI.8, USII.1, USII.4, USII.6, USII.8, USII.9 Mathematics: 6.6, 7.2, 7.3, 8.3, 8.14, 8.17 Science: 6.1, LS.1, PS.1
59	Design an energy and power system to solve a problem.	English: 6.2, 6.6, 7.2, 7.6, 8.2, 8.6 History and Social Science: CE.1, CE.13, USI.1, USI.8, USII.1, USII.4, USII.6, USII.8, USII.9 Mathematics: 6.6, 7.2, 7.3, 8.3, 8.14, 8.17 Science: 6.1, LS.1, PS.1
60	Design an agricultural and related biotechnologies system to solve a problem.	English: 6.2, 6.6, 7.2, 7.6, 8.2, 8.6 History and Social Science: USI.1, USI.5, USI.8, USII.1, USII.4, USII.6, USII.8, USII.9 Mathematics: 6.6, 6.7, 7.2, 7.3, 8.3, 8.13, 8.14, 8.15, A.1, A.4, A.5, A.7 Science: 6.1, LS.1, PS.1
61	Design a medical technology system to solve a problem.	English: 6.2, 6.6, 7.2, 7.6, 8.2, 8.6 History and Social Science: USI.1, USI.8, USII.1, USII.4, USII.6, USII.8, USII.9

		Mathematics: 6.6, 6.7, 7.2, 7.3, 8.3, 8.14, A.1, A.4, A.5, A.7 Science: 6.1, LS.1, PS.1
62	Analyze the cause of a failure or a problem in a technological system.	History and Social Science: CE.1, USI.1, USII.1 Science: PS.11, PS.10d
63	Assess the impact of technological systems on individuals, resources, society, and the environment.	English: 6.6, 7.6, 8.6 History and Social Science: CE.1, USI.1, USI.8, USII.1, USII.4, USII.6, USII.8, USII.9 Mathematics: 7.9, 8.12, 8.14 Science: 6.7, 6.9, LS.10, LS.11, PS.5
64	Research careers related to technological systems.	English: 6.6, 6.9, 7.6, 7.9, 8.6, 8.9 History and Social Science: CE.14

Green Building Infusion Units

The Green Building Infusion Unit (GBIU) was designed to encourage teachers to infuse instructional units on green building knowledge and skills into designated CTE courses. The infusion unit is not mandatory, and, as such, the tasks/competencies are marked as “optional,” to be taught at the instructor’s discretion.</p>

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+)

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 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 Engineer Mechanical Engineering Technician Network and Computer Systems Administrator Network Systems and Data Communication Analyst Nuclear Engineer Petroleum Engineer Power Systems Engineer Production, Planning, Expediting Clerk Project Manager

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