

CTE CONTENT AREA: Technology Education
CONTENT MODULE TITLE: The Designed World

MODULE DESCRIPTION

In this module, students will learn about the different content areas of the designed world that were created by humans to satisfy their needs and wants outside of the natural and social worlds. The content areas include medical technologies, agriculture and biotechnologies, energy and power technologies, communication and information technologies, transportation technologies, manufacturing technologies, and construction technologies. These different areas are not exclusive from one another, but instead are interrelated and interdependent.

The seven content areas offer many opportunities for project-based and problem-based learning in the technology laboratory. Opportunities exist to integrate content and practices from the other technology modules when teaching about the seven content areas. For example, a manufacturing activity or unit can apply design and financial concepts. A programming activity can include communication and information technologies, design, and troubleshooting. A vehicle design activity can include concepts of history, energy, and environmental impacts. All of these areas offer opportunities for integrating communication through drawing, tool use, prototyping, and modeling through hands-on activities.

This module is intended as the fifth of five modules that can be completed in sequence or integrated with content with the other technology modules through laboratory activities and problem-based assignments.

GUIDING QUESTION

What do students need to understand how the designed world supports the development of systems and products by humans?

MODULE CONTENT

The Designed World

1. Medical Technologies

Students will

- a) Describe how advances and innovations in medical technologies improve health care
- b) Describe how sanitation processes and technologies protect people from harmful organisms and disease
- c) Describe how vaccines and immunization require special technologies to develop
- d) Explain how genetic engineering involves modifying DNA to create new genetics

2. Agricultural and Related Biotechnologies

Students will

- a) Describe how technologies make impact resource needs for food production for large

populations

- b) Identify specialized equipment and resources needed for agricultural production of food, fuel, and other useful products
- c) Describe how biotechnology applies biological sciences to create new foods or products
- d) Demonstrate how artificial ecosystems can replicate aspects of the natural environment
- e) Demonstrate how refrigeration, freezing, dehydration, preservation, and irradiation can be applied for long term food storage

3. Energy and Power Technologies

Students will

- a) Describe how energy is the capacity to do work
- b) Demonstrate how energy can be transformed into work using many processes
- c) Describe how power is the rate at which energy is converted from one form to another
- d) Demonstrate how power systems can be used to provide propulsion to technological products or systems
- e) Describe and implement energy conservation and efficiency principles and practices

4. Information and Communication Technologies

Students will

- a) Describe how information and communication systems can communicate between humans and machines
- b) Define components of communication systems that encode, transmit, and receive information from source to destination
- c) Identify the factors influencing the design and production of a message
- d) Utilize images, symbols, measurements, graphs, and drawings as a common language to express ideas
- e) Develop computer programs and algorithms to solve problems through sequential commands and functions

5. Transportation Technologies

Students will

- a) Describe how transportation systems require multiple modes of transportation to move products or people from point to point
- b) Analyze transportation systems and subsystems that need to function together for control, propulsion, and guidance
- c) Describe how government and safety regulations impact transportation system development and operation
- d) Describe the multiple processes and how they connect to make a transportation system operate efficiently

6. Manufacturing Technologies

Students will

- a) Describe or demonstrate how manufacturing processes convert natural or raw materials into products
- b) Demonstrate manufacturing processes to design products, gather resources, use tools to separate, form or combine materials for a finished product
- c) Classify manufactured goods as either durable or non-durable
- d) Demonstrate manufacturing processes for product designing, development, production

(making) and servicing of products

- e) Describe how materials are located then harvested, extracted, or mined for manufacturing purposes
- f) Describe how products are marketed, distributed, and sold to consumers

7. Construction Technologies

Students will

- a) Examine the impact of building laws, codes, convenience, cost, and function contribute to the design of a structure
- b) Demonstrate how foundations anchor and support structures
- c) Demonstrate how elements of tension and compression work together in a structure
- d) Analyze a building as a series of systems and subsystems
- e) Evaluate use of space, materials, and other resources influence construction projects

8. Career Pathways

Students will

- a) Explain roles and functions of individuals engaged in the technology content areas, including medical, agricultural, biotechnical, energy, communications, manufacturing, transportation, and construction fields
- b) Investigate education, training requirements, and opportunities for career paths in the technology content areas
- c) Assess personal employability skills for technical careers and evaluate personal suitability for such careers

ILLUSTRATIVE ACTIVITIES by Theme Module

Career and Community Connections

Technology and Engineering Career Exploration

Students research an occupation in a field of their choice in medical technologies, agriculture and biotechnologies, energy and power technologies, communication and information technologies, transportation technologies, manufacturing technologies, or construction. Students identify and report on the training, education, skills, and aptitudes necessary to enter a chosen occupation along with the benefits of that occupation to self and society. Possible products include a poster, web page, presentation, slides, or written report.

Communication and Interpersonal Relationships

Morse Code Communication

Students explore the history of the development of the Morse Code as a component of communications technologies, relating the use of on/off signals to modern encoding and decoding technologies. Students use a simple device, such as a light or buzzer with a push-button, to send and receive messages with a partner using Morse Code.

Financial and Consumer Literacy

Home Energy Audit

Students evaluate electrical devices that are used regularly as part of their day for efficient energy use. Examples include lights, computers, televisions, or other devices that require

power from an electrical outlet. Students document information on the device's electrical needs in watts (or converted to watts from the amp requirements). Using local electrical rates in kilowatt-hours, students calculate the cost to run the device for one hour, one day, one month, and one year. Using estimates of how many hours each day the device is on, students determine the energy cost savings if the device was turned off for half the time or when not in use.

Health, Safety, and Wellness

Food Preservation

Students investigate ways that food, such as fruit and vegetables, are preserved through drying. Students design and test a food dehydrator that is either solar powered or uses a safe heat source such as a light bulb. Students test and evaluate drying times, product quality, food thickness, and water mass loss.

Problem Solving and Innovation

Design a Small House

Students develop plans for a small house to scale that has a kitchen, eating area, sleeping area, and bathroom. Students design for space efficiency and comfort and develop a scale model of the home to better visualize and communicate the form and function for the house. Design considerations include low cost, efficiency, and ability to be transported to different locations.

Sustainability

Manufacturing for Sustainability

Students develop a product for production that can be produced from recycled or sustainable materials. Students develop working drawings, a production plan, materials lists, and a list of required tools. The class forms a production line based on the production plan, focusing on how production waste can be reduced or eliminated. Students plan the lifecycle of the new product through manufacture, sale, use, and disposal. Consider products such as bird feeders, plant starting containers, puzzles, home aides, or organizational products.

STANDARDS ADDRESSED

New York State Career Development and Occupational Studies (CDOS) Standards

Intermediate Level

<http://www.p12.nysed.gov/cte/>

Standard 1: Career Development

Students will be knowledgeable about the world of work, explore career options, and relate personal skills, aptitudes, and abilities to future career decisions.

Standard 2: Integrated Learning

Students will demonstrate how academic knowledge and skills are applied in the workplace and other settings.

Standard 3a: Universal Foundation Skills

Students will demonstrate mastery of the foundation skills and competencies essential for success in the workplace.

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Common Career Technical Core Standards

Career Ready Practices - www.careertech.org/career-ready-practices

1. Act as a responsible and contributing citizen and employee
2. Apply appropriate and academic and technical skills
3. Attend to personal health and financial well-being
4. Communicate clearly and effectively and with reason
5. Consider environmental, social, and economic impacts of decisions
6. Demonstrate creativity and innovation
7. Employ valid and reliable research strategies
8. Utilize critical thinking to make sense of problems and persevere in solving them
9. Model integrity, ethical leadership, and effective management
10. Plan education and career paths aligned to personal goals
11. Use technology to enhance productivity
12. Work productively in teams while using cultural global competence

International Technology and Engineering Education Association

Standards for Technological Literacy – www.iteea.org/39197.aspx

Standard 14: Students will develop an understanding of and be able to select and use medical technologies.

Standard 15: Students will develop an understanding of and be able to select and use agricultural and related biotechnologies.

Standard 16: Students will develop an understanding of and be able to select and use energy and power technologies.

Standard 17: Students will develop an understanding of and be able to select and use information and communication technologies.

Standard 18: Students will develop an understanding of and be able to select and use transportation technologies.

Standard 19: Students will develop an understanding of and be able to select and use manufacturing technologies.

Standard 20: Students will develop an understanding of and be able to select and use construction technologies.

RESOURCES

International Technology and Engineering Educators' Association

www.iteea.org

ITEEA is the international organization that represents technology and engineering educators. The organization supports an annual conference and publishes two journals, *Technology and Engineering Educator* and *Journal of Technology Education*. Many resources are available for classroom teachers including Engineering by Design. ITEEA developed and maintains the Standards for Technological Literacy.

New York State Technology and Engineering Educators' Association(NYSTEEA)

www.nysteea.org

NYSTEEA represents technology and engineering educators across New York State. The website has important information on technology content, current developments

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in technology and engineering education, professional development opportunities, and other resources important to technology educators.

New York State Department of Labor
New York State Career Zone

<https://www.careerzone.ny.gov>

Career Zone is a no-cost online career exploration and planning tool developed by the New York State Department of Labor. It offers career and education information on thousands of careers, as well as, self-assessment and career planning tools. Career Zone is appropriate for users from middle school through adult.

United States Department of Labor
CareerOneStop

<https://www.careeronestop.org>

CareerOneStop is the career, training, and job search website for the U.S. Department of Labor. The website serves job seekers, businesses, students, and career advisors with a variety of free online tools, information and resources.

Association of Career and Technical Education
Career Planning Guide

https://www.acteonline.org/wp-content/uploads/2018/02/ACTE_CC_Paper_FINAL.pdf

Research has identified middle school as a time when students can benefit the most from career exploration, a process of building self-awareness, learning about potential careers, and developing a plan for reaching future goals.

AdvanceCTE
Middle Level Career Interest Inventory

<https://cte.careertech.org/sites/default/files/StudentInterestSurvey-English.pdf>

AdvanceCTE provides a Career Interest inventory worksheet to use with students in helping them identify the potential matches to the sixteen career clusters available to them.

Career and Technical Education Technical Assistance Center of New York (CTE TAC)

<http://nyctecenter.org/>

The Career and Technical Education Technical Assistance Center (CTE TAC) operates under a state contract to assist the New York State Education Department (NYSED) in carrying out its mission of improving the quality, access, and delivery of career and technical education through research-based methods and strategies resulting in broader CTE opportunities for all students.

Association of Computing Machinery (ACM)

<https://www.acm.org/>

The Association of Computing Machinery promotes computer science and computer information systems professions. There are several special interest groups that including four specifically for computing education.

United States Department of Agriculture (USDA)

<https://www.usda.gov/>

The USDA website has a wealth of information on farming, biotechnology, plants, conservation, and current research. Some teacher resources are available and it is an excellent source of information on current issues in agriculture.

Safety and Training Resources

<https://www.osha.gov/doc/training.html>

The Occupational Safety and Health Administration (OSHA) has regulation information, statistics, and publications specific to manufacturing and construction careers.

Society of Manufacturing Engineers

<http://www.sme.org/>

Society of Manufacturing Engineers supports manufacturing education through events such as manufacturing days. Local chapters can be found throughout the state, and school teachers and students are encouraged to get involved with the organization.

Energy Kids – US Energy Information Administration

<https://www.eia.gov/kids/index.php>

Energy Kids has energy activities for kids and classroom resources for teachers. Information is available on energy sources, conservation, and history. Student activities and games are available in addition to energy calculators.

United States Department of Energy

www.energy.gov

The website has statistics and information on energy sources, consumption, and conservation. There is a section for educators with lesson plans, videos, and student activities.

United States Department of Transportation

www.transportation.gov

This website contains information on all forms of transportation, including air, sea, and ground transportation. There is a wealth of information and data available along with some videos that would be usable in a classroom.