Technology Assessment

8406 18 weeks

8407 36 weeks

Table of Contents

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Office of Career, Technical, and Adult Education
Virginia Department of Education

Course Description

Suggested Grade Level: 11 or 12
Prerequisites: 8404 or 8405

Students use their knowledge and abilities in science, technology, engineering, mathematics (STEM) and other disciplines to analyze the impacts of technological devices and systems. They apply information acquired through activities and research to predict future technologies.

Students use hands-on activities to innovate a product or system based on their research and forecasting skills.

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	8407	8406	Tasks/Competencies
Analyzing the Fundamentals of Technological Assessment			
39	⊕	⊕	Keep an engineering design journal.
40	⊕	⊕	Define *technology assessment*.
41	⊕	○	Explain the concept of appropriate technology.
42	⊕	⊕	Identify organizations and groups involved with technology assessment.
43	⊕	⊕	Explain the historical interaction between technology and society.
44	⊕	○	Describe a current socio-technological issue.
Analyzing Technological Impacts			
45	⊕	⊕	Identify consequences of technological developments.
46	⊕	⊕	Analyze the life cycle of consumer products and systems.
47	⊕	⊕	Describe replacements of outdated technologies.
48	⊕	⊕	Analyze the relationship between technology and the environment.
49	⊕	⊕	Analyze the relationship between technological demand and resources.
Forecasting Technologies			
50	⊕	⊕	Define *forecasting*.

51	⊕	○	Describe the factors necessary for changes in technology.
52	⊕	⊕	Explain forecasting methods.
53	⊕	⊕	Evaluate forecast results.
54	⊕	○	Predict future conditions and technologies.

Innovating a Technical Product or System

55	⊕	⊕	Assess a product or system currently in the market.
56	⊕	⊕	Incorporate aspects of universal design into a product or system.
57	⊕	⊕	Innovate a product or system to solve a problem or satisfy a need.
58	⊕	○	Identify product-development costs and funding sources.
59	⊕	⊕	Use 3D modeling and analysis.
60	⊕	⊕	Describe the evaluation process used to design a product or system.

Producing a Technical Product or System as a Team

61	⊕	⊕	Apply safety procedures and practices.
62	⊕	⊕	Produce a model or prototype that represents improvement in a product or system.
63	⊕	○	Diagram material flow through the supply chain.
64	⊕	○	Identify components of a quality assurance plan.
65	⊕	⊕	Use tools, machines, materials, and processes.
66	⊕	⊕	Evaluate a product or system.
67	⊕	⊕	Produce an engineering design portfolio for a product or system.
68	⊕	⊕	Present the product or system as a team.

Legend: ⊕Essential ○Non-essential ⊖Omitted

Curriculum Framework

Analyzing the Fundamentals of Technological Assessment

Task Number 39

Keep an engineering design journal.

Definition

An engineering design journal may be handwritten and should include

- sketches
- research notes and data
- test results
- reflections
- work log
- a variety of media.

Process/Skill Questions

- What is the purpose of an engineering design journal?
- Why is it important to keep an engineering design journal?
- Why is it important for handwritten information to be legible and accessible?

ITEEA National Standards

13. Assess the Impact of Products and Systems

TSA Competitive Events

3D Animation

Animatronics

Architectural Design

Biotechnology Design

Chapter Team

Children's Stories

Coding

Computer Integrated Manufacturing (CIM)

Computer-Aided Design (CAD), Architecture

Computer-Aided Design (CAD), Engineering

Debating Technological Issues

Digital Video Production

Dragster Design

Engineering Design

Essays on Technology

Extemporaneous Speech

Fashion Design and Technology

Flight Endurance

Future Technology Teacher

Geospatial Technology (Virginia only)

Music Production

On Demand Video

Photographic Technology

Prepared Presentation

Principles of Technology (Virginia only)

Promotional Design

STEM Careers

Scientific Visualization (SciVis)

Software Development

Structural Design and Engineering

System Control Technology

Technology Bowl

Technology Problem Solving

Transportation Modeling

Video Game Design

Webmaster

Task Number 40

Define *technology assessment.*

Definition

Definition of technology assessment should include that it is a process that helps humans analyze, forecast, apply, and design various products and systems.

Process/Skill Questions

- What is the purpose of technology assessment?
- How is forecasting used in technology assessment?
- How can assessing technology benefit society?
- What are some methodologies used for technology assessment?

ITEEA National Standards

13. Assess the Impact of Products and Systems

TSA Competitive Events

Task Number 41

Explain the concept of appropriate technology.

Definition

Explanation should include that appropriate technology seeks to "aid and support the human ability to understand, operate, and sustain technological systems to the benefit of humans while having the least negative societal and environmental impact on communities." (excerpt from the former Office of Technology Assessment, 1981)

Process/Skill Questions

- How do you determine the appropriate technology for a situation?
- Which situations benefit most from technology?
- What are the differences and similarities in the use of technology in developed, emerging, and undeveloped nations?
- What are some of the environmental and economic implications of using technology?
- When does a technology become inappropriate?
- What technologies exist that may be perceived to invade one's privacy?
- How do different cultures weigh privacy vs. security?

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

7. The Influence of Technology on History

TSA Competitive Events

Engineering Design

Task Number 42

Identify organizations and groups involved with technology assessment.

Definition

Identification may include, but is not limited to,

- U.S. Patent and Trademark Office
- National Aeronautics and Space Administration (NASA)
- Food and Drug Administration (FDA)
- Environmental Protection Agency (EPA)
- U.S. Department of Defense (DOD)
- White House Office of Science and Technology Policy
- Underwriters Laboratory
- state and federal government
- industry organizations
- banking (financial) organizations
- universities
- planning commissions.

Process/Skill Questions

- What are some groups or organizations that use technology assessment?
- What are some of the applications of technology assessment?
- How is technology assessment used to improve products, processes, and systems?
- What are some careers that apply technology assessment?

ITEEA National Standards

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

Task Number 43

Explain the historical interaction between technology and society.

Definition

Explanation should include

- important events and dates

- people
- artifacts
- effects of technology on society, politics, the economy, and the environment.

Process/Skill Questions

- What are some historical events that have influenced technology?
- How does the expression "necessity is the mother of invention" apply to technology assessment?
- What are some ways that technology has affected and beenaffected by politics, society, economies, and/or the environment?
- What events in history caused technology to grow exponentially?

ITEEA National Standards

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

Task Number 44

Describe a current socio-technological issue.

Definition

Description may include changes in areas such as communication, transportation, manufacturing, medical, agriculture/biotechnology, construction, and energy and power technologies.

Process/Skill Questions

- What are some current social issues related to technology?
- What are some ethical issues related to technology?
- What privacy issues arise from emerging technologies?

ITEEA National Standards

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

Analyzing Technological Impacts

Task Number 45

Identify consequences of technological developments.

Definition

Identification should include consideration of consequences (positive or negative, expected or unexpected) of technology.

Process/Skill Questions

- What are some of the ecological effects of technology? How might they be expected or unexpected?
- What effects has modern media had on society? How might they be desired and undesired? How have planned developments in one area of technology led to unplanned developments in other areas?
- What technological trade-offs have led to advancements in humanity's growth?
- How has technology led to advancements in energy conservation (i.e., green technologies)?
- How could the consequences of a technology be measured?
- What is the role of risk management in technology assessment?

ITEEA National Standards

5. The Effects of Technology on the Environment

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

TSA Competitive Events

Essays on Technology

Task Number 46

Analyze the life cycle of consumer products and systems.

Definition

Analysis should include researching and summarizing all facets (e.g., materials, processes, systems, consequences) involved in life cycles (i.e., how long the product or system will last and what is done with it at the end of the cycle).

Process/Skill Questions

- What is the relationship of supply and demand to technology?
- How are economic issues factored into product development and use?
- What are some factors that help determine the length of usefulness of a product or system?
- How can technology go through phases of usefulness (e.g., mobile phones being used more for text messaging than voice calls)?
- How can technological advancements render once-useful products obsolete?
- What are some examples of products with planned obsolescence?
- What are some examples of failure modes and effects analysis (FMEA)?

Task Number 47

Describe replacements of outdated technologies.

Definition

Description should include the replacement technology, consideration of cost vs. benefit, and repurposing of the outdated technology.

Process/Skill Questions

- How can replacement technology affect current operations?
- What costs can be incurred when replacing technology?
- How do you determine whether the benefits of replacing technology outweigh the costs of updating?
- How can outdated technology be repurposed?
- What makes a technology obsolete?

ITEEA National Standards

Task Number 48

Analyze the relationship between technology and the environment.

Definition

Analysis may include such issues as

- climate change
- waste management
- green technology
- pollution
- species and habitats
- sustainability.

Process/Skill Questions

- How do technological developments affect the environment?
- What are some current issues related to technological developments?
- How can technology be used to assess environmental conditions?
- What is considered acceptable environmental risk when deciding to implement technology?
- How can human intervention actually enhance an environment?
- What is climate change, and how is it measured?

ITEEA National Standards

5. The Effects of Technology on the Environment

TSA Competitive Events

Essays on Technology

Technology Bowl

Task Number 49

Analyze the relationship between technological demand and resources.

Definition

Analysis should include exploration of

- natural vs. man-made resources
- supply and demand of resources (e.g., people, time, capital, materials, energy, tools, machines, information)
- economic impact
- benefit
- environmental impact
- societal impact.

Process/Skill Questions

- What are some of the effects of developed nations' technologies on world resources?
- How is technological progress limited by resources?
- How do a population's needs affect resources?
- Why is cost an important consideration when designing technology for environmental use?
- How do you determine the feasibility of a technology alternative when facing economic limitations?

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

7. The Influence of Technology on History

TSA Competitive Events

Biotechnology Design

Essays on Technology

Forecasting Technologies

Task Number 50

Define *forecasting*.

Definition

Definition of forecasting should include that it is an analysis of past and present technologies to predict future products and systems.

Process/Skill Questions

- What are some reasons technologists use forecasting?
- What are some limitations of forecasting?
- How is trend analysis used in forecasting?
- How could you use a survey to forecast a tax-funded improvement for a particular locality? What would be the target audience?

Task Number 51

Describe the factors necessary for changes in technology.

Definition

Description of factors should include

- societal needs and readiness
- technological availability
- economics
- material availability
- human resources (e.g., information, education, skills)
- environmental impact.

Process/Skill Questions

- What is the relationship between needs and wants?
- How is technological availability limited by resources?
- What is the relationship between creativity and technological development?
- Of the stated factors, which is most important? Why?

Task Number 52

Explain forecasting methods.

Definition

Explanation should include identifying forecasting methods (e.g., relevance trees, trends, mission flow analysis) and the types of data, outcomes, and purposes of each.

Process/Skill Questions

- What are the differences among forecasting methods?
- What are some examples of applying forecasting methods?
- How is a trend determined?
- How could you use a relevance tree to predict the evolution of a current product (e.g., smartphone, tablet)?

Task Number 53

Evaluate forecast results.

Definition

Evaluation should include

- identifying the forecasting method used
- comparing predicted vs. actual results.

Process/Skill Questions

- What are the similarities and differences between the predicted and actual results?
- What are the benefits of using the forecasting method?
- What are the limitations of using the forecasting method?

Task Number 54

Predict future conditions and technologies.

Definition

Prediction may include

- researching trends in technology
- the use of an existing forecasting method.

Process/Skill Questions

- What is meant by a future condition or technology?
- What factors may influence future conditions or technologies?
- How might you select a method to predict future conditions and technologies?

ITEEA National Standards

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

Innovating a Technical Product or System

Task Number 55

Assess a product or system currently in the market.

Definition

Assessment should include

- researching the product or system (e.g., need, history, target market)
- evaluating the function of the product or system and its effectiveness
- determining the product or system's life cycle
- evaluating the economic consequences of the product or system
- exploring the social, cultural, and ethical effects of the product or system
- identifying possible environmental and political impacts of the product or system.

Process/Skill Questions

- How do public opinion and ethical considerations affect the development of new technologies?

- How will the product affect future technologies?
- How is product assessment valuable to the consumer?

ITEEA National Standards

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

TSA Competitive Events

Biotechnology Design

Engineering Design

Task Number 56

Incorporate aspects of universal design into a product or system.

Definition

Incorporation of universal design should include designing products and environments for use by people of different ages and abilities without adaptation.

Process/Skill Questions

- What organizations have been involved with ensuring technologies are accessible to all people?
- What changes have been made in the building trades and production to achieve aspects of universal design?
- How can a product be optimized for use by a wider range of people?

ITEEA National Standards

8. The Attributes of Design

9. Engineering Design

TSA Competitive Events

Engineering Design

Task Number 57

Innovate a product or system to solve a problem or satisfy a need.

Definition

Innovation of a product or system should use the engineering design process, which includes the following:

- Define an engineering design problem.
- Identify the criteria (i.e., requirements) and constraints (i.e., restrictions/limits) of the design problem.
- Research potential solutions to the design problem.
- Generate (i.e., brainstorm) multiple solutions to the design problem.
- Sketch the solutions to the design problem.
- Evaluate the requirements and constraints of each solution to the design problem.
- Justify an optimal solution to the design problem.
- Create a model or prototype for the chosen solution to the design problem, using appropriate materials and processes (e.g., 3D rapid prototyping).
- Determine the objectives for an engineering test of the solution to the design problem.
- Test the solution to the design problem, using mathematical, conceptual, and/or physical modeling, simulating, and optimizing.
- Evaluate the test results.
- Formulate an alternate solution to the design problem, if needed.
- Test the alternate solution, if needed.
- Present the final project report.
- Document the final project report.

Process/Skill Questions

- What are some possible products or systems that could be innovated?
- How could a product be altered to accommodate a person with disabilities (e.g., ADA compliant)?
- How could a product be altered to improve it?

ITEEA National Standards

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

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Task Number 58

Identify product-development costs and funding sources.

Definition

Identification may include initial and recurring costs, as well as a funding plan.

Process/Skill Questions

- What are some nonrecurring engineering costs for a particular product?
- What would be some recurring costs of product development?
- What resources are available for funding a product?
- What should be considered in a cost-benefit analysis for a product?
- What are examples of funding sources?

ITEEA National Standards

13. Assess the Impact of Products and Systems

Task Number 59

Use 3D modeling and analysis.

Definition

Use may include computer or other 3D modeling tools and should include analysis of the functional aspects of a product design and the optimization of a product.

Process/Skill Questions

- How can computer-aided design/drafting help to reach a suitable solution?
- What are some advantages of 3D modeling?

- Why is it important to have detailed drawings?
- How can computer testing results affect a design?

ITEEA National Standards

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

TSA Competitive Events

Computer-Aided Design (CAD), Engineering

Task Number 60

Describe the evaluation process used to design a product or system.

Definition

Description should include how a planned product meets constraints, optimization, and predictive analysis in the design process.

Process/Skill Questions

- How can constraints be evaluated using computer design?
- How can optimization, including trade-offs, be documented?
- What methods can be used for predictive analysis?

ITEEA National Standards

9. Engineering Design

Producing a Technical Product or System as a Team

Task Number 61

Apply safety procedures and practices.

Definition

Application should include the ability to interpret all safety-related signs, instructions, Safety Data Sheets (SDS), and manuals.

Process/Skill Questions

- What are potential lab hazards?
- How can equipment injuries be avoided?
- What information is contained in an SDS?

ITEEA National Standards

12. Use and Maintain Technological Products and Systems

Task Number 62

Produce a model or prototype that represents improvement in a product or system.

Definition

Production should include a detailed model or prototype based on previous research and design.

Process/Skill Questions

- What are factors used to determine materials for a model or prototype?
- What are the differences among various types of models?
- What roles do models play in the production of a product or system?
- What are some methods for producing prototypes?

ITEEA National Standards

12. Use and Maintain Technological Products and Systems

8. The Attributes of Design

9. Engineering Design

Task Number 63

Diagram material flow through the supply chain.

Definition

Diagram should include how materials flow through the supply chain, from raw material to a final delivered product.

Process/Skill Questions

- From where do raw materials come?
- How are raw materials processed?
- What might be the next step in the supply chain?
- What relationships exist within the supply chain?

ITEEA National Standards

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

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Task Number 64

Identify components of a quality assurance plan.

Definition

Identification should include

- standards
- testing
- failure analysis
- data collection
- improvement plan.

Process/Skill Questions

- Why should there be a quality assurance plan in place?
- What standards exist for quality assurance (e.g., ISO 9000)?
- Who benefits from quality assurance? How?

TSA Competitive Events

Engineering Design

Task Number 65

Use tools, machines, materials, and processes.

Definition

Use should include production of a prototype based on previous research and development.

Process/Skill Questions

- What are the characteristics of a prototype?
- What roles do prototypes play in the production of a product or system?
- How can you assess the tools, machines, materials, and processes used?
- What are the benefits of constructing a product or system in a modern manufacturing facility?

ITEEA National Standards

12. Use and Maintain Technological Products and Systems

Task Number 66

Evaluate a product or system.

Definition

Evaluation should be based on established criteria, constraints, predictive analysis, and a testing protocol.

Process/Skill Questions

- How do you ensure that a product or system meets the established criteria and constraints?
- How much testing is sufficient?
- What aspects of a product or system may be altered to better meet the criteria and constraints?
- How can you analyze the effectiveness of a product or system?

ITEEA National Standards

13. Assess the Impact of Products and Systems

Task Number 67

Produce an engineering design portfolio for a product or system.

Definition

Production should include a portfolio on the design, development, and evaluation of a product or system. The engineering design journal is a component of the portfolio.

Process/Skill Questions

- What important aspects should be included in a portfolio?
- Can a design be replicated from a portfolio? Why, or why not?
- How do you evaluate a portfolio?
- What parts of a portfolio allow for the description of a product or system?

TSA Competitive Events

Engineering Design

Promotional Design

Task Number 68

Present the product or system as a team.

Definition

Presentation should use documentation and explanations from each team member about their role in the process and include the following elements:

- explaining the technological problem solved by the model
- identifying the process used for selecting the best solution among alternatives
- citing relevant resources used to research the solution
- explaining the design for the selected solution
- demonstrating the prototype
- highlighting the benefits and trade-offs of the prototype
- soliciting questions and suggested improvements from the audience
- validating selection with data
- completing the presentation within the allotted time.

Process/Skill Questions

- Why is it important to explain both the part you played on a team and why you played that part?
- How would you explain the trade-offs made to optimize the design?
- Why is clear documentation necessary for an engineering design team?
- How will you prepare for possible questions about your design?

TSA Competitive Events

Engineering Design

Technology Problem Solving

SOL Correlation by Task

39	Keep an engineering design journal.	English: 11.6, 11.7, 12.6, 12.7
40	Define *technology assessment*.	English: 11.3, 12.3
41	Explain the concept of appropriate technology.	English: 11.5, 12.5 History and Social Science: GOVT.14, GOVT.15, VUS.2, VUS.3, VUS.4, VUS.6, VUS.7, VUS.8, VUS.9, VUS.10, VUS.11, VUS.12, VUS.13, VUS.14, WG.4, WG.15, WG.16, WG.17, WHI.2, WHI.3, WHI.4, WHI.5, WHI.6, WHI.8, WHI.9, WHI.10, WHI.11, WHI.12, WHI.13, WHI.14, WHI.15, WHII.2, WHII.3, WHII.4, WHII.5, WHII.6, WHII.7, WHII.8, WHII.9, WHII.10, WHII.11, WHII.12, WHII.13, WHII.14

42	Identify organizations and groups involved with technology assessment.	English: 11.5, 12.5 History and Social Science: GOVT.7, GOVT.14, GOVT.15
43	Explain the historical interaction between technology and society.	English: 11.5, 12.5 History and Social Science: GOVT.14, GOVT.15, VUS.2, VUS.3, VUS.4, VUS.6, VUS.7, VUS.8, VUS.9, VUS.10, VUS.11, VUS.12, VUS.13, VUS.14, WG.4, WG.15, WG.16, WG.17, WHI.2, WHI.3, WHI.4, WHI.5, WHI.6, WHI.8, WHI.9, WHI.10, WHI.11, WHI.12, WHI.13, WHI.14, WHI.15, WHII.2, WHII.3, WHII.4, WHII.5, WHII.6, WHII.7, WHII.8, WHII.9, WHII.10, WHII.11, WHII.12, WHII.13, WHII.14
44	Describe a current socio-technological issue.	English: 11.5, 12.5 History and Social Science: GOVT.12, VUS.14, WG.17, WHII.14
45	Identify consequences of technological developments.	English: 11.5, 12.5
46	Analyze the life cycle of consumer products and systems.	History and Social Science: GOVT.14, GOVT.15
47	Describe replacements of outdated technologies.	English: 11.5, 12.5
48	Analyze the relationship between technology and the environment.	English: 11.5, 12.5 History and Social Science: GOVT.14, GOVT.15, VUS.14, WG.17, WHII.14
49	Analyze the relationship between technological demand and resources.	English: 11.5, 12.5 History and Social Science: GOVT.14, GOVT.15, VUS.14, WG.14, WG.17
50	Define *forecasting*.	English: 11.3, 12.3
51	Describe the factors necessary for changes in technology.	English: 11.5, 12.5 History and Social Science: GOVT.12, GOVT.14, GOVT.15, VUS.14, WG.4, WG.17, WHII.14
52	Explain forecasting methods.	English: 11.5, 12.5
53	Evaluate forecast results.	English: 11.5, 12.5 Mathematics: PS.7*, PS.8*

54	Predict future conditions and technologies.	English: 11.5, 11.8, 12.5, 12.8
55	Assess a product or system currently in the market.	English: 11.5, 11.8, 12.5, 12.8 History and Social Science: GOVT.14, GOVT.15
56	Incorporate aspects of universal design into a product or system.	English: 11.5, 12.5
57	Innovate a product or system to solve a problem or satisfy a need.	English: 11.3, 11.5, 12.3, 12.5 Mathematics: COM.1, COM.2, COM.3, COM.4, COM.6, COM.7, COM.8, COM.9
58	Identify product-development costs and funding sources.	English: 11.5, 12.5
59	Use 3D modeling and analysis.	Mathematics: G.13, G.14
60	Describe the evaluation process used to design a product or system.	English: 11.5, 12.5
61	Apply safety procedures and practices.	English: 11.5, 12.5 Science: CH.1
62	Produce a model or prototype that represents improvement in a product or system.	English: 11.8, 12.8
63	Diagram material flow through the supply chain.	
64	Identify components of a quality assurance plan.	English: 11.5, 12.5 Mathematics: AFDA.8, PS.8*, PS.9*, PS.10*
65	Use tools, machines, materials, and processes.	
66	Evaluate a product or system.	English: 11.5, 12.5
67	Produce an engineering design portfolio for a product or system.	English: 11.1, 12.1
68	Present the product or system as a team.	English: 11.5, 12.5

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.

Entrepreneurship Infusion Units

Entrepreneurship Infusion Units may be used to help students achieve additional, focused competencies and enhance the validated tasks/competencies related to identifying and starting a new business venture. Because the unit is a complement to certain designated courses and is not mandatory, all tasks/competencies are marked "optional."

Appendix: Credentials, Course Sequences, and Career Cluster Information

Industry Credentials: Only apply to 36-week courses

- College and Work Readiness Assessment (CWRA+)
- National Career Readiness Certificate Assessment
- Workplace Readiness Skills for the Commonwealth Examination

Concentration sequences: *A combination of this course and those below, equivalent to two 36-week courses, is a concentration sequence. Students wishing to complete a specialization may take additional courses based on their career pathways. A program completer is a student who has met the requirements for a CTE concentration sequence and all other requirements for high school graduation or an approved alternative education program.*

- Technology Foundations (8402/18 weeks)
- Technology Foundations (8403/36 weeks)
- Technology Transfer (8404/18 weeks)
- Technology Transfer (8405/36 weeks)

Career Cluster: Agriculture, Food and Natural Resources	
Pathway	**Occupations**
Environmental Service Systems	**Environmental Sampling and Analysis Technician** **Hazardous Materials Handler** **Recycling Coordinator** **Water Conservationist**
Natural Resources Systems	**Ecologist** **Forest Manager, Forester** **Forest Technician** **Wildlife Manager**
Plant Systems	**Crop Grower** **Plant Breeder/ Geneticist** **Soil and Plant Scientist**

Career Cluster: Architecture and Construction	
Pathway	**Occupations**
Design/Pre-Construction	**Architect** **Civil Engineer** **Cost Estimator** **Landscape Architect**

Career Cluster: Arts, Audio/Video Technology and Communications	
Pathway	**Occupations**
Audio and Video Technology and Film	**Editor** **Producer** **Sound Engineering Technician**
Journalism and Broadcasting	**Art Director** **Editor** **Program Director** **Radio, TV Announcer** **Radio, TV Reporter**
Printing Technology	**Production, Planning, Expediting Clerk**
Telecommunications	**Computer Programmer** **Network Systems and Data Communication Analyst**

Career Cluster: Business Management and Administration	
Pathway	**Occupations**
Business Information Management	**Chief Executive Officer** **Cost Analyst** **Financial Analyst** **Market Research Analyst** **Operations Research Analyst** **Systems Analyst**
General Management	**Chief Executive Officer** **Entrepreneur**

Career Cluster: Finance	
Pathway	**Occupations**
Business Finance	**Cost Analyst** **Economist**
Securities and Investments	**Real Estate Developer**

Career Cluster: Government and Public Administration	
Pathway	**Occupations**
Governance	**Legislator**

Career Cluster: Government and Public Administration	
Pathway	**Occupations**
Planning	Economic Development Coordinator Urban and Regional Planner
Regulation	Compliance Officer Environmental Compliance Inspector

Career Cluster: Health Science	
Pathway	**Occupations**
Biotechnology Research and Development	Biochemist Research Assistant

Career Cluster: Manufacturing	
Pathway	**Occupations**
Health, Safety, and Environmental Assurance	Safety Engineer
Manufacturing Production Process Development	Industrial Engineer Industrial Engineering Technician

Career Cluster: Science, Technology, Engineering and Mathematics	
Pathway	**Occupations**
Engineering and Technology	Agricultural Engineer Biomedical Engineer Civil Engineer Civil Engineering Technician Environmental Engineer Industrial Engineer Industrial Engineering Technician Materials Engineer Nuclear Engineer Power Systems Engineer
Science and Mathematics	Atmospheric Scientist Ecologist Economist Environmental Scientist Geoscientist Hydrologist Oceanographer Research Chemist Technical Writer

Career Cluster: Transportation, Distribution and Logistics	
Pathway	**Occupations**
Facility and Mobile Equipment Maintenance	**Aircraft Structure, Surfaces, Rigging, and Systems Assembler**
Health, Safety and Environmental Management	**Health, Safety, and Environment Manager**
Logistics Planning and Management Services	**Logistics Analyst** **Logistics Engineer** **Logistics Manager**
Transportation Operations	**Air Traffic Controller** **Flight Engineer** **Pilot** **Ship Engineer** **Transportation Manager**
Transportation Systems/Infrastructure Planning, Management and Regulation	**Aerospace Engineer** **Civil Engineer** **Civil Engineering Technician** **Pilot** **Traffic Engineer** **Transportation Manager** **Urban, Regional Planner**
Warehousing and Distribution Center Operations	**Traffic Engineer** **Transportation Manager**