GEORGIA | PEACH STATE PATHWAYS

Career, Technical, & Agricultural Education

ENGINEERING & TECHNOLOGY

PATHWAY: Engineering

COURSE: Foundations of Engineering and Technology

UNIT: 13. Transportation Systems

INTRODUCTION

Annotation: Briefly describe the unit topics, tasks, methods, etc.

In this unit students will gain an understanding of the major concepts and terms associated with transportation systems and power.

Grade(s):

X	9th
X	10th
X	11th
X	12th

Time: 15 Hours

Author: Cameron Smith

Students with Disabilities:

For students with disabilities, the instructor should refer to the student's IEP to be sure that the accommodations specified are being provided. Instructors should also familiarize themselves with the provisions of Behavior Intervention Plans that may be part of a student's IEP. Frequent consultation with a student's special education instructor will be beneficial in providing appropriate differentiation.

Notes to the Teacher:

- Reference 1: Section IV (Chapters 15 – 19) of *Technology Today and Tomorrow* (Fales, James F., Kuetemeyer, Vincent F., Brusic, Sharon A. (1993) *Technology Today and Tomorrow*. 2nd Edition, Glencoe, New York, NY)
- Reference 2: *Physical Science* (2002). Glencoe/McGraw-Hill – ISBN 0-07-822745-3
- For this unit, the teacher should select an appropriate transportation activity such as the Metric Dragster, rockets, or other activity suggested in the text.

FOCUS STANDARDS

GPS Focus Standards: Please list the standard and elements covered.

- ENGR-FET-1d – Participate in hands-on activities related to multiple engineering and technology pathways.
- ENGR-FET-2e – Explain the interaction between technological development and social change.
- ENGR-FET-3a – Describe the processes of input, processing, output, and feedback that comprise the universal systems model.
- ENGR-FET-3b – Demonstrate applications of the universal systems model across the spectrum of technologies.
- ENGR-FET-4 – Students will apply mathematics and science to the solution of a technological problem.
- ENGR-FET-5a – Explain the problem solving processes used by engineers, designers, and other technologists.
- ENGR-FET-5b – Demonstrate creative approaches to problem solving.
- ENGR-FET-5c – Create a solution to a given problem.
- ENGR-FET-5d – Test and evaluate a problem solution.
- ENGR-FET-5e – Implement a problem solution.
- ENGR-FET-6 – Students will use visual and verbal communication to express basic design elements.
- ENGR-STEM-1 – Students will recognize the systems, components, and processes of a technological system.
- ENGR-STEM-4 – Students will apply principles of science, technology, engineering, mathematics, interpersonal communication, and teamwork to the solution of technological problems.
- ENGR-STEM-5 – Students will select and demonstrate techniques, skills, tools, and understanding related to energy and power, bio-related, communication, transportation, manufacturing, and construction technologies.
- ENGR-STEM-6 – Students will enhance reading by developing vocabulary and comprehension skills associated with text materials, problem descriptions, and laboratory activities associated with engineering and technology education.
- CTAE-FS-1 – Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.
- CTAE-FS-3 – Communications: Learners use various communication skills in expressing and interpreting information.
- CTAE-FS-4 – Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

GPS Academic Standards:

- SSWH21. The student will analyze globalization in the contemporary world.
- MM3P1. Students will solve problems (using appropriate technology).
- SCSh5. Students will demonstrate the computation and estimation skills necessary for analyzing data and developing reasonable scientific explanations.
- MM3P4. Students will make connections among mathematical ideas and to other disciplines.
- SCSh3. Students will identify and investigate problems scientifically.
- ELAALRC3. The student acquires new vocabulary in each content area and uses it correctly.

National / Local Standards / Industry / ISTE:

UNDERSTANDINGS & GOALS

Enduring Understandings: Enduring understandings are statements summarizing important ideas and have lasting value beyond the classroom. They synthesize what students should understand – not just know.

Students will understand how transportation affects the economic value of products and why it is important for engineers to have an understanding of transportation systems.

Essential Questions: Essential questions probe for deeper meaning and understanding while fostering the development of critical thinking and problem-solving skills. Example: Why is life-long learning important in the modern workplace?

- How does transportation affect the economic value of products?
- What are the parts of transportation systems?
- What are the positive and negative impacts of transportation?
- What is a prime mover?
- What are the two main types of engines and how do they operate?
- What are the different kinds of motions that engines produce.

Knowledge from this Unit: Factual information.

Students will:

- Understand the historical development of transportation methods.
- Understand the impact transportation has on the value of products.
- Be able to explain the universal systems model in terms of transportation systems.
- Be able to discuss positive and negative impacts of transportation.
- Be able to explain how four-stroke cycle and two-stroke cycle engines operate.
- Be able to identify two types of motors and explain how they operate.

- Be able to identify the six systems of common engines.
- Understand basic concepts related to fluid, electrical, and thermal systems having to do with small engines.

Skills from this Unit: Performance.

ASSESSMENT(S)

Assessment Method Type: Select one or more of the following. Please consider the type(s) of differentiated instruction you will be using in the classroom.

_____ Pre-test
X Objective assessment - multiple-choice, true- false, etc.
__ Quizzes/Tests
__ Unit test
_____ Group project
_____ Individual project
X Self-assessment - May include practice quizzes, games, simulations, checklists, etc.
__ Self-check rubrics
__ Self-check during writing/planning process
__ Journal reflections on concepts, personal experiences and impact on one's life
__ Reflect on evaluations of work from teachers, business partners, and competition judges
__ Academic prompts
__ Practice quizzes/tests
_____ Subjective assessment/Informal observations
__ Essay tests
__ Observe students working with partners
__ Observe students role playing
_____ Peer-assessment
__ Peer editing & commentary of products/projects/presentations using rubrics
__ Peer editing and/or critiquing
_____ Dialogue and Discussion
__ Student/teacher conferences
__ Partner and small group discussions
__ Whole group discussions
__ Interaction with/feedback from community members/speakers and business partners
_____ Constructed Responses
__ Chart good reading/writing/listening/speaking habits
__ Application of skills to real-life situations/scenarios
_____ Post-test

Assessment(s) Title:

Transportation Quiz

Assessment(s) Description/Directions:

The review questions and cross curricular activities at the end of chapters 15 and 18 can be used to guide Lecture 1 and 2. Lecture 3 should focus on helping students understand the scientific principles involved in the device students will be designing. You can make use of any high school level physical science text.

Attachments for Assessment(s): Please list.

Transportation Quiz

LEARNING EXPERIENCES

Sequence of Instruction

1. Identify the Standards. Standards should be posted in the classroom for each lesson.

- ENGR-FET-1d – Participate in hands-on activities related to multiple engineering and technology pathways.
- ENGR-FET-2e – Explain the interaction between technological development and social change.
- ENGR-FET-3a – Describe the processes of input, processing, output, and feedback that comprise the universal systems model.
- ENGR-FET-3b – Demonstrate applications of the universal systems model across the spectrum of technologies.
- ENGR-FET-4 – Students will apply mathematics and science to the solution of a technological problem.
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- ENGR-STEM-6 – Students will enhance reading by developing vocabulary and comprehension skills associated with text materials, problem descriptions, and laboratory activities associated with engineering and technology education.
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2. Review Essential Questions.

- How does transportation affect the economic value of products?
- What are the parts of transportation systems?
- What are the positive and negative impacts of transportation?
- What is a prime mover?
- What are the two main types of engines and how do they operate?
- What are the different kinds of motions that engines produce.

3. Identify and review the unit vocabulary.

4. Assessment Activity.

- Day 1 – Lecture 1: Introduction to Transportation Systems (with lecture notes worksheet)
  - Assign Transportation History PowerPoint
- Day 2 – Students finish Transportation History PowerPoint
- Day 3 – Student presentations of Transportation History PowerPoint
- Day 4 – Lecture 2: Introduction to Power in Transportation (with lecture notes worksheet)
  - Class demonstration of the parts of a 2 stroke engine
  - Assign 4 Stroke-Cycle Engine PowerPoint
- Day 5 – Finish 4 Stroke-Cycle Engine PowerPoint
  - Worksheet over chapter 15, 18 content
- Day 6 – Review of Lecture 1 and 2
  - Transportation Quiz *(see attached)*
- Day 7 – Introduce Transportation Activity (possible examples at end of chapters 15-19 of *Technology Today and Tomorrow* text)
  - Lecture 3 – Principles of Design related to Transportation Activity (with lecture notes worksheet).
- Day 8 – Transportation Activity Day 1 - Design
- Day 9 – Transportation Activity Day 2 - Design
- Day 10 – Transportation Activity Day 3 - Construction
- Day 11 - Transportation Activity Day 4 - Construction
- Day 12 - Transportation Activity Day 5 - Construction
- Day 13 - Transportation Activity Day 6 - Testing/Reporting
- Day 14 - Transportation Activity Day 7- Testing/Reporting
- Day 15 - Culminating Assessment of Transportation Activity

Attachments for Learning Experiences: Please list.

Transportation Quiz

Notes & Reflections: May include notes to the teacher, pre-requisite knowledge & skills, suggestions, etc.

CULMINATING PERFORMANCE TASK (Optional)

Culminating Unit Performance Task Title:

Transportation History PowerPoint

Four Stroke-Cycle Engine PowerPoint

Transportation Activity

Culminating Unit Performance Task Description/Directions/Differentiated Instruction:

Each student (or pair of students) should be assigned a transportation technology. They should then research and report on 10 iterations of this technology that have been developed over time. For each of the iterations, students should create 1 PowerPoint slide that includes a picture of the assigned technology, the year it was developed, and 3-4 sentences describing the new innovations that were part of this iteration. Including the title slide each presentation should be 11 slides in length.

Rubric for Performance Task: Please list.

The link below is a rubric for assessing student created PowerPoint Presentations:

http://www.uwstout.edu/soe/profdev/pptrubric.html

UNIT RESOURCES

Web Resources:

Explanation of 4 Stroke-Cycle Engines: http://www.howstuffworks.com/engine1.htm

Attachment(s): Supplemental files not listed in assessment, learning experiences, and performance task.

What 21st Century Technology was used in this unit:

	Slide Show Software		Graphing Software		Audio File(s)
	Interactive Whiteboard		Calculator		Graphic Organizer
	Student Response System	X	Desktop Publishing	X	Image File(s)
	Web Design Software		Blog		Video
	Animation Software		Wiki		Electronic Game or Puzzle Maker
	Email	X	Website		