FREEHOLD REGIONAL HIGH SCHOOL DISTRICT

OFFICE OF CURRICULUM AND INSTRUCTION

TECHNOLOGY EDUCATION DEPARTMENT

INTERACTIVE DESIGN

Grade Level: 9-12

Credits: 2.5

BOARD OF EDUCATION ADOPTION DATE:

AUGUST 27, 2012

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Interactive Design - Introduction

Introduction

Course Philosophy

In an ever-changing technological world, it is important for our students to understand the world around them and be able to be successful within it. One of the goals of this course is to give students a basic understanding of the various types of technologies that they may encounter in their lives. Students will explore technologies within their world, and will have the chance to design and create their own technological products. The course will then focus on the various engineering fields in which students may work and will present information. Students will then have the opportunity to learn helpful technological skills that many average consumers may not know. These skill sets will include: home repair, automotive maintenance, electrical wiring and photographic/video graphic skills. The course will culminate with a unit that will teach students multimedia design skills and provide the opportunity to create a custom video game of their own design.

Interactive Design is intended to be an introductory course with a focus on high-level thinking and problem-solving and that skills application to a wide range of 21st century careers and related daily experiences. Students will be engaged in a variety of practical hands-on design challenges that will emphasize the creative and interactive process of design. Skills in science, technology, engineering, mathematics, communication, leadership, teamwork, and problem-solving are reinforced throughout this course. All information and experiences obtained will encourage students to become better problem-solvers, designers, and consumers in the context of a 21st century society.

Course Description

Interactive Design is a 2.5 credit semester course open for enrollment to students in grades 9 through 12. Throughout this course, students will explore basic principles of design while applying learning in the areas of computer animation, household technology, engineering, and electronics. This hands-on course will exercise each student's skills in problem-solving and critical thinking in the context of 21st century technology. This hands-on course will require students to utilize high level thinking skills in problem solving, analytical, and critical thinking scenarios set in the context of 21st Century Technology.

Course Map and Proficiencies/Pacing

Course Map

Relevant Standards	Enduring Understanding	Essential Questions	Assessments		
			Diagnostic	Formative	Summative
RST.9-10.3. 8.2.12.C.1 8.2.12.C.2 8.2.12.C.3 8.2.12.C.4 8.2.12.G.1	Technology encompasses all areas of the human designed world.	How does technology differ from science? How do we as humans rely on technology in today's society? How has technology evolved throughout human history? How has technology helped to extend human capabilities throughout history?	do now pre-test student surveys oral questions/ discussion anticipatory set questions	journals quizzes written assignments oral presentations observations participation and rubrics research assignments	portfolios project-based learning rubric assessment self and peer assessment performance assessment open notebook tests midterm examination final examination
RST.9-10.3 RST.9-10.9 8.2.12.B.1 8.2.12.B.2 8.2.12.B.3	Engineers and designers use a systematic process known as the "design loop" when creating new or improving old technologies.	What are the major steps of the design process? How does the design process help to produce more successful technologies? What are some methods used to share design ideas? What is the difference between a model and a prototype? How have computers become useful in the evaluation and testing of a prototype?	do now pre-test student surveys oral questions/ discussion anticipatory set questions	journals quizzes written assignments oral presentations observations participation and rubrics research assignments	portfolios project-based learning rubric assessment self and peer assessment performance assessment open notebook tests midterm examination final examination

RST.9-10.3 RST.9-10.10 9.2.12 F.3 9.2.12 F.4 9.2.12 F.5	Following safety procedures and using personal protection equipment will reduce the risk of injury in a technology facility.	What are the safety concerns to be considered when working in a lab setting in school or on the job? What protection can be used in a laboratory environment?	do now pre-test student surveys oral questions/ discussion anticipatory set questions	journals quizzes written assignments oral presentations observations participation and rubrics research assignments	portfolios project-based learning rubric assessment self and peer assessment performance assessment open notebook tests midterm examination final examination
RST.9-10.3 RST.9-10.9 RST.9-10.10 WORK.9-12.9.1.12.A.1 WORK.9-12.9.1.12.A.4 WORK.9-12.9.1.12.B.1 WORK.9-12.9.1.12.F.2 WORK.9-12.9.2.12.A.1 WORK.9-12.9.2.12.A.5 TEC.9-12.8.1.12.F.2 TEC.9-12.8.2.12.C.3	Engineering design is a creative and interactive process for identifying and solving problems that meet established criteria and constraints.	What problems are typical to engineers? In what manner can these challenges be resolved? How are science, technology, engineering, and math interrelated?	do now pre-test student surveys oral questions/ discussion anticipatory set questions	journals quizzes written assignments oral presentations observations participation and rubrics research assignments	portfolios project-based learning rubric assessment self and peer assessment performance assessment open notebook tests midterm examination final examination

RST.9-10.3. RST.9-10.9. RST.9-10.10. WORK.9-12.9.1.12.B.2 WORK.9-12.9.1.12.B.3 WORK.9-12.9.1.12.C.5 WORK.9-12.9.1.12.F.2 TEC.9-12.8.1.12.F.1 TEC.9-12.8.2.12.A.1 TEC.9-12.8.2.12.B.1 TEC.9-12.8.2.12.B.2 TEC.9-12.8.2.12.C.3 TEC.9-12.8.2.12.E.1 TEC.9-12.8.2.12.F.1 TEC.9-12.8.2.12.F.2 TEC.9-12.8.2.12.F.3	A core engineering design skill is being able to translate abstract concepts into functional ideas.	How do the constraints of a design challenge ultimately impact the final product? Which societal influences impact engineering design? How is the final design determined? How do engineering designs dictate societal behaviors and changes? What is the natural evolutionary process that occurs in design?	do now pre-test student surveys oral questions/ discussion anticipatory set questions	Journals quizzes written assignments oral presentations observations participation and rubrics research assignments	portfolios project-based learning rubric assessment self and peer assessment performance assessment open notebook tests midterm examination final examination
RST.9-10.3 8.2.12.C.1 8.2.12.C.2 8.2.12.C.3 8.2.12.E.1 8.2.12.E.2	Understanding how technology functions, how it can be applied and how it sometimes it must be repaired/maintained, are all useful skills for anyone living in modern society.	What types of equipment are needed to test the effectiveness of technology? Why is it so important for average citizens to become technologically literate? Where can an average consumer learn basic skills that will help them work with the technology they use on a daily basis?	do now pre-test student surveys oral questions/ discussion anticipatory set questions	journals quizzes written assignments oral presentations observations participation and rubrics research assignments	portfolios project-based learning rubric assessment self and peer assessment performance assessment open notebook tests midterm examination final examination

RST.9-10.3 RST.9-10.10 8.1.12.E.1 8.1.12.E.2 9.1.12 A.2 9.1.12 A.3	Society relies on specialized technicians who must pass rigorous training before working with a specific type of technology.	Where can an individual train to become a technician in a specific technological field? What special skills should a person possess to become a well-rounded technician? What fields in technology offer the greatest opportunities for technical positions?	do now pre-test student surveys oral questions/ discussion anticipatory set questions	journals quizzes written assignments oral presentations observations participation and rubrics research assignments	portfolios project-based learning rubric assessment self and peer assessment performance assessment open notebook tests midterm examination final examination
RST.9-10.3 RST.9-10.9. RST.9-10.10. WORK.9-12.9.1.12.A.1 TEC.9-12.8.1.12.B.1 TEC.9-12.8.1.12.D.2 TEC.9-12.8.2.12.B.3 TEC.9-12.8.2.12.F.1 TEC.9-12.8.2.12.G.1	Interactive digital media involves creating an experience that is both functional and engaging for the user.	What are the higher level interactions that people have with technology? What makes interactive media engaging? How does the usability of interactive media influence the design?	do now pre-test student surveys oral questions/ discussion anticipatory set questions	Journals quizzes written assignments oral presentations observations participation and rubrics research assignments	portfolios project-based learning rubric assessment self and peer assessment performance assessment open notebook tests midterm examination final examination
RST.9-10.3 RST.9-10.9. RST.9-10.10. WORK.9-12.9.1.12.A.1 TEC.9-12.8.1.12.B.1 TEC.9-12.8.1.12.D.2 TEC.9-12.8.2.12.B.3 TEC.9-12.8.2.12.F.1 TEC.9-12.8.2.12.G.1	People use technology to create meaningful and effective interactive digital media.	How do people share information and ideas? What makes digital communication effective? What are the elements of effective interactive media?	do now pre-test student surveys oral questions/ discussion anticipatory set questions	journals quizzes written assignments oral presentations observations participation and rubrics research assignments	portfolios project-based learning rubric assessment self and peer assessment performance assessment open notebook tests midterm/final examination

Proficiencies and Pacing

Unit Title	Unit Understanding(s) and Goal(s)	Recommended Duration
Technology Design Essentials	**Enduring Understandings**: Technology encompasses all areas of the human designed world. Engineers and designers use a systematic process known as the "design loop" when creating new or improving old technologies. Following safety procedures and using personal protection equipment will reduce the risk of injury in a technology facility. At the conclusion of this unit, students will be able to: 1. Differentiate between science and technology; as well explain how they are sometimes interconnected. 2. List and explain the six major areas of technology and how each impacts modern society. (Transportation Technology, Information Technology, Power and Energy Technology, Manufacturing and Construction Technology. Medical and Biotechnology, and Structural and Mechanical Technologies.) 3. Utilize the design loop to solve technological problems using constraints and specifications from the instructor. 4. Create an engineering documentation that explains a solution for a technological problem. 5. Express their ideas through various types of engineering graphics which will include: technical sketching, multi-view drawing and 3D pictorials representations. 6. Create a model or prototype for a solution to a technological problem. 7. Analyze and test various materials and determine their strengths and weaknesses for use as a technological solution. 8. Follow proper safety procedures in a laboratory setting when using various material processing tools and equipment.	5 Weeks
Engineering Basics	**Enduring Understandings**: Engineering design is a creative and interactive process for identifying and solving problems that meet established criteria and constraints. A core engineering design skill is being able to translate abstract concepts into functional ideas. At the conclusion of this unit, students will be able to: 1. Identify ways in which engineers solve problems. 2. Describe how science, math, and engineering are interrelated. 3. List and utilize the steps of the engineering design process. 4. Demonstrate various technical sketching techniques that can be used in the engineering design process. 5. Identify what influences engineering design. 6. Describe the impact of the engineering design on a product or system. 7. Identify, analyze, and improve the design of a real world product using the engineering design process.	5 Weeks

Technology Skills for Today	**Enduring Understandings**: Understanding how technology functions, how it can be applied and how it sometimes it must be repaired/maintained, are all useful skills for anyone living in modern society. Society relies on specialized technicians who must pass rigorous training before working with a specific type of technology. At the conclusion of this unit, students will be able to: 1. Explain and demonstrate preventative maintenance for various transportation technologies. 2. Identify diagnosing lights and sounds from a transport technology and use that information to find solutions to problems. 3. Explain the qualities of a well designed automobile as it applies to purchasing a new vehicle. 4. Demonstrate basic carpentry skills that can be used in a private residence. 5. Demonstrate basic plumbing skills that can be used in a private residence. 6. Demonstrate basic electrical skills that can be used in a private residence. 7. Properly demonstrate basic camera operations as they apply to both still and video photography. 8. Utilize editing software to improve the quality of a still image or video. 9. Successfully create a "how to video" of their choosing using video editing software. 10. Explain the concept of wired and wireless networks in the home or office setting. 11. Troubleshoot a network to help improve efficiency and manage traffic. 12. Analyze their personal consumer electronics and will use that information to become more cost effective by saving money and energy.	5 Weeks
Interactive Digital Media and Design	**Enduring Understandings:** Interactive digital media involves creating an experience that is both functional and engaging for the user. People use technology to create meaningful and effective interactive digital media. At the conclusion of this unit, students will be able to: 1. Describe ways in which people interact with technology to share information and ideas. 2. Describe the concepts and effectiveness of interactive digital media through analysis and critique of existing designs. 3. Identify the elements of effective and engaging interactive digital media. 4. Develop skills in brainstorming, storyboarding, character development, environment design, audio/video editing, and user interaction. 5. Design and create an original animation to learn and apply the process of animation project development. 6. Use animation and video game design software to apply and demonstrate the creative and technical process of interactive digital media design. 7. Communicate an understanding and application of the design process through participation in class discussion and design challenges.	5 Weeks

Interactive Design - Unit #1 (Technology Design Essentials)

Unit Plan

Enduring Understandings:

Technology encompasses all areas of the human designed world.

Engineers and designers use a systematic process known as the "design loop" when creating new or improving old technologies.

Following safety procedures and using personal protection equipment will reduce the risk of injury in a technology facility.

Essential Questions:

- How does technology differ from science?
- How is technology relied upon in today's society?
- How has technology evolved throughout human history?
- How has technology helped to extend human capabilities throughout history?
- What are the major steps of the design process?
- How does the design process help to produce more successful technologies?
- What are some methods used to share design ideas?
- What is the difference between a model and a prototype?
- How have computers become useful in the evaluation and testing of a prototype?
- What are the safety concerns to be considered when working in a lab setting in school or on the job?
- What protection must be used in a laboratory environment?

Unit Goals:

1. Students will be able to differentiate between science and technology, and explain how they are interconnected.
2. Students will be able to list and explain the six major areas of technology and how each impacts modern society. (Transportation Technology, Information Technology, Power and Energy Technology, Manufacturing and Construction Technology. Medical and Biotechnology, and Structural and Mechanical Technologies.
3. Students will be able to utilize the design loop to solve technological problems using constraints and specifications from the instructor.
4. Students will be able to create and engineering documentation that explains a solution for a technological problem.
5. Students will be able to express their ideas through various types of engineering graphics which will include: technical sketching, multi-view drawing and 3-D pictorial representations.
6. Students will be able to create a model or prototype for a solution to a technological problem.
7. Students will be able to analyze and test various materials and determine their strengths and weaknesses for use as a technological solution.
8. Students will be able to follow proper safety procedures in a laboratory setting when using various material processing tools and equipment.

Recommended Duration: 5 weeks

Guiding/Topical Questions	Content/Themes/Skills	Resources and Materials	Suggested Strategies	Suggested Assessments
Why should safety be the first concern while working in a technology laboratory? How do we protect ourselves around dangerous equipment, tools and chemicals?	Understand and be able to follow the required safety rules for the equipment and tools in the laboratory.	Lab safety rules (see Resources Appendix) Classroom supplies for technological learning activities (TLA) Multimedia presentation Internet *Engineering Design: An Introduction*, ISBN: 1418062413 *Design and Problem Solving in Technology*, ISBN: 0827352468 Safety Rules and Regulations: see Resources Appendix)	Overview of all classroom equipment and safety guidelines. Define personal protective equipment (PPE) and list the various types. Explain the role of OSHA *(Occupational Safety and Health Administration)* in the development of new safety guidelines. Students will complete safety worksheets individually using unit content. Students will design 'Safety Posters' based on one of the machines they were tested on. Complete practicum activities for all equipment as demonstration of proper operation.	written tests and quizzes worksheets project assessments article summaries notebook assessments responses to discussion questions journal assessments threaded discussion groups safety quizzes practical assessments for all equipment self and peer assessments Technology Student Association (TSA) rubrics midterm examination final exam

What is technology and how is it created? Are all forms of technology the same?	Define the following terms: science, technology, engineering, design, innovation and trade-offs Explain the difference between science and technology as well as how they relate. List and give an example of each of the six families of technology and be able to create products that fit into those families.	Classroom supplies for technological learning activities (TLA) Multimedia presentation Internet *Engineering Design: An Introduction*, ISBN: 1418062413 *Design and Problem Solving in Technology*, ISBN: 0827352468 Technology vs. Science Presentation: see Resources Appendix Product Design Resource: see Resources Appendix	Pose the question to the class, "What is the difference between science and technology?" Discuss the various answers and have students create a comparison matrix and share with the class. Show the students the multimedia presentation Technology vs. Science and ask them why they feel all Americans should become technologically literate. Show the students some popular products and ask them how they were designed and who they were designed for. Allow the students to look at each product and figure out all the elements that went into those products (materials, manufacturing. etc.) Show the students pictures of various types of technologies and have them classify those technologies in one of the six families using a worksheet or notebook.	worksheets project assessments article summaries notebook assessments responses to discussion questions journal assessments threaded discussion groups midterm examination final examination

What is engineering design and how does it relate to the "design loop"? How do designers and engineers turn ideas into real products?	List and explain the various steps of the design loop. Create a formal engineering documentation for a technology project in class. Use technical sketching techniques to represent ideas for technological solutions.	Classroom supplies for technological learning activities (TLA) Multimedia presentation Internet *Engineering Design: An Introduction*, ISBN: 1418062413 *Design and Problem Solving in Technology*, ISBN: 0827352468 Example online resources: see Resources Appendix "How to Sketch with Pencil" video: see Resources Appendix	Draw the design loop steps on the board and using one of the products utilized in the last lesson and have the students analyze the product again using the design loop. Give students a challenge to create a technological solution to a problem and using the design process, try to solve that problem. Have the students create templates on a word processor program which can be used for formal engineering documentation later in the course. Teach the students about proper sketching by showing the "how to sketch with pencil video". Allow the students the opportunity to try and sketch some objects in class. Overview the various methods of technical sketching: orthographic, isometric and perspective. Using the equipment in the classroom, create a model or prototype of a design the students created using technical sketching.	worksheets project assessments article summaries notebook assessments responses to discussion questions journal assessments threaded discussion groups self and peer assessments Technology Student Association (TSA) rubrics midterm examination final examination

WORK.9-12.9.2.12 F.3	Analyze the occurrence of workplace hazards.
WORK.9-12.9.2.12 F.4	Practice the safe use of tools and equipment.
WORK.9-12.9.2.12 F.5	Implement safety procedures in the classroom and workplace, where appropriate.
TEC.9-12.8.2.12 B.1	Analyze a given technological product, system, or environment to understand how the engineering design process and design specification limitations influenced the final solution.
TEC.9-12.8.2.12 B.2	Evaluate the function, value, and appearance of technological products, systems, and environments from the perspective of the user and the producer.
TEC.9-12.8.2.12 B.3	Develop methods for creating possible solutions, modeling and testing solutions, and modifying proposed design in the solution of a technological problem using hands-on activities.
TEC.9-12.8.2.12 C.1	Explain the life cycle of a product from initial design to reuse, recycling, remanufacture, or final disposal, and its relationship to people, society, and the environment, including conservation and sustainability principles.
TEC.9-12.8.2.12 C.2	Analyze the factors that influence design of products, systems, and environments.
TEC.9-12.8.2.12 C.3	Compare and contrast the effectiveness of various products, systems, and environments associated with technological activities in energy, transportation, manufacturing, and information and communication.

Differentiation

Demonstration and hands-on individual performance tests can be utilized during this unit.

Technology

These methods include but are not limited to: internet research assignment, video/audio clips, flash animations and instructional internet tutorials.

Students must also have access to material processing equipment and tools for hands-on projects. Computers with CAD software can be utilized during the design portion of the unit if available.

College and Workplace Readiness

Being able to work with technology and solve problems are useful skills in a variety of engineering and technical fields of study. During this unit students will gain a general understanding of the various types of technology. Students will also utilize lab equipment and tools to create new solutions to real-world technological problems. The technical sketching and design element of the unit will benefit anyone thinking of working in industrial and product design fields.

Interactive Design - Unit #2 (Engineering Basics)

Unit Plan

Enduring Understandings:
Engineering design is a creative and interactive process for identifying and solving problems that meet established criteria and constraints.
A core engineering design skill is being able to translate abstract concepts into functional ideas.

Essential Questions:

- What problems are typical to engineers? In what manner can these challenges be resolved?
- How are science, technology, engineering, and math interrelated?
- How do the constraints of a design challenge ultimately impact the final product?
- Which societal influences impact engineering design? How is the final design determined?
- How do engineering designs dictate societal behaviors and changes?
- What is the natural evolutionary process that occurs in design?

Unit Goals:

1. Students will be able to identify ways in which engineers solve problems.
2. Students will be able to describe how science, technology, engineering, and math are interrelated.
3. Students will be able to list and utilize the steps of the engineering design process.
4. Students will be able to demonstrate various technical sketching techniques that can be used in the engineering design process.
5. Students will be able to identify what influences engineering design.
6. Students will be able to describe the impact of the engineering design on a product or system.
7. Students will be able to identify, analyze, and improve the design of a real world product using the engineering design process.

Recommended Duration: 5 weeks

Guiding/Topical Questions	Content/Themes/Skills	Resources and Materials	Suggested Strategies	Suggested Assessments
What do engineers do to help people/society? How do engineers solve problems? Why do engineers need to utilize science, technology, engineering, and math to solve problems? How do the needs of people/society affect engineering design?	Engineers provide practical solutions to problems by improving existing designs as well as creating new ones. Engineers apply science and mathematical principals to the design, manufacturing, and operation of efficient and economical designs. Societal needs greatly influence the design of products.	Multimedia presentation Teacher demonstration *Engineering Design: An Introduction*, ISBN: 1418062413 *Design and Problem Solving in Technology*, ISBN: 0827352468 Internet research Article summary Tutorials Online resources: see Resources Appendix Suggested software: computer-assisted design software	Discussion on the different types of engineering and how engineers help people/society. Review the design process and how it applies to engineering. Demonstrate how science, technology, engineering, and math are essential when solving an engineering design problem. Discuss a current global event and analyze how the needs of a particular society/geographic location influence the solution to the problem.	do now pre-test response to discussion questions threaded discussion groups observation performance/ practical assessment written assignment article summary worksheets written tests and quizzes project assessment notebook/portfolio self and peer critique individual participation contribution to group work Technology Student Association (TSA) rubrics midterm and final examination

How does the engineering design process impact the final product? Why does a product/design evolve over time? How do engineers approach improving an existing product/design?	Formulate a design brief to an engineering problem and identify design specifications and constraints given background information. Create brainstorming sketches of solution ideas to an engineering problem. Develop possible solutions to an engineering problem. Evaluate the solutions. Document the entire design process in a design portfolio.	Multimedia presentation Teacher demonstration *Engineering Design: An Introduction*, ISBN: 1418062413 *Design and Problem Solving in Technology*, ISBN: 0827352468 Internet research Article summary Tutorials Online resources: see Resources Appendix Suggested software: computer assisted design software	Discuss the engineering design process as it applies to an existing product. Research the evolution of an existing product and discuss why particular changes were made. "A More Perfect Product": select a product or tool that you use on a daily basis. Evaluate and determine what changes and improvements can be made.	do now pre-test response to discussion questions threaded discussion groups observation performance/ practical assessment written assignment article summary worksheets written tests and quizzes project assessment notebook/portfolio self and peer critique individual participation contribution to group work Technology Student Association (TSA) rubrics midterm and final examination

Standards:

RST.9-10.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

RST.9-10.9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

RST.9-10.10. By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

WORK.9-12.9.1.12.A.1 - [Cumulative Progress Indicator] - Apply critical thinking and problem-solving strategies during structured learning experiences.

WORK.9-12.9.1.12.A.4 - [Cumulative Progress Indicator] - Justify problem-solving strategies used in the development of a particular innovative product or practice in the United States and in another country.

WORK.9-12.9.1.12.B.1 - [Cumulative Progress Indicator] - Present resources and data in a format that effectively communicates the meaning of the data and its implications for solving problems, using multiple perspectives.

WORK.9-12.9.1.12.B.2 - [Cumulative Progress Indicator] - Create and respond to a feedback loop when problem solving.

WORK.9-12.9.1.12.B.3 - [Cumulative Progress Indicator] - Assist in the development of innovative solutions to an onsite problem by incorporating multiple perspectives and applying effective problem-solving strategies during structured learning experiences, service learning, or volunteering.

WORK.9-12.9.1.12.C.5 - [Cumulative Progress Indicator] - Assume a leadership position by guiding the thinking of peers in a direction that leads to successful completion of a challenging task or project.

WORK.9-12.9.1.12.F.2 - [Cumulative Progress Indicator] - Demonstrate a positive work ethic in various settings, including the classroom and during structured learning experiences.

WORK.9-12.9.2.12.A.1 - [Cumulative Progress Indicator] - Analyze the relationship between various careers and personal earning goals.

WORK.9-12.9.2.12.A.5 - [Cumulative Progress Indicator] - Evaluate current advances in technology that apply to a selected occupational career cluster.

TEC.9-12.8.1.12.F.1 - [Cumulative Progress Indicator] - Select and use specialized databases for advanced research to solve real world problems.

TEC.9-12.8.1.12.F.2 - [Cumulative Progress Indicator] - Analyze the capabilities and limitations of current and emerging technology resources and assess their potential to address educational, career, personal, and social needs.

TEC.9-12.8.2.12.A.1 - [Cumulative Progress Indicator] - Design and create a technology product or system that improves the quality of life and identify trade-offs, risks and benefits.

TEC.9-12.8.2.12.B.1 - [Cumulative Progress Indicator] - Design and create a product that maximizes conservation and sustainability of a scarce resource by using the design process and entrepreneurial skills.

TEC.9-12.8.2.12.B.2 - [Cumulative Progress Indicator] - Design and create a prototype for solving a global problem, documenting how the proposed design features affect the feasibility of the prototype through the use of engineering, drawing and other technical methods of illustration.

TEC.9-12.8.2.12.C.3 - [Cumulative Progress Indicator] - Evaluate the positive and negative impacts in a design by providing a digital overview of a chosen product and suggest potential modifications to address the negative impacts.

TEC.9-12.8.2.12.E.1 - [Cumulative Progress Indicator] - Use the design process to devise a technological product or system that addresses a global issue, and provide documentation through drawings, data, and materials, taking the relevant cultural perspectives into account throughout the design and development process.

TEC.9-12.8.2.12.F.1 - [Cumulative Progress Indicator] - Determine and use the appropriate application of resources in the design, development, and creation of a technological product or system.

TEC.9-12.8.2.12.F.2 - [Cumulative Progress Indicator] - Explain how material science impacts the quality of products.

TEC.9-12.8.2.12.F.3 - [Cumulative Progress Indicator] - Select and utilize resources that have been modified by digital tools in the creation of a technological product or system (CNC equipment, CAD software).

Differentiation

A hands-on approach to assignments and projects is recommended as the most effective method of learning.

Students could work in groups, as a jigsaw assignment, researching various engineering topics and share presentations with the class.

Technology

Presentation software will be utilized in student's presentations as performance assessments.

Suggested Educational Technology: internet research assignment, video/audio clips, animations and instruction internet tutorials.

College and Workplace Readiness

Teachers can reinforce instruction by providing additional career and college information and resources, guest speakers, and educational excursions. Students could write an essay describing those careers and college information learned from these experiences.

Interactive Design - Unit #3 (Technology Skills for Today)

Unit Plan

Enduring Understandings:

Understanding how technology functions, how it can be applied and how it sometimes must be repaired/maintained, are all useful skills for anyone living in modern society.

Society relies on specialized technicians who must pass rigorous training before working with a specific type of technology.

Essential Questions:

- What types of equipment are needed to test the effectiveness of technology?
- Why is it so important for average citizens to become technologically literate?
- Where can an average consumer learn basic skills that will help them work with the technology they use on a daily basis?
- Where can an individual train to become a technician in a specific technological field?
- What special skills should a person possess to become a well-rounded technician?
- What fields in technology offer the greatest opportunities for technical positions?

Unit Goals:

1. Students will be able to explain and demonstrate preventative maintenance for various transportation technologies.
2. Students will be able to identify diagnosing lights and sounds from a transportation technology and use that information to find solutions to problems.
3. Students will be able to explain the qualities of a well-designed automobile as it applies to purchasing a new vehicle.
4. Students will be able to demonstrate basic carpentry skills that can be used in a private residence.
5. Students will be able to demonstrate basic plumbing skills that can be used in a private residence.
6. Students will be able to demonstrate basic electrical skills that can be used in a private residence.
7. Students will be able to explain the concept of wired and wireless networks in the home or office setting.
8. Students will be able to troubleshoot a network to help improve efficiency and manage traffic.
9. Students will be able to analyze their personal consumer electronics and will use that information to become more cost effective by saving money and energy.
10. Students will be able to properly demonstrate basic camera operations as they apply to both still and video photography.
11. Students will be able to utilize editing software to improve the quality of a still image or video.
12. Students will be able to successfully create a "how to video" of their choosing using video editing software.

Recommended Duration: 5 weeks

Guiding/Topical Questions	Content/Themes/Skills	Resources and Materials	Suggested Strategies	Suggested Assessments
Why is it important to take care of your automobile on a regular basis? How can a person tell when something is wrong with their automobile? What characteristics should a consumer look for in a well designed automobile?	Create a preventative maintenance schedule for a family automobile. Properly identify the following parts on an automobile or pictures of an automobile: oil dip stick, transmission fluid dip sticks (if present), oil filter, air filter, timing belts, brake fluid, steering fluid, radiator coolant, spark plugs and wires. Demonstrate the steps needed to properly inspect and if needed change a tire. Identify the common warning indicator lights that may be present if there is a problem with an automobile. Create a comparison chart of various models of automobiles and then compare them based on multiple criterions such as (price, size, fuel economy, safety, etc.)	Classroom supplies for technological learning activities (TLA) Multimedia presentation Internet Owners manuals from various automobile manufacturers *Consumer's Guide Magazine* (automotive comparisons) Online resources: see Resources Appendix	Show the students a video from "Top Gear" and ask them why they feel it is important to maintain an automobile on a regular basis. Discuss with the students the concept of a maintenance schedule and why they are so important. Using online and web resources or real life automobiles, demonstrate how to complete basic maintenance tasks on an automobile. Have the students read magazine articles comparing various types of automobiles and have them formulate a table with their top ten car choices based on the following criteria: price, safety, reliability, fuel economy, space, handling and style. Create a simple matching game using auto warning indicator lights and have the students try to match as many lights from memory as possible in one minute. Overview each light and what exactly causes it to turn on as well as what can happen if ignored. Discuss the concept of OBD and OBD-II codes and what information technicians can get from reading these codes from automobile computers.	written tests and quizzes worksheets project assessments article summaries notebook assessments responses to discussion questions journal assessments threaded discussion groups self and peer assessments midterm examination final examination

How do you properly create a product from raw wood? What are the steps to properly sweat a copper pipe? How do you repair leaks in your plumbing? What are the steps to safely wire a new fixture in your home?	Using raw wood materials create a product that meets design constraints provided by the instructor. Using a brazing torch, successfully connect two pieces of copper pipe using flux and solder. Diagnose various leaks in the home and determine the best method to repair them. Using mock up DC components, properly wire a scale model of a home using LED's and DC motors to simulate real lights and ceiling fans.	Classroom supplies for technological learning activities (TLA) Multimedia presentation Internet *Engineering Design: An Introduction*, ISBN: 1418062413 *Design and Problem Solving in Technology*, ISBN: 0827352468 Example online resources: see Resources Appendix	Show the students a video clip from "Alone in the Wilderness" and discuss how the man in the film constructed everything from the wood he found in nature using only hand tools. Have the students define what craftsmanship means to them and have them share with the class. Show some examples of well designed wooden products and discuss why or why not they show craftsmanship. Have the students construct a simple Automata device out of wood using the plans provided: demonstrate how to properly sweat a copper pipe using solder and flux. Discuss the chemistry involved with the tinning solder and some of the safety concerns when working with brazing tools. Have each student properly braze a copper fitting onto the end of a copper pipe using the skills demonstrated. Connect each student's fittings together and test for leaks in the entire system using water and air pressure. Have the students read and summarize the article from "How Stuff Works" discussing leaking drains. Each student will partner up and choose one of the scenarios from the article and create a "how-to" manual to help a homeowner fix that particular plumbing issue. Teach the students about alternating current (AC) and direct current (DC) electricity and the safety precautions when working around both types of electricity. Show the video clip about how to properly and safely wire a switch and plug in your home safely. Using light-emitting diodes (LED's) and basic DC components have the students create some basic circuits to test their knowledge of electricity. Using form core, have the students create a 1/16 scale model of their bedroom and using LED's, DC motors and switches to represent real-life electrical wiring in the home.	written tests and quizzes worksheets project assessments article summaries notebook assessments responses to discussion questions journal assessments threaded discussion groups self and peer assessments midterm examination final examination

What is a computer network and how does it work? What are the differences between a wired and wireless computer network? What are some ways a consumer can setup a computer network properly in their home? What information should a consumer know before purchasing computer technology?	List and explain the various network topologies and their uses. Be able to compare and contrast the elements of a wired and wireless network. Demonstrate how to setup a basic computer network in your home or office. Design a computer to meet the specifications and price range of a fictitious client.	Classroom supplies for technological learning activities Current resources Multimedia presentation Internet Optional references: *Engineering Design: An Introduction*, ISBN: 1418062413 *Design and Problem Solving in Technology*, ISBN: 0827352468 Example Online Resources: See resource appendix	Ask the students if they ever remember a world without the internet. Explain how the internet was once just a small network of government computers. Create a worksheet that explains the types of network topologies and have the students sketch and label each based on their characteristics. Compare and contrast the effectiveness and speed of a wired network vs. a wireless network. Discuss also security and maintenance of each type of network. Have the students watch a video on basic network design and setup. Demonstrate how to properly connect computers using networking cable and how to setup a networks setting in the computer's operating system (OS). Give the students a drawing of a room and ask them to design a network for that room following guidelines you create such as: cost, # of computers, type of data, etc.) Have the students draw their designs on large poster paper and present it to the class. Create a multimedia presentation that illustrates the major components in a computer and each one's purpose. Have the students design a computer using real world prices from online websites (ex: Newegg and Tigerdirect) that meets the needs of a fictitious client. Have the students print pictures of each of their chosen components and create a mock-up explaining their choices.	written tests and quizzes worksheets project assessments article summaries notebook assessments responses to discussion questions journal assessments threaded discussion groups self and peer assessments midterm examination final examination

What are some steps to ensure you take a good photograph? What considerations should you be taking when creating a video? How does editing software allow us to manipulate both still and video images to improve their quality?	Using proper technique, take a series of photos which will later be used in a how-to video on technology skills. Demonstrate a technological skill on film using proper filming techniques. Using editing software, create a 1 minute how-to video on a technological skill using the gathered still and video images and present the final video to the class.	Classroom supplies for technological learning activities (TLA) Current resources Multimedia presentation Internet Optional references: *Engineering Design: An Introduction*, ISBN: 1418062413 *Design and Problem Solving in Technology*, ISBN: 0827352468 Software: Windows Movie Maker Adobe Master Suite CS4 or CS5 (preferably) Online Resources: See resource appendix	Show the students various photos and ask them to analyze each and discuss what they like and dislike about each. Teach the students about the elements of design when it comes to photography and ask them to analyze the same photos again using those elements. Discuss their results as a class. Give an overview of the "Go-Pro" camera or Digital Camera being used for this project and have the students sign a release form to ensure proper procedure. Have the students take various still photos of them demonstrating a technical skill they learned earlier in the unit. Discuss the basics to proper videoography with the class and show them some video clips of both well designed and poor designed how-to videos. Have the students use their cameras to take video clips of their chosen technical skill, making sure to follow proper procedure. Give the students some basic tutorials on video editing with your chosen software package to ensure they have proper understanding. Have the students create a one (1) minute how to video using their still images combined with their video clips. The students should use either voice over or written instructions that explain their skill step by step.	written tests and quizzes worksheets project assessments article summaries notebook assessments responses to discussion questions journal assessments threaded discussion groups self and peer assessments midterm examination final examination

What can be done to enhance a student's knowledge of career education?	Students will understand and be able to explain what resources can be utilized to enhance their knowledge in the area of career education. Students will be able to explain how special training and/or certifications can aid them when exploring career opportunities.	Classroom supplies for technological learning activities Current resources Multimedia notebook presentation Internet Optional references: *Engineering Design: An Introduction*, ISBN: 1418062413 *Design and Problem Solving in Technology*, ISBN: 0827352468 Online Resources: See resource appendix	Multimedia presentation over viewing the various technical careers that can stem from the skills learned in this unit. Dialogue & discussion of possible schools and technical institutes that may offer programs dealing with these skills. Video presentations/Guest Speakers who are local experts currently in each of these technical fields. Research report on one of the chosen career paths that answers the following: What would I do in this career? What skills will be needed? Where can I be trained in this field?	written Report presentation class participation

WORK.9-12.9.1.12 A.4	Review and update their career plan and include the plan in a portfolio.
TEC.9-12.8.1.12.E	Research and Information Literacy
TEC.9-12.8.1.12.E.2	Predict the impact on society of unethical use of digital tools based on research with peers and experts in the field.
TEC.9-12.8.2.12 C.1	Explain the life cycle of a product from initial design to reuse, recycling, remanufacture, or final disposal, and its relationship to people, society, and the environment, including conservation and sustainability principles.
TEC.9-12.8.2.12 C.2	Analyze the factors that influence design of products, systems, and environments.
TEC.9-12.8.2.12 C.3	Compare and contrast the effectiveness of various products, systems, and environments associated with technological activities in energy, transportation, manufacturing, and information and communication.

Differentiation

Since this unit is skills specific, the main form of assessment should be demonstration of those particular skills. However, students may demonstrate understanding of the skills through a variety of methods.

Hands-on demonstration, written instructions, "how to videos" and/or technical manuals are all suggestions for assessing understanding of the skills based in this unit.

Unit content can be presented through a variety of instruction methods which may include but are not limited to: formal notes, multimedia presentations, video clips, interactive websites and simulation and/or real world demonstration.

Technology

Various forms of educational technology may be needed for this unit based on the individual school's equipment and supplies. Video and online simulation will be needed to demonstrate many of the skills taught in this unit if the school does not have the real-life equipment.

Various specialized tools will also be needed so that the students can demonstrate understanding of each skill set; these tools include but are not limited to: basic carpentry equipment, basic plumbing equipment, basic electrical wiring equipment, digital cameras, digital video cameras, editing computers and/or basic networking equipment.

College and Workplace Readiness

This unit focuses not only on how to troubleshoot technology but also how to become a specialized technician in one area of technology. Students will have the opportunity to look at both colleges as well as technical trade schools that can help them to start a career working with technology. The four main areas of focus will be: transportation technology, home repair, information technology and multimedia design.

It is suggested that instructors utilize local experts in these fields to help assist students in both the instruction of the course as well as provide them with an opportunity to see real individuals working in these fields of technology. Future partnerships may be setup with certain schools and employers to help students' transition from high school to a post-secondary training/education.

Interactive Design - Unit #4 (Interactive Digital Media and Design)

Unit Plan

Enduring Understandings:
Interactive digital media involves creating an experience that is both functional and engaging for the user.

People use technology to create meaningful and effective interactive digital media.

Essential Questions:

- What are the higher level interactions that people have with technology?
- What makes interactive media engaging?
- How does the usability of interactive media influence the design?
- How do people share information and ideas?
- What makes digital communication effective?
- What are the elements of effective interactive media?

Unit Goals:

1. Students will be able to describe ways in which people interact with technology to share information and ideas.
2. Students will be able to understand the concepts and effectiveness of interactive digital media through analysis and critique of existing designs.
3. Students will be able to identify the elements of effective and engaging interactive digital media.
4. Students will be able to develop skills in brainstorming, storyboarding, character development, environment design, audio/video editing, and user interaction.
5. Students will be able to design and create an original animation to learn and apply the process of animation project development.
6. Students will be able to use animation and video game design software to apply and demonstrate the creative and technical process of interactive digital media design.
7. Students will be able to communicate an understanding and application of the design process through participation in class discussion and design challenges.

Recommended Duration: 5 weeks

Guiding/Topical Questions	Content/Themes/Skills	Resources and Materials	Suggested Strategies	Suggested Assessments
How do people communicate and share ideas with other people? How has interactive communication technology evolved over time? What makes interactive communication technology engaging? What are some types of animation? How can you apply the design process to develop an original animation?	Communication technology is a technical system that connects a sender to a receiver. People use technology to communicate with: Printed graphic communication, Photography, Telecommunication (electronic communication), Interactive computer and Internet communication. Animation Types: Flip book, 2D traditional cell, 2D computer animation, 3D computer animation, Stop motion Animation Design Process: Brainstorming, storyboarding, character development, environment design, audio/video editing, and user interaction.	Multimedia presentation Teacher demonstration Internet research Article summary Tutorials Online resources: see Resources Appendix Suggested software: *Adobe CS3* or higher, *Windows Movie Maker*	Guided discussion on types of communication. Research and present the evolution of communication technology. Analyze existing products to gain strategies for making communication technology more engaging. Show students various types of animations and discuss applications for each. Design and create an original animation to learn and apply the process of animation project development.	do now pre-test response to discussion questions threaded discussion groups observation performance/ practical assessment written assignment article summary worksheets written tests and quizzes project assessment notebook/portfolio self and peer critique individual participation contribution to group work TSA rubrics midterm examination final examination

How is a video game different from an animation? What are the components that make up a video game? Why is it important for a video game to be interactive and engaging? Why are teamwork and collaboration essential to design a functional and engaging video game?	Video games should be interesting, exciting, visually appealing, intellectually challenging, engaging, functional, and interactive. Video Game Components: Story, flow, characters/ objects (sprites), sounds, actions, environments (maps) A well-designed game not only entertains but often requires the game player to use complex problem solving skills.	Multimedia presentation Teacher demonstration Tutorials Online resources: see Resources Appendix Suggested software: *Game Maker* by YoYo Games Ltd	Guided discussion on comparing animation to video game interaction. Show students examples of video games; list and define their components. Find examples of poor video game design and describe what can be improved in the design to make it more engaging and interactive. Working as a team, design and create an original video game.	do now pre-test response to discussion questions threaded discussion groups observation performance/ practical assessment written assignment article summary worksheets written tests and quizzes project assessment notebook/portfolio self and peer critique individual participation contribution to group work TSA rubrics midterm examination final examination

RST.9-10.3. Follow precisely a complex multi-step procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
RST.9-10.9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
RST.9-10.10. By the end of grade 10 read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
WORK.9-12.9.1.12.A.1 *- [Cumulative Progress Indicator] - Apply critical thinking and problem-solving strategies during structured learning experiences.*
TEC.9-12.8.1.12.B.1 *- [Cumulative Progress Indicator] - Design and pilot a digital learning game to demonstrate knowledge and skills related to one or more content areas or a real world situation.*
TEC.9-12.8.1.12.D.2 *- [Cumulative Progress Indicator] - Demonstrate appropriate use of copyrights, fair use and creative commons.*
TEC.9-12.8.2.12.B.3 *- [Cumulative Progress Indicator] - Analyze the full costs, benefits, trade-offs and risks related to the use of technologies in a potential career path.*
TEC.9-12.8.2.12.F.1 *- [Cumulative Progress Indicator] - Determine and use the appropriate application of resources in the design, development, and creation of a technological product or system.*
TEC.9-12.8.2.12.G.1 *- [Cumulative Progress Indicator] - Analyze the interactions among various technologies and collaborate to create a product or system demonstrating their interactivity.*

Differentiation

A hands-on approach to assignments and projects is recommended as the most effective method of learning. Teacher should always adjust learning environment based on reluctant learners or special education needs.

Students with individual learning styles can be assisted through adjustments in assessment standards, one-to-one teacher support, additional testing time, and use of visual and auditory teaching methods

A wide variety of assessments and strategies complement the individual learning experience.

Provide one-on-one assistance and critique throughout this unit in order to provide formative feedback during the design process.

Project requirements can be modified to meet students' varying readiness levels, learning styles, and interests.

Project instructions and assessment should adapt to student differences.

Technology

In order to engage students throughout this unit, multiple forms of technology should be used for instruction and demonstration. Varying the teaching methods and styles will meet students' varying levels and learning styles.

Suggested Educational Technology: web quests, video/audio clips, animations and instruction web based tutorials.

College and Workplace Readiness

Interactive Design will prepare students for college and career opportunities by providing knowledge, experience, and problem solving skills to understand, design, produce, use and manage the human-made world in order to contribute and function in the context of a 21st century society. Instructors can reinforce instruction by providing additional career and college information and resources, guest speakers, and educational excursions.