DELAWARE VALLEY SCHOOL DISTRICT

PLANNED INSTRUCTION

A PLANNED COURSE FOR:

Manufacturing Technology

Grade Level: 10-12

Date of Board Approval: _____2019_____

DELAWARE VALLEY SCHOOL DISTRICT

Planned Instruction

Title of Planned Instruction: Manufacturing Technology

Subject Area: Technology Education Grade(s): 10-12

Course Description: This course is designed for students who have successfully completed **Introduction to Technology** and or **Technology Systems** and is created to emulate, to some degree, a manufacturing environment. Students will form a student enterprise, conduct market research, then design and manufacture a product. The purpose of this exercise is to challenge students to think independently and cooperatively for a solution to a problem. Using a problem solving/design model common to engineers, students will take their ideas from concept to concrete while developing a greater appreciation for the technology and products that are often taken for granted.

Time/Credit for the Course: 70 hours/ 1/2 credit

Curriculum Writing Committee: Eric Thiele

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Curriculum Map

1. **Marking Period One -Overview with time range in days:**
   The fields of manufacturing engineering and design require specific skill sets. 35-45 days

   Marking Period One -Goals:
   Understanding of:
   - Lineal measurement with precision to 1/16" (review)
   - Mechanical drawing/drafting tools (review)
   - Single view & multi view projection (review)
   - The importance of planning and documentation in the successful completion of projects (review)
   - Designing/Planning within a budget
   - Tools & equipment safety and use (review)
   - Additional tools/machines for processing materials
   - Proper tool selection for the required operation
   - Mature responsible attitude towards safety and work

2. **Marking Period Two -Overview with time range in days:**
   Apply skills previously learned to design, prototype, manufacture a product. 45 days

   Marking Period Two -Goals:
   Understanding of:
   - **The advantage that manufactured goods offer consumers**
   - **The systems involved in manufacturing**
   - **The importance of organization and planning to the manufacturing system**
   - **Logistics and sequential ordering pertaining to manufacturing**
   - **Use of fixtures for speed and accuracy in processing material**
   - **Material selection and limitations when designing a product**
   - **The interrelationship between science, mathematics, and technology**
   - **Both positive and negative impacts associated with manufacturing**

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UNIT: 1

Big Idea # 1:

- Technology is created, used, and modified by humans

Essential Questions:

- What knowledge and skills are essential for humans to make sound decisions about creating, using, and modifying technologies?

Concepts:

- Decisions about the use of products and systems can result in known and unexpected consequences.
- Creating optimal solutions under constraints are a primary component of technological problem solving (e.g., tools/machines, materials, information, people, capital, energy, and time).

Competencies:

- Describe the complementary roles of scientific knowledge and technological application.
- Explain how making informed decisions about the development and use of technology may have known and unexpected consequences.

Big Idea #2:

- Technological design is a creative process that anyone can do which may result in new inventions and innovations.

Essential Questions:

- How would you apply technological design and problem solving methods in the development of inventions and innovations?

Concepts:

- Technological design & problem solving requires the ability to clearly communicate engineered solutions.
- Technological design & problem solving utilizes a series of steps that take place in a well-defined sequence.
- Technological design & problem solving requires the application of hands-on abilities such as sketching, prototyping, and fabricating.

Competencies:

- Use design and problem solving skills to solve technological challenges.
- Use hands-on skills to create useful products and solve technological challenges.
- Transform ideas into technological products and/or systems.
- Clearly communicate engineered solutions in written, spoken, and graphical means.

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Curriculum Plan

Unit: **1** **Time Range in Days: 40-45**

Standard(s):
(Number Only- See Appendix for Description) CC.3.5.9-10.C; CC.3.6.9-10.B; CC.2.1.HS.F.2; CC.2.1.HS.F.5 PA – 3.4.10.A1; 3.4.10.B1; 3.4.10.B4

Anchor(s):
(As Applicable)
S11.A.1.2; S11.A.1.3; S11.A2.1.2; S11.A3.1.2

Overview:
The fields of manufacturing engineering and design require specific skill sets. 35-45 days

Focus Question(s):

- What are the factors that have influenced our designed world?
- What does “necessity is the mother of invention” mean to you?

Goals:

- Students will select and safely use the tools and equipment necessary to make a small product based on a design provided.
- Upon completion of individual products, students will recognize the supple differences between them in spite of using the same plan.

Objectives:

1. Students will develop proficiency in reading and interpreting a set of working drawings, then execute those plans to create a product. (DOK3)
2. Students will demonstrate safe correct use of hand and power tools while working independently on an assigned product. (DOK3)
3. Students will recognize individual differences between the products and conclude the reason for this occurrence. (DOK1)
4. Students will develop skills and self-confidence as they create this product. (DOK 3)

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Core Activities and Corresponding Instructional Methods:

1. Continue to develop lineal measurement proficiency and cutting ability to the nearest 16^{th} inch through the use of a required construction project.
2. Independent and group work to view and interpret working drawings.
3. Following lectures, demonstrations, and safety testing, students will safely & effectively
    a. Use layout and measuring tools
    b. Use basic hand and power tools
    c. Use stationary woodworking machines and equipment
4. Develop an understanding of basic woodworking terminology related to board layout and grain direction.
5. Use appropriate tools and techniques for sequential assembly of various parts.
6. Demonstrate sanding and finishing methods as discussed.
7. Analyze the processes and procedures used and critique work individually and collectively.

Assessments:

Diagnostic:

- Oral response/discussion

Formative:

- Reading assignments, vocabulary/concept activities
- Drawing review and interpretation
- Apply concepts and create product

Summative:

- Product construction and assembly
- Final analysis/critique

Extensions:

- Working with a set of prepared plans students will review and discuss the procedures for the accurate completion of this project.
- Review the steps of problem solving and breaking a problem into smaller pieces.
- Discuss the importance of accuracy in cutting material and the effect on quality and appearance.
- Demonstrate/Discuss correct use of layout and measurement tools on chosen materials.
- Demonstrate/Discuss steps in squaring a board – checking for square.

- Review various power tools needed for specific operations and the sequence of use.
- Introduce sanding procedures when preparing to stain and clear coat a project.

Correctives:

- Individual instruction and demonstrations will be given to students having difficulty

Materials and Resources:

- Technology Engineering & Design reference text
- Various layout & measuring tools
- Belt/Disk Sander
- Scroll Saw
- Band Saw
- Radial Arm Saw
- Drill Press
- Motorized Miter Box
- Palm Sander
- Router/Shaper
- Hand drill
- Table saw
- Jointer
- Thickness planer
- CNC router
- LASER Engraver
- CAD and Coreldraw software

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UNIT: 2

Big Idea # 1:

- Technology is created, used, and modified by humans

Essential Question:

- What knowledge and skills are essential for humans to make sound decisions about creating, using, and modifying technologies?

Concepts:

- Decisions about the use of products and systems can result in known and unexpected consequences.
- Creating optimal solutions under constraints are a primary component of technological problem solving (e.g., tools/machines, materials, information, people, capital, energy, and time).

Competencies:

- Describe the complementary roles of scientific knowledge and technological application.
- Explain how making informed decisions about the development and use of technology may have known and unexpected consequences.

Big Idea #2:

- Technological design is a creative process that anyone can do which may result in new inventions and innovations.

Essential Questions:

- How would you apply technological design and problem solving methods in the development of inventions and innovations?

Concepts:

- Technological design & problem solving requires the ability to clearly communicate engineered solutions.
- Technological design & problem solving utilizes a series of steps that take place in a well-defined sequence.
- Technological design & problem solving requires the application of hands-on abilities such as sketching, prototyping, and fabricating.

Competencies:

- Use design and problem solving skills to solve technological challenges.
- Use hands-on skills to create useful products and solve technological challenges.
- Transform ideas into technological products and/or systems.
- Clearly communicate engineered solutions in written, spoken, and graphical means.

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Curriculum Plan

Unit: 2 **Time Range in Days: 40-45**

Standard(s):
(Number Only- See Appendix for Description) CC.3.5.9-10.C; CC.3.6.9-10.B; CC.2.1.HS.F.2; CC.2.1.HS.F.5 PA – 3.4.10.A1; 3.4.10.B1; 3.4.10.B4

Anchor(s):
S11.A.1.2; S11.A.1.3; S11.A2.1.2; S11.A3.1.2

Overview:
The fields of manufacturing engineering and design require specific skill sets. 35-45 days

Focus Question(s):
- What are the factors that have influenced our designed world?
- What does "necessity is the mother of invention" mean to you?
- How has manufacturing changed over time?

Goals:
- Use the engineering/technology design model, select a product to develop from idea to final production

Objectives:
1. Students will create and design a set of working drawings, then execute those plans to create a product. (DOK 4)
2. Students will demonstrate safe correct use of hand and power tools while working independently and collectively on a selected product. (DOK 2)
3. Students will recognize the need for high organization and precision in order to create a product that is desirable. (DOK 3)
4. Students will develop individual skills, group skills, and self-confidence as they create a product. (DOK 3)
5. Students will apply concepts of manufacturing to create a high quality product. (DOK 4)

Core Activities and Corresponding Instructional Methods:
1. Create a product based on basic criteria of
    a. Function
    b. Size

   c. Complexity
   d. Cost
   e. Marketability
2. Research, sketch, and develop working drawings for selected product
3. Prototype the design
4. Analyze and redesign/modify original plan
5. Review/revise processes and develop a process/flow chart
6. Design and construction needed fixtures and templates
7. Establish work groups for various processes/tasks and begin product run

Assessments:

Diagnostic:

- Oral response/discussion

Formative:

- Reading assignments, vocabulary/concept activities
- Drawing/planning review and interpretation
- Creating a working business plan
- Selecting product to develop and prototype
- Prototyping selected product
- Market analysis for product selected

Summative:

- Product construction and assembly
- Marketing and sales

Extensions:

- Working with a set of prepared plans students will review and discuss the procedures for the accurate completion of this project.
- Review the steps of problem solving and breaking a problem into smaller pieces.
- Discuss the importance of accuracy in cutting material and the effect on quality and appearance.
- Demonstrate/Discuss correct use of layout and measurement tools on chosen materials.
- Demonstrate/Discuss steps in squaring a board – checking for square.
- Review various power tools needed for specific operations and the sequence of use.
- Introduce sanding procedures when preparing to stain and clear coat a project.

Correctives:

- Individual remediation, instruction and demonstrations will be given to students having difficulty

Materials and Resources:

- Technology Engineering & Design reference text
- Various layout & measuring tools
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- Radial Arm Saw
- Drill Press
- Motorized Miter Box
- Palm Sander
- Router/Shaper
- Hand drill
- Table saw
- Jointer
- Thickness planer
- CNC router
- LASER Engraver
- CAD and Coreldraw software

Primary Textbook(s) Used for this Course of Instruction

Name of Textbook (reference): Technology Engineering & Design

Textbook ISBN #: 978-0-07-876810-1

Textbook Publisher &Year of Publication: Glencoe/McGraw-Hill 2008

Appendix

Standards Addressed: CC

CC.3.5.9-10.C - 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.

CC.3.6.9-10.B - Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

CC.2.1.HS.F.2 - Apply properties of rational and irrational numbers to solve real world or mathematical problems.

CC.2.1.HS.F.5 - Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

PA – ST:

3.4.10.A1 - Illustrate how profit and an economic market often drive the development of technologies.

3.4.10.B1 - Compare and contrast how the use of technology involves weighing the trade-offs between the positive and negative effects.

3.4.10.B4 - Recognize that technological development has been evolutionary, the result of a series of refinements to a basic invention**.**

3.4.10.C1: Apply the components of the technological design process.

3.4.10.C2: Analyze a prototype and/or create a working model to test a design concept by making actual observations and necessary adjustments.

Anchor(s):

S11.A.1.2 - Identify and analyze the scientific or technological challenges of societal issues; propose possible solutions and discuss implications.

S11.A.1.3 - Describe and interpret patterns of change in natural and human-made systems.

S11.A.2.1 - Apply knowledge of scientific investigation or technological design to develop or critique aspects of the experimental or design process.

S11.A.2.1.3 - Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.

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Checklist to Complete and Submit with Curriculum:

_____ **A hard copy of the curriculum using The template entitled "Planned Instruction," available on the district website**

_____ **Hard copies of all supplemental resources not available electronically**

_____ **The primary textbook form(s)**

_____ **The appropriate payment form, in compliance with the maximum curriculum writing hours noted on the first page of this document**

_____ **A USB/Flash Drive containing a single file that will print the curriculum in its intended sequence from beginning to end and all supplemental resources that are available in electronic format.**

Each principal and/or department chair has a schedule of First and Second Readers/Reviewers. Each Reader/Reviewer must sign & date below.

First Reader/Reviewer Printed Name_____

First Reader/Reviewer Signature_____ Date_____

Second Reader/Reviewer Printed Name_____

Second Reader/Reviewer Signature _____ Date_____