

# **Wayne**

Township Public Schools

**Applied Technology**

**9-12**

**Fab Tech**

**July 23, 2018**

**Robert Yost**

**Wayne School District  
Curriculum Format**

<b>Content Area/ Grade Level/ Course:</b>	<b>Technology Education 9-12 Fab Tech</b>
<b>Unit Plan Title:</b>	<b>Unit I: Designing and Engineering Products</b>
<b>Time Frame</b>	<b>10 Weeks</b>
<b>Anchor Standards/Domain*    *i.e: ELA: reading, writing i.e.: Math: Number and Operations in Base 10</b>	
<p><b>8.2 Design Thinking</b> This standard, previously standard 8.2 Technology Education of the 2014 NJSL – Technology, outlines the technological design concepts and skills essential for technological and engineering literacy. The new framework design, detailed previously, includes Engineering Design, Ethics and Culture, and the Effects of Technology on the Natural world among the disciplinary concepts</p> <p><b>9.2 Career Awareness, Exploration, Preparation and Training.</b> This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.</p> <p><b>Standard 9.4 Life Literacies and Key Skills.</b> This standard outline key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy* that are critical for students to develop to live and work in an interconnected global economy.</p> <p><a href="#">Anchor Companion Standards (Reading and Writing Grades 9-10)</a></p> <p><a href="#">Anchor Companion Standards (Reading and Writing Grades 11-12)</a></p>	
<b>Unit Summary</b>	
<p>Introduction to manufacturing</p> <ol style="list-style-type: none"> <li>1. Definition of manufacturing technology</li> <li>2. Purposes for manufacturing</li> <li>3. Technologies related to manufacturing</li> <li>4. Industry</li> <li>5. Systems             <ol style="list-style-type: none"> <li>i. Open loop                 <ul style="list-style-type: none"> <li>● Input-process-output</li> </ul> </li> <li>ii. Closed loop                 <ul style="list-style-type: none"> <li>● Input-process-output-feedback</li> </ul> </li> </ol> </li> <li>6. Outputs of manufacturing             <ol style="list-style-type: none"> <li>i. Products</li> <li>ii. Impacts                 <ul style="list-style-type: none"> <li>● Expected/Desired</li> <li>● Expected/Undesired</li> <li>● Unexpected/Desired</li> <li>● Unexpected/Undesired</li> </ul> </li> </ol> </li> </ol>	

7. Manufacturing goals
- Designing and Engineering a product
1. Identifying good product ideas
  2. Product development
  3. Objectives of design
  4. The Design Process
    - i. Identify the problem
    - ii. Research the problem
    - iii. Define limitations and set goals
  5. Generate alternative solutions
  6. Product engineering
  7. Engineering drawings
    - i. Perspective drawings
    - ii. Technical drawings
  8. Design specifications
  9. Documentation
    - i. Notations
    - ii. Drawings
    - iii. Photos
    - iv. Text

#### **Standard Number(s)**

- 8.2.5.ETW.1: Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems.
- 8.2.5.ETW.2: Describe ways that various technologies are used to reduce improper use of resources.
- 8.2.5.ETW.3: Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved.
- 8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.
- 8.2.12.ED.2: Create scaled engineering drawings for a new product or system and make modification to increase optimization based on feedback.

[Progress Indicators- Reading and Writing Standards Grades 9-10](#)

[Progress Indicators- Reading and Writing Grades 11-12](#)

#### **Essential Question(s)**

- **What is the purpose of Manufacturing and Manufacturing Technologies?**
- **What is the effect of Manufacturing and Manufacturing Technology on the individual? On society? On the environment?**

- How does the design and engineering process affect a product and its manufacturing process?
- How can the design and problem solving model be transferred to other areas of your life?

### Enduring Understandings

- Manufacturing is the process of creating, marketing and distributing goods to the consumer. Manufacturing Technologies methods of manufacturing.
- The manner in which a product is designed and manufactured will affect both the distribution of goods to the marketplace and the consumer decisions on the purchase and use of the range of goods made available to them.
- The design and problem solving model can be utilized to weigh the pros and cons of any problem or concern encountered in any area of our daily lives.

In this unit plan, the following 21<sup>st</sup> Century themes and skills are addressed.

Check all that apply. 21 <sup>st</sup> Century Themes		Indicate whether these skills are E-Encouraged, T-Taught, or A-Assessed in this unit by marking E, T, A on the line before the appropriate skill. 21 <sup>st</sup> Century Skills	
<input checked="" type="checkbox"/>	Global Awareness	<input type="checkbox"/> E,T,A	Creativity and Innovation
<input type="checkbox"/>	Environmental Literacy	<input type="checkbox"/> E,T,A	Critical Thinking and Problem Solving
<input type="checkbox"/>	Health Literacy	<input type="checkbox"/> E,T,A	Communication
<input type="checkbox"/>	Civic Literacy	<input type="checkbox"/> E,T,A	Collaboration
<input checked="" type="checkbox"/>	Financial, Economic, Business, and Entrepreneurial Literacy		

### Student Learning Targets/Objectives (Students will know/Students will understand)

#### Introduction to manufacturing

1. Define manufacturing technology
2. List all the important types of manufacturing activities
3. Explain the purposes for manufacturing
4. Define the term technology
5. List and describe technologies related to manufacturing
6. Explain the three different meanings of the term industry
7. Define the term system
8. Describe the common parts of any type of system
9. Name two manufacturing technologies
10. Explain what an output is and describe the outputs of manufacturing
11. Define the term goal and suggest common manufacturing goals

#### Designing and Engineering a product

1. Explain how companies can identify good product ideas
2. Study how the role of product development plays on the success of a manufacturing firm
3. List and describe the objectives of design
4. List and describe steps in a design process
5. Explain how products are engineered
6. Recognize different types of engineering drawings and tell how they are used

7. Discuss specifications and describe their form and contents

8. Design Brief

- i. A real life situation forms the context of the activity
- ii. Define the problem to be solved
- iii. Determine design criteria: specifications and constraints
- iv. Develop Solutions
- v. Form design teams/cooperative learning groups
- vi. Investigate possible solutions
- vii. Generate alternative solutions
- viii. Test solutions
- ix. Optimize solutions
- x. Test and evaluate final design solution

**Assessments (Pre, Formative, Summative, Other)  
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*Denote required common assessments with*

Learning experiences will be design and inquiry based. Both extended task activities, as well as shorter, more focused resource tasks/practical tasks will be utilized to maximize learning. Each learning experience will reinforce the following elements for students:

A. Engineering Design Process (real-world design & problem solving)

- open-ended problems with constraints & specifications
- design, draw, build and test
- modeling and optimizing solutions

B. Team Building Skills (working on a design team)

- group dynamics
- social and leadership skills
- delegating and accepting responsibility
- 3 R's (respect, responsibility and results)

C. Technical Writing

- providing a context for written communication
- producing engineering reports
- maintaining written logs
- documenting learning in a design portfolio

D. Public Speaking

- preparing an oral presentation
- developing poise and self confidence
- improving oral communications skills

E. Design Brief

- A real life situation forms the context of the activity
- Define the problem to be solved
- Determine design criteria: specifications and constraints

F. Develop Solutions

- Form design teams/cooperative learning groups
- Investigate possible solutions
- Generate alternative solutions
- Test solutions
- Optimize solutions
- Test and evaluate final design solution

G. Assessment

- Performance of final design solution relative to constraints and specifications

- Student design portfolios containing: reports, drawings, daily logs, data and analysis
- Multimedia and oral presentation of design solution
- Standardized authentic assessment instrument

*Teaching and Learning Activities*

<i>Activities</i>	<ul style="list-style-type: none"> <li>• Define and explain technical terminology.</li> <li>• Research popular products. Prepare a visual analysis of the products, the industry that produced them, the technical processes for their production, the outcomes of the manufacture of the product, and how it is marketed.</li> <li>• Use a sketchbook to begin sketching activities and visualizing everyday objects.</li> <li>• Begin reviewing the Engineering drawing process, including the terminology, equipment and preliminary use of drawing skills.</li> </ul>
<i>Differentiation Strategies</i>	<ul style="list-style-type: none"> <li>• Individual and collaborative research, design and problem solving</li> <li>• Student interest and skill level assessment (Learning Style Assessment results)</li> <li>• Individual, small group, and large group instruction</li> <li>• Media presentations and guest speakers</li> <li>• Student presentations and Flipped Lessons</li> </ul>

Resources

- <http://www.state.nj.us/education/cccs/>
- Engineering Fundamentals: Design, Principles, and Careers, Goodheart-Wilcox, copyright 2014
- Pre-Engineering, McGraw Hill, copyright 2012

**Wayne School District  
Curriculum Format**

<b>Content Area/ Grade Level/ Course:</b>	Technology Education 9-12 Fab Tech
<b>Unit Plan Title:</b>	Unit II: Developing Production Systems
<b>Time Frame</b>	10 Weeks
<b>Anchor Standards/Domain*    *i.e: ELA: reading, writing i.e.: Math: Number and Operations in Base 10</b>	
<p><b>8.2 Design Thinking</b> This standard, previously standard 8.2 Technology Education of the 2014 NJSL – Technology, outlines the technological design concepts and skills essential for technological and engineering literacy. The new framework design, detailed previously, includes Engineering Design, Ethics and Culture, and the Effects of Technology on the Natural world among the disciplinary concepts</p> <p><b>9.2 Career Awareness, Exploration, Preparation and Training.</b> This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.</p> <p><b>Standard 9.4 Life Literacies and Key Skills.</b> This standard outline key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy* that are critical for students to develop to live and work in an interconnected global economy.</p> <p><a href="#">Anchor Companion Standards (Reading and Writing Grades 9-10)</a></p> <p><a href="#">Anchor Companion Standards (Reading and Writing Grades 11-12)</a></p>	
<b>Unit Summary</b>	

Primary manufacturing processes

1. Primary and secondary processes
2. Manufacturing processes
  - i. Casting
  - ii. Molding
  - iii. Forming
  - iv. Separating
  - v. Conditioning
  - vi. Joining/fastening
  - vii. Assembling
  - viii. Finishing
3. Environmental Impacts of manufacturing
4. Renewable versus exhaustible resources
5. Movement of raw materials
6. Standard and synthetic stock

Secondary manufacturing processes and layout

1. Measurement and layout tools
2. Surfaces of flat and round stock
3. Principles of measurement
4. Engineering drawing

**Standard Number(s)**



8.2.5.ETW.1: Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems.

8.2.5.ETW.2: Describe ways that various technologies are used to reduce improper use of resources. •

8.2.5.ETW.3: Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved.

8.2.12.ITH.1: Analyze a product to determine the impact that economic, political, social, and/or cultural factors have had on its design, including its design constraints

8.2.12.ITH.2: Propose an innovation to meet future demands supported by an analysis of the potential costs, benefits, trade-offs, and risks related to the use of the innovation.

8.2.12.ETW.1: Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation, and maintenance of a chosen product.

8.2.12.NT.2: Redesign an existing product to improve form or function.

9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).

9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).

9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)

[Progress Indicators- Reading and Writing Standards Grades 9-10](#)

[Progress Indicators- Reading and Writing Grades 11-12](#)

#### Essential Question(s)

- Does the intended use of the product determine the manufacturing process and the material from which it is made?
- What is the importance of Engineering Drawing skills and techniques?

#### Enduring Understandings

- We live in a disposable society. The objects we use daily must be manufactured from both renewable and non-renewable resources, which affect the world around us.
- Engineering drawing is the language of industry. It provides a standardized method of visualizing the product with instructions for its manufacture and distribution.

In this unit plan, the following 21<sup>st</sup> Century themes and skills are addressed.

Check all that apply. 21 <sup>st</sup> Century Themes		Indicate whether these skills are E-Encouraged, T-Taught, or A-Assessed in this unit by marking E, T, A on the line before the appropriate skill. 21 <sup>st</sup> Century Skills
	Global Awareness	E,T, A
X	Environmental Literacy	E,T, A
	Health Literacy	E,T, A
	Civic Literacy	E,T, A
X	Financial, Economic, Business, and Entrepreneurial Literacy	
		Creativity and Innovation
		Critical Thinking and Problem Solving
		Communication
		Collaboration

**Student Learning Targets/Objectives (Students will know/Students will understand)**

Primary manufacturing processes

1. Identify manufacturing processes as primary or secondary
2. List and discuss major steps in the manufacturing processes
3. Define primary and secondary processes
4. Explain primary processing
5. Discuss the impact of manufacturing processes on the environment
6. Define renewable and exhaustible resources and give examples of each.
7. Explain methods by which raw materials are moved to mills and refineries
8. Define and identify various types of standard stock
9. Describe 4 major types of synthetic wood composites
10. List forms of standard plastic stock
11. Explain how forest products are converted into standard stock

Secondary manufacturing processes and layout

1. State the meaning of the terms measurement and layout
2. Identify surfaces of a part
3. Identify special features of a part
4. Identify measuring and layout tools
5. List principles of measurement for round and flat stock
6. Describe how to layout a part
7. Identify and apply casting and molding processes
8. Identify the major stages of forming and describe what happens in each stage
9. List and describe the three elements common to all separating processes
10. List the six types of separating machines and describe how they work
11. Explain what conditioning does to a material and give at least one simple example of a conditioning
12. Demonstrate an understanding of the importance of assembling processes in manufacturing ducts.
13. Define three types of mechanical fastening and describe the process of each
14. Explain the two purposes of finishes
15. Give brief descriptions of application methods for each type of finish

**Assessments (Pre, Formative, Summative, Other)**  
an \*

*Denote required common assessments with*

- A. Engineering Design Process (real-world design & problem solving)
  - open-ended problems with constraints & specifications
  - design, draw, build and test
  - modeling and optimizing solutions
- B. Team Building Skills (working on a design team)
  - group dynamics
  - social and leadership skills
  - delegating and accepting responsibility
  - 3 R's (respect, responsibility and results)
- C. Technical Writing
  - providing a context for written communication
  - producing engineering reports
  - maintaining written logs
  - documenting learning in a design portfolio
- D. Public Speaking
  - preparing an oral presentation
  - developing poise and self confidence
  - improving oral communications skills
- E. Design Brief
  - A real life situation forms the context of the activity
  - Define the problem to be solved
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- F. Develop Solutions
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  - Optimize solutions
  - Test and evaluate final design solution
- G. Assessment
  - Performance of final design solution relative to constraints and specifications
  - Student design portfolios containing: reports, drawings, daily logs, data and analysis
  - Multimedia and oral presentation of design solution
  - Standardized authentic assessment instrument

*Teaching and Learning Activities*

<i>Activities</i>	<ul style="list-style-type: none"> <li>• Using the objects from the previous unit, follow the object from raw material to final product.</li> <li>• Begin an introduction to drawing: sketching for visualization; orthographic projection, isometric views, perspective drawing.</li> <li>• Practice sketching and drawing skills.</li> </ul>
<i>Differentiation Strategies</i>	<ul style="list-style-type: none"> <li>• Individual and collaborative research, design and problem solving</li> <li>• Student interest and skill level assessment (Learning Style Assessment results)</li> <li>• Individual, small group, and large group instruction</li> <li>• Media presentations and guest speakers</li> <li>• Student presentations and Flipped Lessons</li> </ul>

Resources

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**Wayne School District  
Curriculum Format**

<b>Content Area/ Grade Level/ Course:</b>	<b>Technology Education 9-12 Fab Tech</b>
<b>Unit Plan Title:</b>	<b>Unit III: Manufacturing Products</b>
<b>Time Frame</b>	<b>10 Weeks</b>
<b>Anchor Standards/Domain*    *i.e: ELA: reading, writing i.e.: Math: Number and Operations in Base 10</b>	
<p><b>8.2 Design Thinking</b> This standard, previously standard 8.2 Technology Education of the 2014 NJSL – Technology, outlines the technological design concepts and skills essential for technological and engineering literacy. The new framework design, detailed previously, includes Engineering Design, Ethics and Culture, and the Effects of Technology on the Natural world among the disciplinary concepts</p> <p><b>9.2 Career Awareness, Exploration, Preparation and Training.</b> This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.</p> <p><b>Standard 9.4 Life Literacies and Key Skills.</b> This standard outline key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy* that are critical for students to develop to live and work in an interconnected global economy.</p> <p><a href="#">Anchor Companion Standards (Reading and Writing Grades 9-10)</a></p> <p><a href="#">Anchor Companion Standards (Reading and Writing Grades 11-12)</a></p>	
<b>Unit Summary</b>	

## Developing manufacturing systems

1. Types of manufacturing
  - i. Custom
  - ii. Intermittent
  - iii. Continuous
2. Engineering tasks
3. Hiring

## Manufacturing the product

1. Major steps in production
2. Resources management
  - i. People
  - ii. Information
  - iii. Materials
  - iv. Tools/machines
  - v. Capital
  - vi. Energy
  - vii. Time
3. Methods and sequences in managing production
4. Four major phases of a safety program
5. Quality control

## Standard Number(s)

8.2.5.ETW.1: Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems.

8.2.5.ETW.2: Describe ways that various technologies are used to reduce improper use of resources.

8.2.5.ETW.3: Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved.

8.2.12.ITH.1: Analyze a product to determine the impact that economic, political, social, and/or cultural factors have had on its design, including its design constraints

8.2.12.ITH.2: Propose an innovation to meet future demands supported by an analysis of the potential costs, benefits, trade-offs, and risks related to the use of the innovation.

8.2.12.ETW.1: Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation, and maintenance of a chosen product.

8.2.12.NT.2: Redesign an existing product to improve form or function.

9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).

9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).

9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)

**Essential Question(s)**

- How does the manufacture of products assist in solving real world problems?
- Why is it necessary to use tools, machines and materials safely?

**Enduring Understandings**

- We use our knowledge of the resources and processes of manufacturing to develop solutions to everyday local and global problems, increase human productivity, and promote creativity.
- Without the safe use of tools, machines and materials, the individual, society, the economy and the environment will be adversely affected.

In this unit plan, the following 21<sup>st</sup> Century themes and skills are addressed.

Check all that apply. 21 <sup>st</sup> Century Themes		Indicate whether these skills are <i>E-Encouraged, T-Taught, or A-Assessed</i> in this unit by marking <i>E, T, A</i> on the line before the appropriate skill. 21 <sup>st</sup> Century Skills	
X	Global Awareness	E,T, A	Creativity and Innovation
	Environmental Literacy	E,T, A	Critical Thinking and Problem Solving
X	Health Literacy	E,T, A	Communication
	Civic Literacy	E,T, A	Collaboration
X	Financial, Economic, Business, and Entrepreneurial Literacy		

**Student Learning Targets/Objectives (Students will know/Students will understand)**

Developing manufacturing systems

1. Recognize the difference between custom, intermittent, and continuous manufacturing and compare these 3 different types of manufacturing
2. List the major engineering tasks in organizing a manufacturing operation
3. List steps for hiring workers and describe how hiring is done
4. Describe various personnel and material forms and their uses

Manufacturing the product

1. List and explain the three major steps in production
2. Describe, in general terms, the method and sequence used in managing production
3. Give reasons why safety on the job is important to yourself and the company
4. List and discuss the four major phases of a safety program

**Assessments (Pre, Formative, Summative, Other)**

*Denote required common assessments with*

*an \**

A. Engineering Design Process (real-world design & problem solving)

- open-ended problems with constraints & specifications
  - design, draw, build and test
  - modeling and optimizing solutions
- B. Team Building Skills (working on a design team)
- group dynamics
  - social and leadership skills
  - delegating and accepting responsibility
  - 3 R's (respect, responsibility and results)
- C. Technical Writing
- providing a context for written communication
  - producing engineering reports
  - maintaining written logs
  - documenting learning in a design portfolio
- D. Public Speaking
- preparing an oral presentation
  - developing poise and self confidence
  - improving oral communications skills
- E. Design Brief
- A real life situation forms the context of the activity
  - Define the problem to be solved
  - Determine design criteria: specifications and constraints
- F. Develop Solutions
- Form design teams/cooperative learning groups
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  - Generate alternative solutions
  - Test solutions
  - Optimize solutions
  - Test and evaluate final design solution
- G. Assessment
- Performance of final design solution relative to constraints and specifications
  - Student design portfolios containing: reports, drawings, daily logs, data and analysis
  - Multimedia and oral presentation of design solution
  - Standardized authentic assessment instrument

*Teaching and Learning Activities*

<p><i>Activities</i></p>	<p>Each student will participate in a mass manufacturing project where:</p> <ul style="list-style-type: none"> <li>● Students will decide on a product they want to manufacture and sell</li> <li>● Do market research</li> <li>● Write a business plan</li> <li>● Sell stock to purchase materials and goods required to manufacture their product</li> <li>● Assign each student a role in the corporation</li> <li>● MANUFACTURE THE PRODUCT</li> <li>● Market the product</li> <li>● Sell the product</li> <li>● Write a financial report</li> <li>● Pay a return on the stock</li> </ul>
<p><i>Differentiation Strategies</i></p>	<ul style="list-style-type: none"> <li>● Individual and collaborative research, design and problem solving</li> <li>● Student interest and skill level assessment (Learning Style Assessment results)</li> </ul>

- |  |   |
|--|---|
|  | <ul style="list-style-type: none"><li>● Individual, small group, and large group instruction</li><li>● Media presentations and guest speakers</li><li>● Student presentations and Flipped Lessons</li></ul> |
|--|---|

#### Resources

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**Wayne School District  
Curriculum Format**

<b>Content Area/ Grade Level/ Course:</b>	<b>Technology Education 9-12 Fab Tech</b>
<b>Unit Plan Title:</b>	<b>Unit IV: Marketing Products</b>
<b>Time Frame</b>	<b>3 Weeks</b>
<b>Anchor Standards/Domain*    *i.e: ELA: reading, writing i.e.: Math: Number and Operations in Base 10</b>	
<p><b>8.2 Design Thinking</b> This standard, previously standard 8.2 Technology Education of the 2014 NJSL – Technology, outlines the technological design concepts and skills essential for technological and engineering literacy. The new framework design, detailed previously, includes Engineering Design, Ethics and Culture, and the Effects of Technology on the Natural world among the disciplinary concepts</p> <p><b>9.2 Career Awareness, Exploration, Preparation and Training.</b> This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.</p> <p><b>Standard 9.4 Life Literacies and Key Skills.</b> This standard outline key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy* that are critical for students to develop to live and work in an interconnected global economy.</p> <p><a href="#"><u>Anchor Companion Standards (Reading and Writing Grades 9-10)</u></a></p> <p><a href="#"><u>Anchor Companion Standards (Reading and Writing Grades 11-12)</u></a></p>	
<b>Unit Summary</b>	
<p>Marketing the product</p> <ol style="list-style-type: none"> <li>1. Elements of a marketing plan</li> <li>2. Market research</li> <li>3. Determining factory pricing</li> <li>4. Effective advertising</li> <li>5. Package design</li> <li>6. Channels of distribution and consumer goods</li> <li>7. Sales</li> <li>8. Durable and nondurable goods</li> <li>9. Repair and maintenance of products</li> <li>10. Replacement versus repair</li> </ol>	
<b>Standard Number(s)</b>	

- 8.2.5.ETW.1: Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems.
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- 8.2.5.ETW.3: Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved.
- 8.2.12.ITH.1: Analyze a product to determine the impact that economic, political, social, and/or cultural factors have had on its design, including its design constraints
- 8.2.12.ITH.2: Propose an innovation to meet future demands supported by an analysis of the potential costs, benefits, trade-offs, and risks related to the use of the innovation.
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- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice
- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving
- 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions

#### Essential Question(s)

- **How does marketing affect the distribution, sales and consumption of manufactured products?**
- **What is planned obsolescence and how does it affect the repair and/or replacement of products?**
- **How in turn does this affect the individual, society, the economy, and the environment?**

#### Enduring Understandings

- **Goods and services require marketing, advertising, sales, and distribution to move the manufactured product to the consumer.**
- **Manufacturing processes determine the availability of new and improved versions of the product available to the consumer.**
- **This turnover of products in the marketplace also affect the amount of disposable, unwanted, irreparable, and obsolete products find their way to the landfill.**

**In this unit plan, the following 21<sup>st</sup> Century themes and skills are addressed.**

*Check all that apply.*

*Indicate whether these skills are **E**-Encouraged, **T**-Taught, or **A**-Assessed in this unit by marking **E, T, A** on the line before the appropriate skill.*

21 <sup>st</sup> Century Themes		21 <sup>st</sup> Century Skills	
X	Global Awareness	E,T, A	Creativity and Innovation
	Environmental Literacy	E,T, A	Critical Thinking and Problem Solving
	Health Literacy	E,T, A	Communication
X	Civic Literacy	E,T, A	Collaboration
X	Financial, Economic, Business, and Entrepreneurial Literacy		

**Student Learning Targets/Objectives (Students will know/Students will understand)**

Marketing the product

1. Define the term marketing
2. List 5 major elements in a marketing plan
3. Define market research and list the data that is collected
4. Explain the method used in arriving at a factory price for a product
5. List and explain the functions of an advertisement that is effective
6. Give three basic steps needed to create an advertisement
7. Give the basic steps in designing a package
8. Name 5 main considerations in selecting a package
9. List and describe the three major channels of distribution used or consumer goods
10. Explain 2 major types of sales
11. List the steps in making a sale
12. Tell the difference between durable and nondurable goods
13. Explain the difference between repair and maintenance of products
14. List and explain the steps used to repair products
15. Explain the economics of replacement versus repair

**Assessments (Pre, Formative, Summative, Other)**  
*an \**

*Denote required common assessments with*

A. Engineering Design Process (real-world design & problem solving)

- open-ended problems with constraints & specifications
- design, draw, build and test
- modeling and optimizing solutions

B. Team Building Skills (working on a design team)

- group dynamics
- social and leadership skills
- delegating and accepting responsibility
- 3 R's (respect, responsibility and results)

C. Technical Writing

- providing a context for written communication
- producing engineering reports
- maintaining written logs
- documenting learning in a design portfolio

D. Public Speaking

- preparing an oral presentation

- developing poise and self confidence
- improving oral communications skills

E. Design Brief

- A real life situation forms the context of the activity
- Define the problem to be solved
- Determine design criteria: specifications and constraints

F. Develop Solutions

- Form design teams/cooperative learning groups
- Investigate possible solutions
- Generate alternative solutions
- Test solutions
- Optimize solutions
- Test and evaluate final design solution

G. Assessment

- Performance of final design solution relative to constraints and specifications
- Student design portfolios containing: reports, drawings, daily logs, data and analysis
- Multimedia and oral presentation of design solution
- Standardized authentic assessment instrument

*Teaching and Learning Activities*

<i>Activities</i>	<ul style="list-style-type: none"> <li>• Prepare an advertising campaign for a manufactured product.</li> <li>• Create a plan for the disposal/recycling of disposable, unwanted, irreparable, and obsolete products.</li> </ul>
<i>Differentiation Strategies</i>	<ul style="list-style-type: none"> <li>• Individual and collaborative research, design and problem solving</li> <li>• Student interest and skill level assessment (Learning Style Assessment results)</li> <li>• Individual, small group, and large group instruction</li> <li>• Media presentations and guest speakers</li> <li>• Student presentations and Flipped Lessons</li> </ul>

Resources

- <http://www.state.nj.us/education/cccs/>
- Engineering Fundamentals: Design, Principles, and Careers, Goodheart-Wilcox, copyright 2014
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<b>Content Area/ Grade Level/ Course:</b>	<b>Technology Education 9-12 Fab Tech</b>
<b>Unit Plan Title:</b>	<b>Unit V: Performing Financial Activities</b>
<b>Time Frame</b>	<b>2 Weeks</b>
<b>Anchor Standards/Domain*    *i.e: ELA: reading, writing i.e.: Math: Number and Operations in Base 10</b>	
<p><b>8.2 Design Thinking</b> This standard, previously standard 8.2 Technology Education of the 2014 NJSL – Technology, outlines the technological design concepts and skills essential for technological and engineering literacy. The new framework design, detailed previously, includes Engineering Design, Ethics and Culture, and the Effects of Technology on the Natural world among the disciplinary concepts</p> <p><b>9.2 Career Awareness, Exploration, Preparation and Training.</b> This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.</p> <p><b>Standard 9.4 Life Literacies and Key Skills.</b> This standard outline key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy* that are critical for students to develop to live and work in an interconnected global economy.</p> <p><a href="#">Anchor Companion Standards (Reading and Writing Grades 9-10)</a></p> <p><a href="#">Anchor Companion Standards (Reading and Writing Grades 11-12)</a></p>	
<b>Unit Summary</b>	
<p>Establishing a manufacturing enterprise</p> <ol style="list-style-type: none"> <li>1. Role and function of management</li> <li>2. Methods of ownership</li> <li>3. Company organization</li> <li>4. Monetary needs and financing</li> </ol> <p>Performing financial activities</p> <ol style="list-style-type: none"> <li>1. Types of financial records</li> <li>2. Types of budgets</li> <li>3. Assets versus liabilities</li> <li>4. Company dissolution</li> <li>5. Bankruptcy</li> </ol>	
<b>Standard Number(s)</b>	
<p>8.2.12.ITH.1: Analyze a product to determine the impact that economic, political, social, and/or cultural factors have had on its design, including its design constraints</p> <p>8.2.12.ITH.2: Propose an innovation to meet future demands supported by an analysis of the potential costs, benefits, trade-offs, and risks related to the use of the innovation.</p> <p>8.2.12.ETW.1: Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation, and maintenance of a chosen product.</p>	

8.2.12.NT.2: Redesign an existing product to improve form or function.

9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice

9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving

9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions

[Progress Indicators- Reading and Writing Standards Grades 9-10](#)

[Progress Indicators- Reading and Writing Grades 11-12](#)

### Essential Question(s)

- Why is it necessary to add the management layer into the manufacturing process?
- How do monetary needs affect the manufacturing process?
- What career opportunities are available in the field of manufacturing?

### Enduring Understandings

- Management adds the ability to monitor the manufacturing process and its advancement.
- Monetary needs must be addressed at all phases of the manufacturing process. Without money, the remaining resources will be adversely affected.
- There are a variety of career opportunities within the field of manufacturing, which require all levels of education. Students need to be able to effectively research those opportunities and make informed career decisions.

In this unit plan, the following 21<sup>st</sup> Century themes and skills are addressed.

Check all that apply. 21 <sup>st</sup> Century Themes		Indicate whether these skills are <b>E-Encouraged</b> , <b>T-Taught</b> , or <b>A-Assessed</b> in this unit by marking <b>E, T, A</b> on the line before the appropriate skill.	21 <sup>st</sup> Century Skills
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X	Civic Literacy	E,T, A	Collaboration
X	Financial, Economic, Business, and Entrepreneurial Literacy		

**Student Learning Targets/Objectives (Students will know/Students will understand)**

Establishing a manufacturing enterprise

1. Identify the roles of managers in companies formed to manufacture products and construct structures

2. List the function of management

3. Explain and give examples of management functions

4. List 5 kinds of management activities carried on by management

5. Explain the kind of work done in each management activity

6. Describe three methods of ownership

7. Discuss the advantages and disadvantages of each type of ownership

8. Identify steps required by law to own a company

9. Describe 3 kinds of company organization

10. Describe how a company determines its money needs

11. List ways for financing for starting a company

Performing financial activities

1. Name three types of financial records kept by manufacturing companies

2. List and describe the major types of budgets

3. Tell the difference between a company's assets and liabilities

4. Describe the process of dissolving a company

5. Name the two types of bankruptcy and explain how they differ

6. List the steps a company must follow in going through dissolution

**Assessments (Pre, Formative, Summative, Other)**

*Denote required common assessments with*

*an \**

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*Teaching and Learning Activities*

<i>Activities</i>	<p>Each student will participate in a mass manufacturing project where:</p> <ul style="list-style-type: none"> <li>• Students will decide on a product they want to manufacture and sell</li> <li>• Do market research</li> <li>• Write a business plan</li> <li>• Sell stock to purchase materials and goods required to manufacture their product</li> <li>• Assign each student a role in the corporation</li> <li>• Market the product</li> <li>• Sell the product</li> <li>• Write a financial report</li> <li>• Pay a return on the stock</li> </ul>
<i>Differentiation Strategies</i>	<ul style="list-style-type: none"> <li>• Individual and collaborative research, design and problem solving</li> <li>• Student interest and skill level assessment (Learning Style Assessment results)</li> <li>• Individual, small group, and large group instruction</li> <li>• Media presentations and guest speakers</li> <li>• Student presentations and Flipped Lessons</li> </ul>

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