

**Randolph Township Schools
Randolph High School**

Problem Solving in Woodworking

Department of Science, Technology, Engineering and Math
Michael Cascione, Supervisor

Curriculum Committee:
Sanford Feld
David Thatcher
Duncan Crannell

Curriculum Developed:
November 2017

Date of Board Approval:
February 20, 2018

**Randolph Township Schools
Department of Social Studies
Problem Solving in Woodworking**

Table of Contents

<u>Section</u>	<u>Page(s)</u>
Mission Statement and Education Goals – District	3
Affirmative Action Compliance Statement	3
Educational Goals – District	4
Introduction	5
Career Readiness Practices	6
Curriculum Pacing Chart	7

Randolph Township Schools

Mission Statement

We commit to inspiring and empowering all students in Randolph schools to reach their full potential as unique, responsible and educated members of a global society.

Randolph Township Schools Affirmative Action Statement

Equality and Equity in Curriculum

The Randolph Township School district ensures that the district's curriculum and instruction are aligned to the state's standards. The curriculum provides equity in instruction, educational programs and provides all students the opportunity to interact positively with others regardless of race, creed, color, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, religion, disability or socioeconomic status.

N.J.A.C. 6A:7-1.7(b): Section 504, Rehabilitation Act of 1973; N.J.S.A. 10:5; Title IX, Education Amendments of 1972

RANDOLPH TOWNSHIP BOARD OF EDUCATION

EDUCATIONAL GOALS

VALUES IN EDUCATION

The statements represent the beliefs and values regarding our educational system. Education is the key to self-actualization, which is realized through achievement and self-respect. We believe our entire system must not only represent these values, but also demonstrate them in all that we do as a school system.

We believe:

- The needs of the child come first
- Mutual respect and trust are the cornerstones of a learning community
- The learning community consists of students, educators, parents, administrators, educational support personnel, the community and Board of Education members
- A successful learning community communicates honestly and openly in a non-threatening environment
- Members of our learning community have different needs at different times. There is openness to the challenge of meeting those needs in professional and supportive ways
- Assessment of professionals (i.e., educators, administrators and educational support personnel) is a dynamic process that requires review and revision based on evolving research, practices and experiences
- Development of desired capabilities comes in stages and is achieved through hard work, reflection and ongoing growth

Randolph Township Schools

Department of Science, Technology, Engineering and Math

Introduction

The Randolph Township School District is committed to excellence. We believe that all children are entitled to an education that will equip them to become productive citizens of the 21st century. We believe that an education grounded in the fundamental principles of science, technology, engineering, and math (STEM) will provide students with the skills and content necessary to become future leaders and lifelong learners.

A sound STEM education is grounded in the principles of inquiry, rigor, and relevance. Students will be actively engaged in learning as they use real-world STEM skills to construct knowledge. They will have many opportunities to manipulate materials and solve problems in ways that are developmentally appropriate to their age. They will work in an environment that encourages them to take risks, think critically, build models, observe patterns, and recognize anomalies in those patterns. Students will be encouraged to ask questions, not just the “how” and the “what” of observed phenomena, but also the “why”. They will develop the ability, confidence, and motivation to succeed academically and personally.

STEM literacy requires understandings and habits of mind that enable students to make sense of how our world works. Scientifically and technologically literate citizens deal sensibly with problems that involve mathematics, evidence, patterns, logical arguments, uncertainty, and problem solving.

Problem Solving in Woodworking

Introduction

The goal of this course is to provide an opportunity for students who already have woodworking skills to engage in self-directed, sophisticated woodworking. They will be given some challenging problems by the instructor, and will spend most of their time using a variety of woodworking materials and methods, including problem-solving methods, to create their own designs in wood.

Some other materials and techniques may also be employed, such as soldering, sandblasting glass and mirrors, and using state of the art equipment like a 3-D carving machine.

Career Readiness Practices

The application of the Career Readiness Practices will be utilized throughout the course.

CRP1-Career Ready Practices: All students will act as a responsible and contributing citizen and employee.

CRP2-Career Ready Practices: All students will apply appropriate academic and technology skills.

CRP4-Career Ready Practices: All students will communicate clearly and effectively and with reason.

CRP5-Career Ready Practices: All students will consider the environmental, social and economic impacts of decisions.

CRP6-Career Ready Practices: All students will demonstrate creativity and innovation.

CRP7-Career Ready Practices: All students will employ valid and reliable research strategies.

CRP8-Career Ready Practices: All students will utilize critical thinking to make sense of problems and persevere in solving them.

CRP9-Career Ready Practices: All students will model integrity, ethical leadership and effective management.

CRP11-Career Ready Practices: All students will use technology to enhance productivity.

CRP12-Career Ready Practices: All students will work productively in teams while using global competence.

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Curriculum Pacing Chart
Problem Solving in Woodworking

SUGGESTED TIME ALLOTMENT	UNIT NUMBER	CONTENT - UNIT OF STUDY
Ongoing	I	Safety
Ongoing	II	Planning
6 weeks	III	Designing, Creating, and Presenting a Project Suitable for a Woodworking Class
5 weeks	IV	Jigs, Fixtures, and Set-Ups
6 weeks	V	Independent Project

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Problem Solving in Woodworking
UNIT I: Safety

TRANSFER: Students will work safely and in a responsible, conscientious manner.

NJSL STANDARDS / GOALS: <u>Standard 9.3.MN-HSE.1:</u> Demonstrate the safe use of manufacturing equipment. <u>Standard 9.3.MN-PRO.2:</u> Manage safe and healthy production working conditions and environmental risks.	ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
	Following proper safety measures will ensure a healthy working environment.	<ul style="list-style-type: none"> In what ways has “personal safety” changed in the workplace?
	Maintaining the workspace in a neat, safe condition helps to protect the user from injury and enhances the quality of the finished product.	<ul style="list-style-type: none"> How can someone demonstrate responsibility?
	KNOWLEDGE	SKILLS
	Students will know: When using hand tools: <ul style="list-style-type: none"> maintain them in sharp, usable condition, cut away from oneself, hold the tool in both hands employ clamping devices where feasible wear safety glasses When using power tools: <ul style="list-style-type: none"> wear safety glasses keep all body parts a safe distance 	Students will be able to: Demonstrate safe practices by wearing safety glasses at all appropriate times. Use hand tools found in the lab safely and responsibly.

	<p>from moving parts keep hair and clothing out of the way work carefully and without distraction</p> <p>When using soldering irons and power supplies:</p> <ul style="list-style-type: none"> • wear safety glasses • have all equipment ready • clear work area of unneeded materials 	<p>Demonstrate safe practices by wearing safety glasses at all appropriate times.</p> <p>Practice safe procedures when working with electricity.</p> <p>Use power tools found in the lab safely and responsibly.</p> <p>Operate soldering equipment and electrical power supplies in a safe, energy-conserving manner.</p>
<p>ASSESSMENT EVIDENCE: Students will show their learning by: Working with all tools, both hand and power, in a safe and responsible manner.</p> <p>KEY LEARNING EVENTS AND INSTRUCTION: Model safe working habits.</p>		

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Problem Solving in Woodworking
Unit I: Safety

SUGGESTED TIME ALLOTMENT	CONTENT-UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
Ongoing	Unit I: Safety <ul style="list-style-type: none"> • Hand tool safety • Power tool safety 	<p>Teacher generated handouts, Power Point slides, demonstrations</p> <p>https://ccohs.ca/oshanswers/safety_haz/woodwork/gen_safe.html</p> <p>Woodworking Machines - General Safety Tips : OSH Answers</p> <p>https://sites01.lsu.edu/wp/ehs/files/2010/12/EHS_Header_1_Fire.jpg</p> <p>Louisiana State University Environmental Health and Safety</p>

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Problem Solving in Woodworking
UNIT II: Planning

TRANSFER: Students will be able to research and develop plans for woodworking projects.

NJSL STANDARDS / GOALS: <u>Standard G-CO.D: Congruence:</u> Make formal geometric constructions with a variety of tools and methods. <u>Standard G-SRT.D: Similarity, Right Triangles, and Trigonometry:</u> Apply trigonometry to general triangles. <u>Standard G-C.A: Circle:</u> Understand and apply theorems about circles. <u>Standard G-GMD.B: Geometric Measurement and Dimension:</u> Visualize relationships between two-dimensional and three-dimensional objects. <u>Standard G-MG.A: Modeling with Geometry:</u> Apply geometric concepts in modeling situations. <u>Standard W.11-12.1.D: Writing:</u> Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. Establish and maintain a style and tone appropriate to the audience and	ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
	Careful, accurate plans, such as drawings, are essential to achieving a successful result.	<ul style="list-style-type: none"> What is the purpose of creating?
	The more complete and accurate a plan is, the better the chance for success.	<ul style="list-style-type: none"> How do ideas become reality?
	KNOWLEDGE	SKILLS
	<p>Students will know:</p> <p>3-D objects can be represented accurately on a 2-D plane.</p> <p>Tools are used to accurately represent straight lines, square corners, and regular curves.</p>	<p>Students will be able to:</p> <p>Draw a sketch of an original design using graph paper, straight edge, ruler, and compass.</p> <p>Refine an original design using drafting instruments, <i>i.e.</i> drawing board, T-square, triangles, and compass.</p>

<p>purpose (e.g. formal and objective for academic writing) while attending to the norms and conventions of the discipline in which they are writing.</p>	<p>Computers can be used to more quickly and accurately portray an object than by hand techniques.</p> <p>There are many sources available to access plans created by other people, especially the Internet.</p> <p>Keeping an engineering journal is vital to the successful completion of designing, prototyping, and completing any project.</p>	<p>Use computer software (e.g., Sketch-Up, ImageJ) to create a 3-D representation of an original design to be used as part of a project.</p> <p>Analyze a working drawing from another source.</p> <p>Use digital resources to develop plans for projects, as well as to enhance existing plans and designs.</p> <p>Keep an engineering journal.</p>
<p>ASSESSMENT EVIDENCE: Students will show their learning by:</p> <ul style="list-style-type: none"> • Creating neat, accurate, complete plans for their woodworking projects with the appropriate number and orientation of views. • Searching for, modifying, and adapting images and plans found elsewhere to fit their needs. • Keeping an engineering journal. <p>KEY LEARNING EVENTS AND INSTRUCTION:</p> <ul style="list-style-type: none"> • Developing, through sufficient number of iterations, a comprehensive plan for each project undertaken. • Instructor will provide individual instruction and mentoring. 		

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Problem Solving in Woodworking
Unit II: Planning

SUGGESTED TIME ALLOTMENT	CONTENT-UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
Ongoing	Unit II: Planning <ul style="list-style-type: none"> • Sketching • Drawing with T-square, triangle, compass • Using Sketch-Up/ImageJ to manipulate designs • Keeping an engineering journal 	Teacher generated handouts, Power Point slides, demonstrations ImageJ Sketch-Up Microsoft Office

RANDOLPH TOWNSHIP SCHOOL DISTRICT

Problem Solving in Woodworking

UNIT III: Designing, Creating, and Presenting a Project Suitable for a Woodworking Class

TRANSFER: Students will be able to design, create, and present a project suitable for another class.		
NJSL STANDARDS / GOALS: <u>Standard 9.3.12.AC.1</u> Use vocabulary, symbols and formulas common to architecture and construction. <u>Standard 9.3.12.AC.2</u> Use architecture and construction skills to create and manage a project. <u>Standard 9.3.12.AC.6</u> Read, interpret and use technical drawings, documents and specifications to plan a project. <u>Standard 9.3.12.AC-DES.1</u> Justify design solutions through the use of research documentation and analysis of data. <u>Standard 9.3.12.AC-DES.2</u> Use effective communication skills and strategies (listening, speaking, reading, writing and graphic communications) to work with clients and colleagues. <u>Standard 9.3.12.AC-DES.6</u> Apply the techniques and skills of modern drafting, design, engineering and construction to projects. <u>Standard 9.3.ST-ET.1</u> Use STEM concepts and processes to solve problems involving design and/or production.	ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
	The best way of growing your craft is to teach it to someone else.	How do you communicate your inspirations and creativity to others?
	Creative work is best done when the artist and the work go through a series of changes together, until both reach completion at the same time.	How can we present not just an image of the finished creation, but the way to achieve it?
	KNOWLEDGE	SKILLS
	Students will know: That appropriate skill levels vary for other woodworking students. What goes into making clear, understandable plans. A prototype or model is essential to presenting a clear idea of a woodworking project.	Students will be able to: Research the appropriate skill levels for different woodworking projects. Create a comprehensive set of plans and drawings for a simple woodworking project. Fabricate a prototype of a simple woodworking project.

	<p>The necessary steps in making a woodworking project.</p> <p>KEY TERMS: procedure, machine drawing, prototype, Prezi, Youtube, Instructables</p>	<p>Generate a Power Point series, Prezi, Youtube video, or Instructables article, text based document to demonstrate the necessary steps in making a woodworking project.</p>
<p>ASSESSMENT EVIDENCE: Students will show their learning by: Successfully designing, creating, and presenting a project suitable for another class.</p> <p>KEY LEARNING EVENTS AND INSTRUCTION: Instruction on an individual basis based on the chosen project.</p>		

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Problem Solving in Woodworking
Unit III: Designing, Creating, and Presenting a Project Suitable for a Woodworking Class

SUGGESTED TIME ALLOTMENT	CONTENT-UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
6 Weeks	Unit III: Designing, Creating, and Presenting a Project Suitable for a Woodworking Class <ul style="list-style-type: none"> • Researching skill levels for different age and experience levels • Describing a procedure • Machine drawing, CAD • Working with Prezi, Youtube, Instructables 	Teacher generated handouts, Power Point slides, demonstrations.

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Problem Solving in Woodworking
UNIT IV: Jigs, Fixtures, and Setups

TRANSFER: Students will be able to produce accurate, repeatable results by designing and developing jigs, fixtures, and set-ups for woodworking machinery.

NJSL STANDARDS / GOALS:	ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
<u>Standard 9.3.MN-PPD.1</u> Produce quality products that meet manufacturing standards and exceed customer satisfaction.	The concepts of repeatable results and interchangeable parts are key elements of construction and engineering.	<ul style="list-style-type: none">• How can woodworking machinery be set up to produce repeatable, accurate results?• What types of things can be used to produce desired accuracy and repeatability?
<u>Standard 9.3.MN-PPD.2</u> Research, design and implement alternative manufacturing processes to manage production of new and/or improved products.	Properly set up woodworking machinery to virtually eliminate dependence on hand to eye coordination and skill.	<ul style="list-style-type: none">• How does one who lacks proper skills produce satisfying results?
<u>Standard 9.3.MN-PPD.3</u> Monitor, promote and maintain a safe and productive workplace using techniques and solutions that ensure safe production of products.	KNOWLEDGE	SKILLS
<u>Standard 9.3.MN-PPD.4</u> Implement continuous improvement processes in order to maintain quality within manufacturing production.	Students will know: The terms jig and fixture are often interchangeable. How to design and use jigs, fixtures, and set ups.	Students will be able to: Use both jigs and fixtures to achieve desired results. Locate and drill holes consistently. Cut stock to an accurate length. Repeat a curve on several pieces of stock.
<u>Standard 9.3.MN-PPD.5</u> Develop procedures to create products that meet customer needs.		
<u>Standard 9.3.MN-PRO.1</u> Diagnose production process problems and take corrective action to meet production		

<p>quality standards.</p> <p>Standard 9.3.MN.2 Analyze and summarize how manufacturing businesses improve performance.</p> <p>Standard 9.3.MN.6 Demonstrate workplace knowledge and skills common to manufacturing.</p> <p>Standard 9.3.MN-PRO.5 Demonstrate the safe use of manufacturing equipment.</p> <p>Standard 9.3.ST-ET.4 Apply the elements of the design process.</p> <p>Standard 9.3.ST-SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.</p>	<p>Proper teaching techniques to convey materials to other students.</p> <p>KEY TERMS: jig, fixture, set-up, stop, fence, table, depth gauge, go-no go, chip clearance</p>	<p>Make sophisticated, properly fitting joints such as dovetails, spline joints, and dado-rabbets.</p> <p>Successfully teach other students how to properly use their constructed jig and/or fixtures.</p>
<p>ASSESSMENT EVIDENCE: Students will show their learning by:</p> <ul style="list-style-type: none"> • Successfully creating a working jig/fixture/set-up. • Successfully teach other students to employ the designed device. <p>KEY LEARNING EVENTS AND INSTRUCTION:</p> <ul style="list-style-type: none"> • Completion of a mass production project using student-designed jigs, fixtures, and set ups, and to be used by a class of another group of students, typically those without prior woodworking experience. 		

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Problem Solving in Woodworking
Unit IV: Jigs, Fixtures, and Set-ups

SUGGESTED TIME ALLOTMENT	CONTENT-UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
5 Weeks	Unit IV: Jigs, Fixtures, and Set-ups <ul style="list-style-type: none"> • Research different types of jigs, fixtures and setups. • Research different types of instruction. • Research different types of materials to be used for jigs and fixtures. • Research the reasons to use jigs, fixtures, and setups. 	Teacher generated handouts, Power Point slides, demonstrations. Various woodworking plans. Various woodworking YouTube videos. Articulation with various faculty from different departments.

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Problem Solving in Woodworking
UNIT V: Independent Project

TRANSFER: Students will continue to expand their woodworking skills by completing an independent project mutually agreed upon by the student and the instructor.		
NJSL STANDARDS / GOALS: <u>Standard 9.3.MN-MIR.2</u> Demonstrate the safe use of manufacturing equipment to ensure a safe and healthy environment. <u>Standard 9.3.MN-PPD.1</u> Produce quality products that meet manufacturing standards and exceed customer satisfaction. <u>Standard 9.3.MN-PPD.2</u> Research, design and implement alternative manufacturing processes to manage production of new and/or improved products. <u>Standard 9.3.MN-PPD.3</u> Monitor, promote and maintain a safe and productive workplace using techniques and solutions that ensure safe production of products. <u>Standard 9.3.MN-PPD.5</u> Develop procedures to create products that meet customer needs. <u>Standard 9.3.MN-PRO.2</u> Manage safe and healthy production working conditions and environmental risks.	ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
	There are tools, materials, and processes which can extend and improve our ability to accomplish goals.	<ul style="list-style-type: none"> How does one choose the correct tools, materials and processes to achieve a given goal?
	All real world design solutions are created in a context of parameters and special considerations.	<ul style="list-style-type: none"> How do we choose what we really need, and how to go about getting it?
	KNOWLEDGE	SKILLS
	Students will know: Through use of the knowledge acquired in class, an independent project can be designed and constructed.	Students will be able to: Draw a sketch of an original design using graph paper, straight edge, ruler, and compass. Refine an original design using drafting instruments, i.e. drawing board, t square, triangles, and compass.

<p><u>Standard 9.3.ST-ET.1</u> Use STEM concepts and processes to solve problems involving design and/or production.</p> <p><u>Standard 9.3.ST-ET.4</u> Apply the elements of the design process.</p> <p><u>Standard 9.3.ST-SM.2</u> Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.</p>		<p>Use computer software such as Sketch-Up or ImageJ to create a 3-D representation of an original design to be used as part of a project.</p> <p>Analyze a working drawing from another source.</p> <p>Use digital resources to develop plans for optional projects, as well as enhancing existing plans and designs.</p> <p>Create a spreadsheet to detail the individual components of a project, total amount of materials, and projected cost.</p> <p>Lay out a project in such a way as to conserve material, power, and cost.</p> <p>Demonstrate mastery of various hand tools to achieve a professional result in the construction of a project.</p> <p>Demonstrate mastery of various power tools to achieve a professional result in the construction of a project.</p> <p>Apply a consistently fine finish.</p>

ASSESSMENT EVIDENCE: Students will show their learning by:

- Students will complete a woodworking project of their choice, with the instructor's approval.

KEY LEARNING EVENTS AND INSTRUCTION:

- Instruction on an individual basis based on the chosen project.

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Problem Solving in Woodworking
Unit V: Independent Project

SUGGESTED TIME ALLOTMENT	CONTENT-UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
6 Weeks	Unit V: Independent Project	Electronic and print media