Totowa Public Schools

Shop

Grades 6-8

Aligned to NJSLS 2020 Standards

Revised and BOE Adopted: 8/31/2022

Units of Study & Pacing Guide

Unit of Study	Timeline	Notes
Unit 1: Problem Solving & Design	6 Weeks	
Unit 2: Tool Safety	6 Weeks	
Unit 3: Woodworking	6 Weeks	

Title	Problem Solving and Design
Unit Duration	6 Weeks
Unit Summary & Rationale	Students will learn the steps to plan, design, and write up their solutions to proposed real world problems. The first step in any project is being able to sketch a design. It does not matter if it is successful, as failure leads to a greater understanding of our problem.
Unit Goals	
Essential Questions	• What scale best fits this design? • How would you redesign this project to make it more functional? • If given the opportunity to do this challenge again, what would you do differently? • What was the most challenging part of the assignment?
Enduring Understandings	• The first step in any creation project begins with the design phase. Here, students learn that failure leads to a greater understanding of the process.
Learning Outcomes	• Use a ruler and sketchbook to design. • Students will learn the steps to plan, design, and write up their solutions to proposed real world problems. • Students will be introduced to the idea of scale and perspective drawings to create their first design portfolio entries.
Assessment Evidence	
Formative	Collaborative Activities, Homework, Classwork, Discussion, Independent Class Assignment, Informal Observations of Students, Interactive Notebooks, Sketchbooks, Safety test
Summative	Tests, Pre-Assessments, Quizzes, Written Responses, Projects
Alternative and Benchmark	Formative, Summative, Alternative and Benchmark Assessments
Resources to Promote Learning	
Resources & Equipment Needed	Smartboard, Computers, iPads, websites and digital interactives/models, Multi-media presentations, video streaming, Brain Pop, Microsoft 365, hand tools, wood, machines, safety glasses, pencils, folders, rulers, other appropriate tools for the shop.

	Approved Class Resource List
Content & Interdisciplinary Standards	
Computer Science & Design Thinking	
NJSLS	**Activity**
Engineering design is a systematic, creative, and iterative process used to address local and global problems. The process includes generating ideas, choosing the best solution, and making, testing, and redesigning models or prototypes.	• 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem. • 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).
Engineering design requirements and specifications involve making trade-offs between competing requirements and desired design features.	• 8.2.8.ED.5: Explain the need for optimization in a design process. • 8.2.8.ED.6: Analyze how trade-offs can impact the design of a product. • 8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches).
Economic, political, social and cultural aspects of society drive development of new technological products, processes, and systems.	• 8.2.8.ITH.1: Explain how the development and use of technology influences economic, political, social, and cultural issues.
Resources need to be utilized wisely to have positive effects on the environment and society. Some technological decisions involve tradeoffs between environmental and economic needs, while others have positive effects for both the economy and environment.	• 8.2.8.ETW.1: Illustrate how a product is upcycled into a new product and analyze the short- and long-term benefits and costs. • 8.2.8.ETW.2: Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital). • 8.2.8.ETW.3: Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact. • 8.2.8.ETW.4: Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best.
Technological disparities have consequences for public health and prosperity.	• 8.2.8.EC.1: Explain ethical issues that may arise from the use of new technologies.

	• 8.2.8.EC.2: Examine the effects of ethical and unethical practices in product design and development.
Computer Science and Design Thinking Practices	
• Fostering an Inclusive Computing and Design Culture • Collaborating Around Computing and Design • Recognizing and Defining Computational Problems • Developing and Using Abstractions • Creating Computational Artifacts • Testing and Refining Computational Artifacts • Communicating About Computing and Design	
NJ: 2016 SLS: English Language Arts	
• RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts. • RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics • RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently. • WHST.6-8.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	
2020 SLS: Career Readiness, Life Literacies, and Key Skills	
NJSLS Performance Expectations (By the end of 8th Grade)	
Career Readiness, Life Literacies, and Key Skills Practices describe the habits of the mind that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. These practices should be taught and reinforced in all content areas with increasingly higher levels of complexity	• Act as a responsible and contributing community members and employee. • Attend to financial well-being. • Consider the environmental, social and economic impacts of decisions • Demonstrate creativity and innovation. • Utilize critical thinking to make sense of problems and persevere in solving them. • Model integrity, ethical leadership and effective management. • Plan education and career paths aligned to personal goals.

and expectation as a student advances through a program of study.	• Use technology to enhance productivity increase collaboration and communicate effectively. • Work productively in teams while using cultural/global competence
9.2.8.CAP.2: Develop a plan that includes information about career areas of interest. 9.2.8.CAP.3: Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income. 9.2.8.CAP.12: Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential. 9.2.8.CAP.15: Present how the demand for certain skills, the job market, and credentials can determine an individual's earning power.	
Interdisciplinary Connections	
Math	• 6.RP.A.1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. • 7.G.A.1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. • 7.G.A.2. Draw (with technology, with ruler and protractor, as well as freehand) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle. • 7.G.A.3. Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids. • 8.G.A.1. Verify experimentally the properties of rotations, reflections, and translations: 8.G.A.1a. Lines are transformed to lines, and line segments to line segments of the same length. 8.G.A.1b. Angles are transformed to angles of the same
Visual & Performing Art	• 1.2.8.Cr1a: Generate a variety of ideas, goals and solutions for media artworks using creative processes such as sketching, brainstorming, improvising, and prototyping with increased proficiency, divergent thinking, and opportunity for student choice. • 1.2.8.Cr1b: Organize and design artistic ideas for media arts productions.

	• 1.2.8.Cr1c: Critique plans, prototypes and production processes considering purposeful and expressive intent. • 1.2.8.Cr3a: Experiment with and implement multiple approaches that integrate content and stylistic conventions. • 1.2.8.Cr3b: Communicate an intentional purpose and meaning utilizing varying point of view and perspective.
Connections and Skills	• Critical thinking • Collaboration and Teamwork • Problem Solving

Title	Tool Safety
Unit Duration	6 Weeks
Unit Summary & Rationale	Prior to working with any tools, students must learn and demonstrate being able to work safely in the woodshop. This unit is dedicated to teaching students how to be safe in the shop.
Unit Goals	
Essential Questions	When should you use a tool? If an injury occurs, what do you do? Where should you work on your project? What do you do if you are done early?
Enduring Understandings	Always respect others, tools, and the woodshop. Safety is everyone's responsibility. We must always remember to work in a safe environment.
Learning Outcomes	Identify basic classroom safety

List Safety rules for tools and machinery
Demonstrate proper safety when using machines.

Assessment Evidence	
Formative	Collaborative Activities, Homework, Classwork, Discussion, Independent Class Assignment, Informal Observations of Students, Interactive Notebooks, Sketchbooks, Safety test
Summative	Tests, Pre-Assessments, Quizzes, Written Responses, Projects
Alternative and Benchmark	Formative, Summative, Alternative and Benchmark Assessments
Resources to Promote Learning	
Resources & Equipment Needed	Smartboard, Computers, iPads, websites and digital interactives/models, Multi-media presentations, video streaming, Brain Pop, Microsoft 365, hand tools, wood, machines, safety glasses, pencils, folders, rulers, other appropriate tools for the shop. Approved Class Resource List
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Computer Science & Design Thinking	
NJSLS	**Activity**
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Engineering design requirements and specifications involve making trade-offs	• 8.2.8.ED.5: Explain the need for optimization in a design process. • 8.2.8.ED.6: Analyze how trade-offs can impact the design of a product.

between competing requirements and desired design features.	• 8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches).
Computer Science and Design Thinking Practices	
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reinforced in all content areas with increasingly higher levels of complexity and expectation as a student advances through a program of study.	• Model integrity, ethical leadership and effective management. • Plan education and career paths aligned to personal goals. • Use technology to enhance productivity increase collaboration and communicate effectively. • Work productively in teams while using cultural/global competence
• 9.2.8.CAP.2: Develop a plan that includes information about career areas of interest. • 9.2.8.CAP.3: Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income. • 9.2.8.CAP.12: Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential. • 9.2.8.CAP.15: Present how the demand for certain skills, the job market, and credentials can determine an individual's earning power. • 9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3). • 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries.	
Interdisciplinary Connections	
Visual and Performing Art	1.2.8.Cr1a: Generate a variety of ideas, goals and solutions for media artworks using creative processes such as sketching, brainstorming, improvising, and prototyping with increased proficiency, divergent thinking, and opportunity for student choice. 1.2.8.Cr1b: Organize and design artistic ideas for media arts productions.
Mathematics	• 7.RP.A.1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. • 7.RP.A.2. Recognize and represent proportional relationships between quantities. • 6.RP.A.1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. • 7.G.A.1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. • 7.G.A.2. Draw (with technology, with ruler and protractor, as well as freehand) geometric shapes with given conditions. Focus on constructing

	triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle. • 7.G.A.3. Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids. • 8.G.A.1. Verify experimentally the properties of rotations, reflections, and translations: 8.G.A.1a. Lines are transformed to lines, and line segments to line segments of the same length. 8.G.A.1b. Angles are transformed to angles of the same
Connections and Skills	• Critical thinking • Collaboration and Teamwork • Problem Solving

Title	Woodworking
Unit Duration	6 Weeks
Unit Summary & Rationale	As students engage in the design process, and learn how to operate safely in a woodshop, this is their opportunity to put into practice what they have learned. Each grade level will complete a different project.
Unit Goals	
Essential Questions	What was the most challenging part of this project? How could you adapt this design to make it more functional?
Enduring Understandings	The creation of each project is unique. From the design process to the finished product, changes will be made from the original design. Each project proposes a problem for students to solve. Through the design process, each student attempts to solve the problem and then begins to execute the design.
Learning Outcomes	• Students will develop their skills on using had tools, including pull saws, hammers, block planes, brace drills, and eggbeater drills.

- Students will use hand saws safely and properly to cut lumber for their projects.
- Students will Identify Trademarks and why they are/were used.
- Students will identify Stamps (Metal letters) and their use.
- Use of a ruler, combination square, tape measure, or other measuring device to measure wood accurately
  Choosing the proper clap/vise to hold wood when working with it
- Aligning boards and prepping nails to assemble pieces together.
- Practice the following techniques – safety, Hand Saws - Rip, crosscut, back, coping, and hack.

Projects

Grade 6 – Gumball Dispenser

- Executing the design process.
- Discuss material trade off.
- Examine the following: Sustainability, repeatably, and life of the product.
- Use of the handsaw techniques

Grade 7 – Catapult

- Executing the design process.
- Discuss material trade off.
- Examine the following: Sustainability, repeatably, and life of the product.
- Build a simple machine.
- Reinforce measuring and cutting
- Utilize hand saw techniques.

Grade 8 – CO2 Powered Racecar

- Executing the design process.
- Discuss material trade off.
- Examine the following: Sustainability, repeatably, and life of the product.
- Build a simple machine involving wheels and axles
- Utilize the coping saw and pull saw to create a cutout car

- Utilize the brace drill to make wheel and body holes
- Demonstrate proper set up of the drill press
- Drill Press, Safety glasses, drill bits, work sheet
- Think about weights and balance for maximum speed

Assessment Evidence	
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Economic, political, social and cultural aspects of society drive development of new technological products, processes, and systems.	• 8.2.8.ITH.1: Explain how the development and use of technology influences economic, political, social, and cultural issues.
Technology interacts with society, sometimes bringing about changes in a society's economy, politics, and culture, and often leading to the creation of new needs and wants. New needs and wants may create strains on local economies and workforces. Improvements in technology are intended to make the completion of tasks easier, safer, and/or more efficient.	• 8.2.8.ITH.2: Compare how technologies have influenced society over time. • 8.2.8.ITH.3: Evaluate the impact of sustainability on the development of a designed product or system. • 8.2.8.ITH.4: Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact. • 8.2.8.ITH.5: Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another.
Technology advances through the processes of innovation and invention which relies upon the imaginative and inventive nature of people. Sometimes a technology developed for one purpose is adapted to serve other purposes. Engineers use a systematic process of creating or modifying technologies that is fueled and constrained by physical laws, cultural norms, and economic resources. Scientists use systematic investigation to understand the natural world.	• 8.2.8.NT.1: Examine a malfunctioning tool, product, or system and propose solutions to the problem. • 8.2.8.NT.2: Analyze an existing technological product that has been repurposed for a different function. • 8.2.8.NT.3: Examine a system, consider how each part relates to other parts, and redesign it for another purpose.
Computer Science and Design Thinking Practices	

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- Collaborating Around Computing and Design
- Recognizing and Defining Computational Problems
- Developing and Using Abstractions
- Creating Computational Artifacts
- Testing and Refining Computational Artifacts
- Communicating About Computing and Design

NJ: 2016 SLS: English Language Arts

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- RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.
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2020 SLS: Career Readiness, Life Literacies, and Key Skills

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• 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1). • 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.	
Interdisciplinary Connections	
Math	• 6.RP.A.1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. • 7.RP.A.1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. • Show details • 7.RP.A.2. Recognize and represent proportional relationships between quantities. • 7.G.A.1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. • 7.G.A.2. Draw (with technology, with ruler and protractor, as well as freehand) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle. • 7.G.A.3. Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids. • 8.G.A.1. Verify experimentally the properties of rotations, reflections, and translations: 8.G.A.1a. Lines are transformed to lines, and line segments to line segments of the same length. 8.G.A.1b. Angles are transformed to angles of the same
Science	• MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

	• MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
Visual and Performing Art	• 1.2.8.Cr1a: Generate a variety of ideas, goals and solutions for media artworks using creative processes such as sketching, brainstorming, improvising, and prototyping with increased proficiency, divergent thinking, and opportunity for student choice. • 1.2.8.Cr1b: Organize and design artistic ideas for media arts productions. • 1.2.8.Cr1c: Critique plans, prototypes and production processes considering purposeful and expressive intent. • 1.2.8.Cr2b: Critique plans, prototypes and production processes considering purposeful and expressive intent.
Connections and Skills	• Critical thinking • Collaboration and Teamwork • Problem Solving

Accommodations & Modifications
Special Education Students, 504 students, English Language Learners, Students at-Risk Based on Students' Individual Needs

Time/General	Processing	Comprehension
• Allow extra time • Repeat and clarify directions • Provide breaks in between tasks • Have student verbalize directions • Provide timelines/due dates for reports and projects	• Provide extra response time • Have student verbalize steps • Repeat directions • Provide small group instruction • Include partner work	• Provide reading material on student's level • Have student underline important points • Assist student on how to use context clues to identify words/phrases • Ensure short manageable tasks
Tests/Quizzes/Grading	**Behavior/Attention**	**Organization**
• Provide extended time • Provide study guides • Limit number of responses	• Establish classroom rules • Write a contract with the student specifying expected behaviors • Provide preferential seating • Re-focus student as needed • Reinforce student for staying on task	• Monitor the student and provide reinforcement of directions • Verify the accurateness of homework assignments • Display a written agenda

ELL, Enrichment, Gifted & Talented Strategies

Accommodations Based on Students' Individual Needs

ELL Strategies

- Provide explicit, systematic instruction in vocabulary.
- Ensure that ELLs have ample opportunities to talk with both adults and peers and provide ongoing feedback and encouragement.
- Expose ELLs to rich language input.
- Scaffolding for ELLs language learning.

- Encourage continued L1 language development.
- Alphabet knowledge
- Phonological awareness
- Print awareness
- Design instruction that focuses on all of the foundational literacy skills.
- Recognize that many literacy skills can transfer across languages.
- English literacy development by helping ELLs make the connection between what they know in their first language and what they need to know in English.
- Graphic organizers
- Modified texts
- Modified assessments
- Written/audio instruction
- Shorter paragraph/essay length
- Homogeneously grouped by level

Accommodations Based on Students' Individual Needs:

Enrichment Strategies

- Evaluate vocabulary
- Elevate Text Complexity
- Incorporate inquiry based assignments and projects
- Extend curriculum
- Balance individual, small group and whole group instruction
- Provide tiered/multi-level activities
- Include purposeful learning centers
- Provide open-ended activities and projects
- Offer opportunities for heterogeneous grouping to work with age and social peers as well as homogeneous grouping to provide time to work with individual peers
- Provide pupils with experiences outside the ‘regular’ curriculum

- Alter the pace the student uses to cover regular curriculum in order to explore topics of interest in greater depth/breadth within their own grade level
- Require a higher quality of work than the norm for the given age group
- Promote higher level of thinking and making connections.
- Focus on process learning skills such as brainstorming, decision making and social skills
- Use supplementary materials in addition to the normal range of resources.
- Encourage peer to peer mentoring
- Integrate cross-curricular lessons
- Incorporate real-world problem solving activities
- Facilitate student-led questioning and discussions

Gifted & Talented Strategies

- More elaborate, complex, and in-depth study of major ideas, problems, and themes that integrate knowledge within and across systems of thought.
- Development and application of productive thinking skills to enable students to reconceptualize existing knowledge and/or generate new knowledge.
- Explore constantly changing knowledge and information and develop the attitude that knowledge is worth pursuing in an open world.
- Encourage exposure to, selection, and use of appropriate and specialized resources.
- Promote self-initiated and self-directed learning and growth.
- Provide for the development of self-understanding and the understanding of one's relationship to persons, societal institutions, nature, and culture.
- Flexible pacing
- Use of more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace. If they master a particular unit, they need to be provided with more advanced learning activities, not more of the same activity.
- Questions that require a higher level of response and/or open-ended questions that stimulate inquiry, active exploration, and discovery.
- Encourage students to think about subjects in more abstract and complex ways

- Activity selection based on student interests, that encourage self-directed learning
- Group interaction and simulations
- Guided self-management
- Encourage students to demonstrate what they have learned in a wide variety of forms that reflect both knowledge and the ability to manipulate ideas.
- Engage students in active problem-finding and problem-solving activities and research.
- Provide students opportunities for making connections within and across systems of knowledge by focusing on issues, themes, and ideas.