# West Windsor-Plainsboro Regional School District
# Woodworking Grade 7 Practical

# Unit 0: Technology Education

Content Area: Technology Education

Course & Grade Level: Technology Education - Grade 7

## Summary and Rationale

The West Windsor-Plainsboro Regional School District recognizes the importance of the study 21st Century Life and Careers standards. Additionally, it is also believed this learning should not be taught in isolation and cross curricular and career ready practices are embedded in every unit of study. Unit 0 is incorporated into each unit of study of this curricular document.

## Recommended Pacing:

ELA Companion Standards and Career Ready Practices will be integrated throughout all units of study.

## Interdisciplinary Connections

**Grades 6-8**
**Progress Indicators Reading Science and Technical Subjects**

**Key Ideas and Details**

RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.

RST.6-8.2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

**Craft and Structure**

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.6-8.5. Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

RST.6-8.6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

**Integration of Knowledge and Ideas**

RST.6-8.7. Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

RST.6-8.8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

RST.6-8.9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

**Range of Reading and Level of Text Complexity**

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.

## Career Ready Practices

CRP1. Act as a responsible and contributing citizen and employee.

CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively and with reason.

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP9. Model integrity, ethical leadership and effective management.

CRP10. Plan education and career paths aligned to personal goals.

CRP11. Use technology to enhance productivity.

CRP12. Work productively in teams while using cultural global competence.

| Competencies for 21st Century Learners | | | |
|---|---|---|---|
| X | Collaborative Team Member | X | Effective Communicator |
| X | Globally Aware, Active, & Responsible Student/Citizen | X | Information Literate Researcher |
| X | Innovative & Practical Problem Solver | X | Self-Directed Learner |

# Unit 1: Safety

**Content Area: Industrial Technology**

**Course & Grade Level: Woodworking I Elective, Grade 7**

## Summary and Rationale

The woodworking course is for all students. The program applies problem solving strategies and proposes rational solutions to human problems and human adaptation to the environment. The process brings human and material resources together to solve problems and extend human potential. The approach appeals to the diverse learning styles of middle school students who can develop and create their own ideas, make choices and apply previously learned knowledge, while studying and building things that evoke their natural curiosity, To accomplish this, students must understand what resources are available, how these resources are processed and what can be expected as results. The processes of technology require that the students solve problems, think critically and make decisions regarding purpose, design, construction, tools, materials and energy. Students can begin the process as used in industry to produce, develop and maintain systems, create new products and techniques and perform complex tasks.

The woodworking program at the Middle School believes that its primary purpose is to prepare students, who are users and creators of technology, for a productive and meaningful life, both now and beyond their schooling years. They must 'learn how to learn'. This involves the application of mathematical, scientific, social science and communication principles and skills to understand, select, process and evaluate the technology around them. Students must be taught to understand and evaluate the impacts, tradeoffs and consequences of their technological choices.

Cooperative learning and teamwork are emphasized to encourage social development and sensitivity to others. Students communicate their individual knowledge and creativity through graphics, the written and spoken work and by the construction of models. Products designed and constructed are the result of the students' effort and creativity, which enhances their self-esteem and encourages lifelong learning. Success is demonstrated through design solutions, effectiveness, accuracy, and excellence in production.

In this unit, students will learn about the importance of eye protection along with other types of personal protection while working in the shop. They will learn about procedures to follow in the event of a personal injury or injury of a fellow student. They will understand the importance of being safety minded at all times. Students will understand that a safe shop depends on everyone working safely. Students will learn that power machinery is inherently dangerous and the utmost care must be used when operating machinery. Students will understand that their safety depends on their being alert at all times. Students will learn that advanced woodworking techniques require additional safety measures.

## Recommended Pacing

3 Days

## State Standards

**8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:**

All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

| CPI # | Cumulative Progress Indicator (CPI) |
|---|---|
| **8.2.8.A.1** | Research a product that was designed for a specific demand and identify how the product has changed to meet new demands (i.e. telephone for communication - smart phone for mobility needs). |
| **8.2.8.A.2** | Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system. |
| **8.2.8.A.3** | Investigate a malfunction in any part of a system and identify its impacts. |
| **8.2.8.A.4** | Redesign an existing product that impacts the environment to lessen its impact(s) on the environment. |
| **8.2.8.A.5** | Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system. |
| **8.2.8.B.1** | Evaluate the history and impact of sustainability on the development of a designed product or system over time and present results to peers. |
| **8.2.8.B.2** | Identify the desired and undesired consequences from the use of a product or system. |
| **8.2.8.B.3** | Research and analyze the ethical issues of a product or system on the environment and report findings for review by peers and /or experts. |
| **8.2.8.B.4** | Research examples of how humans can devise technologies to reduce the negative consequences of other technologies and present your findings. |
| **8.2.8.B.5** | Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries and societies. |
| **8.2.8.B.6** | Compare and contrast the different types of intellectual property including copyrights, patents and trademarks. |
| **8.2.8.B.7** | Analyze the historical impact of waste and demonstrate how a product is upcycled, reused or remanufactured into a new product. |
| **8.2.8.C.1** | Explain how different teams/groups can contribute to the overall design of a product. |
| **8.2.8.C.2** | Explain the need for optimization in a design process. |
| **8.2.8.C.3** | Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer. |
| **8.2.8.C.4** | Identify the steps in the design process that would be used to solve a designated problem. |
| **8.2.8.C.5** | Explain the interdependence of a subsystem that operates as part of a system. |
| **8.2.8.C.5.a** | Create a technical sketch of a product with materials and measurements labeled. |
| **8.2.8.C.6** | Collaborate to examine a malfunctioning system and identify the step-by-step process used to troubleshoot, evaluate and test options to repair the product, presenting the better solution. |
| **8.2.8.C.7** | Collaborate with peers and experts in the field to research and develop a product using the design process, data analysis and trends, and maintain a design log with annotated sketches to record the developmental cycle. |
| **8.2.8.C.8** | Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers. |
| **8.2.8.D.1** | Design and create a product that addresses a real world problem using a design process under specific constraints. |

| | |
|---|---|
| **8.2.8.D.2** | Identify the design constraints and trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation, design portfolio or engineering notebook. |
| **8.2.8.D.3** | Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution. |
| **8.2.8.D.4** | Research and publish the steps for using and maintaining a product or system and incorporate diagrams or images throughout to enhance user comprehension. |
| **8.2.8.D.5** | Explain the impact of resource selection and the production process in the development of a common or technological product or system. |
| **8.2.8.D.6** | Identify and explain how the resources and processes used in the production of a current technological product can be modified to have a more positive impact on the environment. |

## Instructional Focus

**Unit Enduring Understandings**

- Safety depends on being safety conscience at all times
- Recognizing potentially hazardous situations is key to avoiding injury
- Knowing proper procedures can reduce the risk of injury
- Knowing ones limitations can greatly reduce your chance of injury
- Technology has played a key role in human development since the beginnings of time (e.g. spear, farming, wheel, writing, etc.).
- The ability to recognize a problem and apply critical thinking and problem-solving skills to solve the problem is a lifelong skill that develops over time.
- Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
- Collaboration and teamwork enable individuals or groups to achieve common goals with greater efficiency.
- Leadership abilities develop over time through participation in groups and/or teams that are engaged in challenging or competitive activities.
- The nature of the 21st-century workplace has shifted, demanding greater individual accountability, productivity, and collaboration.

**Unit Essential Questions**

- What is safety consciousness?
- Why do injuries occur?
- How is your safety related to the safety of others?
- What can you do to reduce your chances of an injury?
- How did technology change the way people lived? How does it affect our world today?
- Is there a “best way” to solve a problem?
- How do we know we have the proper information and knowledge to solve a problem?
- What makes a group more efficient?
- What makes a leader effective?
- How has the workplace changed in the 21$^{st}$ century? How has it remained the same?

**Objectives**

**Students will know:**

- Safe handling procedures for lifting and carrying lumber

- Safe handling procedures for hand and power tool operation
- Shop safety rules and regulations for working in the shop

**Students will be able to:**

- Answer the essential questions
- Demonstrate the ability to self-assess and seek out needed resources
- Actively and meaningfully participate in all classroom activities and discussions
- Develop a safety poster illustrating one of the safety rules discussed in class
- Evaluate the shop room and make recommendations for improving the overall safety of the room
- Develop a list of 10 general safety rules for working in the woodshop
- Demonstrate safe work habits
- Use the internet to chart the most common school accidents and present their findings to the class

## Evidence of Learning

**Assessment**

Common Assessment 1.1

**Competencies for 21st Century Learners**

| | | | |
|---|---|---|---|
| x | Collaborative Team Member | x | Effective Communicator |
| x | Globally Aware, Active, & Responsible Student/Citizen | x | Information Literate Researcher |
| x | Innovative & Practical Problem Solver | x | Self-Directed Learner |

## Resources

**Suggested Resources:**

# Unit 2: Lumber Characteristics

**Content Area: Industrial Technology**

**Course & Grade Level: Woodworking I Elective, Grade 7**

## Summary and Rationale

The woodworking course is for all students. The program applies problem solving strategies and proposes rational solutions to human problems and human adaptation to the environment. The process brings human and material resources together to solve problems and extend human potential. The approach appeals to the diverse learning styles of middle school students who can develop and create their own ideas, make choices and apply previously learned knowledge, while studying and building things that evoke their natural curiosity, To accomplish this, students must understand what resources are available, how these resources are processed and what can be expected as results. The processes of technology require that the students solve problems, think critically and make decisions regarding purpose, design, construction, tools, materials and energy. Students can begin the process as used in industry to produce, develop and maintain systems, create new products and techniques and perform complex tasks.

The woodworking program at the Middle School believes that its primary purpose is to prepare students, who are users and creators of technology, for a productive and meaningful life, both now and beyond their schooling years. They must 'learn how to learn'. This involves the application of mathematical, scientific, social science and communication principles and skills to understand, select, process and evaluate the technology around them. Students must be taught to understand and evaluate the impacts, tradeoffs and consequences of their technological choices.

Cooperative learning and teamwork are emphasized to encourage social development and sensitivity to others. Students communicate their individual knowledge and creativity through graphics, the written and spoken work and by the construction of models. Products designed and constructed are the result of the students' effort and creativity, which enhances their self-esteem and encourages lifelong learning. Success is demonstrated through design solutions, effectiveness, accuracy, and excellence in production.

In this unit, students will learn about wood as a raw material. They will learn about how the lumbering process and technology has changed over the past 100 years. Students will learn about the parts of a tree, how it grows and how it is harvested.

## Recommended Pacing

15 Days

## State Standards

**8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:**

All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

| CPI # | Cumulative Progress Indicator (CPI) |
|---|---|
| **8.2.8.A.1** | Research a product that was designed for a specific demand and identify how the product has changed to meet new demands (i.e. telephone for communication - smart phone for mobility needs). |

| | |
|---|---|
| **8.2.8.A.2** | Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system. |
| **8.2.8.A.3** | Investigate a malfunction in any part of a system and identify its impacts. |
| **8.2.8.A.4** | Redesign an existing product that impacts the environment to lessen its impact(s) on the environment. |
| **8.2.8.A.5** | Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system. |
| **8.2.8.B.1** | Evaluate the history and impact of sustainability on the development of a designed product or system over time and present results to peers. |
| **8.2.8.B.2** | Identify the desired and undesired consequences from the use of a product or system. |
| **8.2.8.B.3** | Research and analyze the ethical issues of a product or system on the environment and report findings for review by peers and /or experts. |
| **8.2.8.B.4** | Research examples of how humans can devise technologies to reduce the negative consequences of other technologies and present your findings. |
| **8.2.8.B.5** | Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries and societies. |
| **8.2.8.B.6** | Compare and contrast the different types of intellectual property including copyrights, patents and trademarks. |
| **8.2.8.B.7** | Analyze the historical impact of waste and demonstrate how a product is upcycled, reused or remanufactured into a new product. |
| **8.2.8.C.1** | Explain how different teams/groups can contribute to the overall design of a product. |
| **8.2.8.C.2** | Explain the need for optimization in a design process. |
| **8.2.8.C.3** | Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer. |
| **8.2.8.C.4** | Identify the steps in the design process that would be used to solve a designated problem. |
| **8.2.8.C.5** | Explain the interdependence of a subsystem that operates as part of a system. |
| **8.2.8.C.5.a** | Create a technical sketch of a product with materials and measurements labeled. |
| **8.2.8.C.6** | Collaborate to examine a malfunctioning system and identify the step-by-step process used to troubleshoot, evaluate and test options to repair the product, presenting the better solution. |
| **8.2.8.C.7** | Collaborate with peers and experts in the field to research and develop a product using the design process, data analysis and trends, and maintain a design log with annotated sketches to record the developmental cycle. |
| **8.2.8.C.8** | Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers. |
| **8.2.8.D.1** | Design and create a product that addresses a real world problem using a design process under specific constraints. |
| **8.2.8.D.2** | Identify the design constraints and trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation, design portfolio or engineering notebook. |

| | |
|---|---|
| **8.2.8.D.3** | Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution. |
| **8.2.8.D.4** | Research and publish the steps for using and maintaining a product or system and incorporate diagrams or images throughout to enhance user comprehension. |
| **8.2.8.D.5** | Explain the impact of resource selection and the production process in the development of a common or technological product or system. |
| **8.2.8.D.6** | Identify and explain how the resources and processes used in the production of a current technological product can be modified to have a more positive impact on the environment. |

## Instructional Focus

**Unit Enduring Understandings**

- The individual's choice of lumber will greatly affect the look and feel of the work
- Lumbers will have varying degrees of difficulties when machining, due to their individual characteristics
- The direction of the grain is equally important as the look and feel of a piece of wood
- The direction of the grain is a major factor in the woods strength
- There are many products produced from trees
- Tree growth is affected by many factors
- Forest management ensures a long lasting forest
- The forester works with a myriad of professions in order to maintain a forest
- Technology has played a key role in human development since the beginnings of time (e.g. spear, farming, wheel, writing, etc.).
- The ability to recognize a problem and apply critical thinking and problem-solving skills to solve the problem is a lifelong skill that develops over time.
- Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
- Collaboration and teamwork enable individuals or groups to achieve common goals with greater efficiency.
- Leadership abilities develop over time through participation in groups and/or teams that are engaged in challenging or competitive activities.
- The nature of the 21st-century workplace has shifted, demanding greater individual accountability, productivity, and collaboration.

**Unit Essential Questions**

- What makes wood a unique raw material?
- How have lumbering practices from the 1900's?
- What is meant by the terms hardwood and softwood?
- Why are softwoods commonly cut to standard sizes and hardwoods not?
- What is the advantage of having more than one cutting method for boards?
- Why is lumber sold by the board foot and not simply by length and width?
- How is lumber made?
- How is lumber dried and why?
- How does the wood grain affect the use of the piece of wood?
- How is a forest renewable?
- Is wood the only product we get from trees?
- How did technology change the way people lived? How does it affect our world today?
- Is there a "best way" to solve a problem?

- How do we know we have the proper information and knowledge to solve a problem?
- What makes a group more efficient?
- What makes a leader effective?
- How has the workplace changed in the 21st century? How has it remained the same?

**Objectives**

**Students will know:**

- The difference between a hardwood and softwood
- How to identify specific types of lumber
- How lumber is made
- How lumber is dried and why
- How lumber is dimensioned and the meaning of board foot, square foot, and linear foot
- The meaning of S2S and S4S
- How lumber is graded
- Key terms (e.g. old growth, lumbering, coniferous, deciduous)
- How forests are harvested
- What the job of a forester is
- The main parts of a tree

**Students will be able to:**

- Answer the essential questions
- Demonstrate the ability to self-assess and seek out needed resources
- Use the many environmental sites on the internet to create a list of endangered trees and explain why they are disappearing as well as the impact this has on the environment
- Identify specific types of hardwood
- Estimate the cost of lumber using board feet in their calculations
- Draw on paper the difference in the look of a plain-sawed log and a quarter-sawn log
- Comprise a partial list of items that they use throughout their day, and be able to tell which items come from trees
- Given a box of wood blocks, students will be able to separate the blocks into hardwoods and softwoods and using the internet determine what type of wood the blocks are.

## Evidence of Learning

**Assessment**

Common Assessment 2.1

**Competencies for 21st Century Learners**

| | | | |
|---|---|---|---|
| x | Collaborative Team Member | x | Effective Communicator |
| x | Globally Aware, Active, & Responsible Student/Citizen | x | Information Literate Researcher |
| x | Innovative & Practical Problem Solver | x | Self-Directed Learner |

## Resources

**Suggested Resources:**

# Unit 3: Layout, Design & Planning

**Content Area: Industrial Technology**

**Course & Grade Level: Woodworking I Elective, Grade 7**

## Summary and Rationale

The woodworking course is for all students. The program applies problem solving strategies and proposes rational solutions to human problems and human adaptation to the environment. The process brings human and material resources together to solve problems and extend human potential. The approach appeals to the diverse learning styles of middle school students who can develop and create their own ideas, make choices and apply previously learned knowledge, while studying and building things that evoke their natural curiosity, To accomplish this, students must understand what resources are available, how these resources are processed and what can be expected as results. The processes of technology require that the students solve problems, think critically and make decisions regarding purpose, design, construction, tools, materials and energy. Students can begin the process as used in industry to produce, develop and maintain systems, create new products and techniques and perform complex tasks.

The woodworking program at the Middle School believes that its primary purpose is to prepare students, who are users and creators of technology, for a productive and meaningful life, both now and beyond their schooling years. They must 'learn how to learn'. This involves the application of mathematical, scientific, social science and communication principles and skills to understand, select, process and evaluate the technology around them. Students must be taught to understand and evaluate the impacts, tradeoffs and consequences of their technological choices.

Cooperative learning and teamwork are emphasized to encourage social development and sensitivity to others. Students communicate their individual knowledge and creativity through graphics, the written and spoken work and by the construction of models. Products designed and constructed are the result of the students' effort and creativity, which enhances their self-esteem and encourages lifelong learning. Success is demonstrated through design solutions, effectiveness, accuracy, and excellence in production.

In this unit, students will learn about the importance of well-drawn plans and the need for accurate measurement. They will learn to read a plan and understand the various symbols and lines used. They will learn how to create a bill of materials, estimate board feet, make accurate measurements, draw up a plan, adapt existing designs to fit their specific needs, and transfer the information to a piece of wood. They will understand that without proper planning the inventions we live with daily would not exist. They will learn how to draw clear accurate lines to serve as guides for cutting and shaping operations. They will learn that how parts are placed on the material often dictates how it can be cut out. They will understand the importance of giving a little extra thought to the layout process to prevent problems. Students will learn that a layout that is neat, well thought out, and orderly will conserve valuable materials, benefit the environment, reduce costs and time in the long run, and result in a quality end product.

## Recommended Pacing

15 Days

## State Standards

**8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:**

| All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment. | |
|---|---|
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| **8.2.8.A.1** | Research a product that was designed for a specific demand and identify how the product has changed to meet new demands (i.e. telephone for communication - smart phone for mobility needs). |
| **8.2.8.A.2** | Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system. |
| **8.2.8.A.3** | Investigate a malfunction in any part of a system and identify its impacts. |
| **8.2.8.A.4** | Redesign an existing product that impacts the environment to lessen its impact(s) on the environment. |
| **8.2.8.A.5** | Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system. |
| **8.2.8.B.1** | Evaluate the history and impact of sustainability on the development of a designed product or system over time and present results to peers. |
| **8.2.8.B.2** | Identify the desired and undesired consequences from the use of a product or system. |
| **8.2.8.B.3** | Research and analyze the ethical issues of a product or system on the environment and report findings for review by peers and /or experts. |
| **8.2.8.B.4** | Research examples of how humans can devise technologies to reduce the negative consequences of other technologies and present your findings. |
| **8.2.8.B.5** | Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries and societies. |
| **8.2.8.B.6** | Compare and contrast the different types of intellectual property including copyrights, patents and trademarks. |
| **8.2.8.B.7** | Analyze the historical impact of waste and demonstrate how a product is upcycled, reused or remanufactured into a new product. |
| **8.2.8.C.1** | Explain how different teams/groups can contribute to the overall design of a product. |
| **8.2.8.C.2** | Explain the need for optimization in a design process. |
| **8.2.8.C.3** | Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer. |
| **8.2.8.C.4** | Identify the steps in the design process that would be used to solve a designated problem. |
| **8.2.8.C.5** | Explain the interdependence of a subsystem that operates as part of a system. |
| **8.2.8.C.5.a** | Create a technical sketch of a product with materials and measurements labeled. |
| **8.2.8.C.6** | Collaborate to examine a malfunctioning system and identify the step-by-step process used to troubleshoot, evaluate and test options to repair the product, presenting the better solution. |
| **8.2.8.C.7** | Collaborate with peers and experts in the field to research and develop a product using the design process, data analysis and trends, and maintain a design log with annotated sketches to record the developmental cycle. |
| **8.2.8.C.8** | Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers. |

| | |
|---|---|
| **8.2.8.D.1** | Design and create a product that addresses a real world problem using a design process under specific constraints. |
| **8.2.8.D.2** | Identify the design constraints and trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation, design portfolio or engineering notebook. |
| **8.2.8.D.3** | Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution. |
| **8.2.8.D.4** | Research and publish the steps for using and maintaining a product or system and incorporate diagrams or images throughout to enhance user comprehension. |
| **8.2.8.D.5** | Explain the impact of resource selection and the production process in the development of a common or technological product or system. |
| **8.2.8.D.6** | Identify and explain how the resources and processes used in the production of a current technological product can be modified to have a more positive impact on the environment. |

## Instructional Focus

**Unit Enduring Understandings**

- No amount of skill replaces a well-executed plan.
- All modem marvels began with a plan.
- Symbols used in working drawings are standardized in order to improve understanding and communication.
- Accuracy is essential when developing a working drawing.
- Proper layout will save time, money and materials.
- The layout process is an important step in the planning portion of the project.
- Getting the maximum yield out of a piece of lumber is an economical and ecologically sound practice.
- Wood is affected by atmospheric moisture.
- Technology has played a key role in human development since the beginnings of time (e.g. spear, farming, wheel, writing, etc.).
- The ability to recognize a problem and apply critical thinking and problem-solving skills to solve the problem is a lifelong skill that develops over time.
- Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
- Collaboration and teamwork enable individuals or groups to achieve common goals with greater efficiency.
- Leadership abilities develop over time through participation in groups and/or teams that are engaged in challenging or competitive activities.
- The nature of the 21st-century workplace has shifted, demanding greater individual accountability, productivity, and collaboration.

**Unit Essential Questions**

- What is a working drawing and what do we do with it?
- What constitutes a plan?
- What is the difference between a plan of procedure and a bill of material?
- If you are building only one item, do you still need to develop a plan?
- How is a working drawing a language in and of itself?
- How does the layout of parts on the wood determine how the parts can be cut out?

- What is meant by the term “square”?
- What part does the grain of the wood play in the layout process?
- What is meant by “multiple cuts” or “repetitive cuts”?
- What is meant by hydroscopic?
- How did technology change the way people lived? How does it affect our world today?
- Is there a “best way” to solve a problem?
- How do we know we have the proper information and knowledge to solve a problem?
- What makes a group more efficient?
- What makes a leader effective?
- How has the workplace changed in the 21st century? How has it remained the same?

**Objectives**

**Students will know:**

- Key terms and vocabulary
- How to develop a plan and a working drawing
- How to construct a template
- How to take measurements with common measuring tools
- How to use layout tools to transfer the plans to the wood
- How to properly use a framing square to square-up a board
- How to layout project parts to produce the greatest yield from the material

**Students will be able to:**

- Answer the essential questions
- Demonstrate the ability to self-assess and seek out needed resources
- Create a working drawing for a given project using a basic CADD program
- Find a plan for a given project and adapt it for their specific use
- Using a spreadsheet on the computer, create a bill of materials along with an estimated completed cost for a project
- Develop a plan of procedure for a project
- Layout the parts of a project using common layout tools
- Layout their project parts in a safe and efficient manner
- Make clear accurate measurements and make accurate lines to serve as guidelines for sawing stock

## Evidence of Learning

**Assessment**

Common Assessment 3.1

**Competencies for 21st Century Learners**

| | | | |
|---|---|---|---|
| x | Collaborative Team Member | x | Effective Communicator |
| x | Globally Aware, Active, & Responsible Student/Citizen | x | Information Literate Researcher |
| x | Innovative & Practical Problem Solver | x | Self-Directed Learner |

## Resources

**Suggested Resources:**

# Unit 4: Cutting and Shaping

**Content Area: Industrial Technology**

**Course & Grade Level: Woodworking I Elective, Grade 7**

## Summary and Rationale

The woodworking course is for all students. The program applies problem solving strategies and proposes rational solutions to human problems and human adaptation to the environment. The process brings human and material resources together to solve problems and extend human potential. The approach appeals to the diverse learning styles of middle school students who can develop and create their own ideas, make choices and apply previously learned knowledge, while studying and building things that evoke their natural curiosity, To accomplish this, students must understand what resources are available, how these resources are processed and what can be expected as results. The processes of technology require that the students solve problems, think critically and make decisions regarding purpose, design, construction, tools, materials and energy. Students can begin the process as used in industry to produce, develop and maintain systems, create new products and techniques and perform complex tasks.

The woodworking program at the Middle School believes that its primary purpose is to prepare students, who are users and creators of technology, for a productive and meaningful life, both now and beyond their schooling years. They must 'learn how to learn'. This involves the application of mathematical, scientific, social science and communication principles and skills to understand, select, process and evaluate the technology around them. Students must be taught to understand and evaluate the impacts, tradeoffs and consequences of their technological choices.

Cooperative learning and teamwork are emphasized to encourage social development and sensitivity to others. Students communicate their individual knowledge and creativity through graphics, the written and spoken work and by the construction of models. Products designed and constructed are the result of the students' effort and creativity, which enhances their self-esteem and encourages lifelong learning. Success is demonstrated through design solutions, effectiveness, accuracy, and excellence in production.

In this unit, students will learn about the many types of cutting and shaping tools available to today's woodworker. Students will learn about the various types of saws and shaping tools and be able to safely use them for their intended purpose. The students will learn advanced operations on the table saw, radial arm saw, band saw, scroll saw, and power miter box. They will learn about the thickness planer and the jointer. The students will learn about and understand the specific safety concerns, and precautions related to the machines they will be working with. They will learn about the uniqueness of each machine and have an opportunity to experiment with each. Students will learn about what features and characteristics to look for when purchasing a saw.

## Recommended Pacing

15 Days

## State Standards

**8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:**

All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

| CPI # | Cumulative Progress Indicator (CPI) |
|---|---|
| **8.2.8.A.1** | Research a product that was designed for a specific demand and identify how the product has changed to meet new demands (i.e. telephone for communication - smart phone for mobility needs). |
| **8.2.8.A.2** | Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system. |
| **8.2.8.A.3** | Investigate a malfunction in any part of a system and identify its impacts. |
| **8.2.8.A.4** | Redesign an existing product that impacts the environment to lessen its impact(s) on the environment. |
| **8.2.8.A.5** | Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system. |
| **8.2.8.B.1** | Evaluate the history and impact of sustainability on the development of a designed product or system over time and present results to peers. |
| **8.2.8.B.2** | Identify the desired and undesired consequences from the use of a product or system. |
| **8.2.8.B.3** | Research and analyze the ethical issues of a product or system on the environment and report findings for review by peers and /or experts. |
| **8.2.8.B.4** | Research examples of how humans can devise technologies to reduce the negative consequences of other technologies and present your findings. |
| **8.2.8.B.5** | Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries and societies. |
| **8.2.8.B.6** | Compare and contrast the different types of intellectual property including copyrights, patents and trademarks. |
| **8.2.8.B.7** | Analyze the historical impact of waste and demonstrate how a product is upcycled, reused or remanufactured into a new product. |
| **8.2.8.C.1** | Explain how different teams/groups can contribute to the overall design of a product. |
| **8.2.8.C.2** | Explain the need for optimization in a design process. |
| **8.2.8.C.3** | Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer. |
| **8.2.8.C.4** | Identify the steps in the design process that would be used to solve a designated problem. |
| **8.2.8.C.5** | Explain the interdependence of a subsystem that operates as part of a system. |
| **8.2.8.C.5.a** | Create a technical sketch of a product with materials and measurements labeled. |
| **8.2.8.C.6** | Collaborate to examine a malfunctioning system and identify the step-by-step process used to troubleshoot, evaluate and test options to repair the product, presenting the better solution. |
| **8.2.8.C.7** | Collaborate with peers and experts in the field to research and develop a product using the design process, data analysis and trends, and maintain a design log with annotated sketches to record the developmental cycle. |
| **8.2.8.C.8** | Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers. |
| **8.2.8.D.1** | Design and create a product that addresses a real world problem using a design process under specific constraints. |

| | |
|---|---|
| **8.2.8.D.2** | Identify the design constraints and trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation, design portfolio or engineering notebook. |
| **8.2.8.D.3** | Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution. |
| **8.2.8.D.4** | Research and publish the steps for using and maintaining a product or system and incorporate diagrams or images throughout to enhance user comprehension. |
| **8.2.8.D.5** | Explain the impact of resource selection and the production process in the development of a common or technological product or system. |
| **8.2.8.D.6** | Identify and explain how the resources and processes used in the production of a current technological product can be modified to have a more positive impact on the environment. |

## Instructional Focus

**Unit Enduring Understandings**

- All power machines are inherently dangerous.
- Concentration and caution must be exercised when operating all machinery.
- Most accidents are not caused by the machine, but by the operator.
- All tools as well as operators have their limitations.
- When purchasing tools, it is important to invest in quality.
- The grain of the wood often dictates what type of tool may be used to cut it.
- All saw blades are either a rip blade or a crosscut blade and both types have a specific purpose.
- The set of a saw blade is essential to limit friction buildup.
- Technology has played a key role in human development since the beginnings of time (e.g. spear, farming, wheel, writing, etc.).
- The ability to recognize a problem and apply critical thinking and problem-solving skills to solve the problem is a lifelong skill that develops over time.
- Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
- Collaboration and teamwork enable individuals or groups to achieve common goals with greater efficiency.
- Leadership abilities develop over time through participation in groups and/or teams that are engaged in challenging or competitive activities.
- The nature of the 21st-century workplace has shifted, demanding greater individual accountability, productivity, and collaboration.

**Unit Essential Questions**

- Why are accurate cutting and shaping skills important to the quality of a wood project?
- What is safety consciousness?
- What are the two main types of saw blades and how can we tell them apart?
- What part does the wood grain play in choosing a cutting or shaping tool?
- What is done to prepare wood for cutting on a saw?
- What is a kick-back and how can it be avoided?
- What part does the table saw play in the furniture industry?
- How is a straight edge achieved on a board?
- What process is used to make the two faces of a board parallel?

- How can you change the thickness of a board?
- What part does the operator play in working safely on a machine?
- How has cutting lumber changed over the years?
- How did technology change the way people lived? How does it affect our world today?
- Is there a "best way" to solve a problem?
- How do we know we have the proper information and knowledge to solve a problem?
- What makes a group more efficient?
- What makes a leader effective?
- How has the workplace changed in the 21st century? How has it remained the same?

**Objectives**

**Students will know:**

- Key terms and tool names
- Types of power saws and their uses
- The difference between a ripping blade and a crosscut blade
- How to use cutting an shaping tools safely
- How to choose the correct type of saw
- Safety practices for using any tool that needs to be plugged in
- The safety rules pertaining to the safe operation of power saws
- How to check the stock before cutting it on a power saw
- How to change the thickness of a board and how to square up all four sides
- How to operate the safety guards
- How to safely start, adjust and stop a power machine

**Students will be able to:**

- Answer the essential questions
- Demonstrate the ability to self-assess and seek out needed resources
- Demonstrate the proper use of both the table saw and the radial arm saw
- Identify several blades, including the crosscut blade, ripping blade, plywood blade and dado blade
- Demonstrate the use of the scroll saw
- Install a blade on the table saw
- Identify the major parts of a saw and call them by their correct name
- Demonstrate the correct procedure for starting, adjusting and stopping a saw
- Demonstrate an understanding of the importance of being safety conscience at all times
- Explain the dangers of wearing jewelry or loose clothing while working near a machine
- List 10 safety rules concerning cutting tools
- Use the internet to research how the technology has improved for cutting material over the past century
- Show how new cutting technologies have affected the amount of waste and why this is a good thing for the environment

## Evidence of Learning

**Assessment**

Common Assessment 4.1

**Competencies for 21st Century Learners**

| | | | |
|---|---|---|---|
| x | Collaborative Team Member | x | Effective Communicator |
| x | Globally Aware, Active, & Responsible Student/Citizen | x | Information Literate Researcher |
| x | Innovative & Practical Problem Solver | x | Self-Directed Learner |

| Resources |
| --- |
| **Suggested Resources:** |

# Unit 5: Drilling and Boring Tools

**Content Area: Industrial Technology**

**Course & Grade Level: Woodworking I Elective, Grade 7**

## Summary and Rationale

The woodworking course is for all students. The program applies problem solving strategies and proposes rational solutions to human problems and human adaptation to the environment. The process brings human and material resources together to solve problems and extend human potential. The approach appeals to the diverse learning styles of middle school students who can develop and create their own ideas, make choices and apply previously learned knowledge, while studying and building things that evoke their natural curiosity, To accomplish this, students must understand what resources are available, how these resources are processed and what can be expected as results. The processes of technology require that the students solve problems, think critically and make decisions regarding purpose, design, construction, tools, materials and energy. Students can begin the process as used in industry to produce, develop and maintain systems, create new products and techniques and perform complex tasks.

The woodworking program at the Middle School believes that its primary purpose is to prepare students, who are users and creators of technology, for a productive and meaningful life, both now and beyond their schooling years. They must 'learn how to learn'. This involves the application of mathematical, scientific, social science and communication principles and skills to understand, select, process and evaluate the technology around them. Students must be taught to understand and evaluate the impacts, tradeoffs and consequences of their technological choices.

Cooperative learning and teamwork are emphasized to encourage social development and sensitivity to others. Students communicate their individual knowledge and creativity through graphics, the written and spoken work and by the construction of models. Products designed and constructed are the result of the students' effort and creativity, which enhances their self-esteem and encourages lifelong learning. Success is demonstrated through design solutions, effectiveness, accuracy, and excellence in production.

In this unit, students will learn about the various methods of drilling holes in wood. They will learn how to use the drill press, as well as the electric hand drill, and cordless battery drills. Students will learn about many types of drill bits and accessories available on the market today and be able to make educated decisions when purchasing using or purchasing them. They will not only be able to choose the correct type of drill bit but also demonstrate its use on their project. Students will learn the various purposes and safe operation of the drill press. They will learn about the personal safety required when using the drill press as well as any other stationary machine. The students will learn how to drill holes in a variety of materials accurately. They will understand that there is a huge variety in the quality of drill presses currently on the market.

## Recommended Pacing

15 Days

## State Standards

**8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:**

| All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment. | |
|---|---|
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| **8.2.8.A.1** | Research a product that was designed for a specific demand and identify how the product has changed to meet new demands (i.e. telephone for communication - smart phone for mobility needs). |
| **8.2.8.A.2** | Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system. |
| **8.2.8.A.3** | Investigate a malfunction in any part of a system and identify its impacts. |
| **8.2.8.A.4** | Redesign an existing product that impacts the environment to lessen its impact(s) on the environment. |
| **8.2.8.A.5** | Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system. |
| **8.2.8.B.1** | Evaluate the history and impact of sustainability on the development of a designed product or system over time and present results to peers. |
| **8.2.8.B.2** | Identify the desired and undesired consequences from the use of a product or system. |
| **8.2.8.B.3** | Research and analyze the ethical issues of a product or system on the environment and report findings for review by peers and /or experts. |
| **8.2.8.B.4** | Research examples of how humans can devise technologies to reduce the negative consequences of other technologies and present your findings. |
| **8.2.8.B.5** | Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries and societies. |
| **8.2.8.B.6** | Compare and contrast the different types of intellectual property including copyrights, patents and trademarks. |
| **8.2.8.B.7** | Analyze the historical impact of waste and demonstrate how a product is upcycled, reused or remanufactured into a new product. |
| **8.2.8.C.1** | Explain how different teams/groups can contribute to the overall design of a product. |
| **8.2.8.C.2** | Explain the need for optimization in a design process. |
| **8.2.8.C.3** | Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer. |
| **8.2.8.C.4** | Identify the steps in the design process that would be used to solve a designated problem. |
| **8.2.8.C.5** | Explain the interdependence of a subsystem that operates as part of a system. |
| **8.2.8.C.5.a** | Create a technical sketch of a product with materials and measurements labeled. |
| **8.2.8.C.6** | Collaborate to examine a malfunctioning system and identify the step-by-step process used to troubleshoot, evaluate and test options to repair the product, presenting the better solution. |
| **8.2.8.C.7** | Collaborate with peers and experts in the field to research and develop a product using the design process, data analysis and trends, and maintain a design log with annotated sketches to record the developmental cycle. |
| **8.2.8.C.8** | Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers. |

| | |
|---|---|
| **8.2.8.D.1** | Design and create a product that addresses a real world problem using a design process under specific constraints. |
| **8.2.8.D.2** | Identify the design constraints and trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation, design portfolio or engineering notebook. |
| **8.2.8.D.3** | Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution. |
| **8.2.8.D.4** | Research and publish the steps for using and maintaining a product or system and incorporate diagrams or images throughout to enhance user comprehension. |
| **8.2.8.D.5** | Explain the impact of resource selection and the production process in the development of a common or technological product or system. |
| **8.2.8.D.6** | Identify and explain how the resources and processes used in the production of a current technological product can be modified to have a more positive impact on the environment. |

## Instructional Focus

**Unit Enduring Understandings**

- Any tool is inherently dangerous and safety must be number one on the mind.
- Extra care must be exercised when using electric tools.
- Tools that are properly maintained and not abused will last a lifetime.
- When purchasing tools, invest in quality.
- Care must be exercised not to exceed the design limits of the drill or the drill bit.
- The density of the wood often dictates the speed and the type of bit that may be used.
- Material must be held securely in place before attempting to drill into it.
- The importance of following all safety rules and manufacturer's directions at all times.
- Concentration is key to operating the drill press.
- The drill press can be used for many types of operations.
- Simple attachments can extend the versatility of the drill press.
- All machines as well as operators have their limitations.
- Technology has played a key role in human development since the beginnings of time (e.g. spear, farming, wheel, writing, etc.).
- The ability to recognize a problem and apply critical thinking and problem-solving skills to solve the problem is a lifelong skill that develops over time.
- Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
- Collaboration and teamwork enable individuals or groups to achieve common goals with greater efficiency.
- Leadership abilities develop over time through participation in groups and/or teams that are engaged in challenging or competitive activities.
- The nature of the 21st-century workplace has shifted, demanding greater individual accountability, productivity, and collaboration.

**Unit Essential Questions**

- How are holes put in lumber?
- What tools are available to drill holes in wood?

- What part does the operator play in working safely with drills?
- How do you select the correct drilling tool for an intended use?
- How do you maintain and care for drilling tools?
- What are the most common safety concerns when using drills?
- What is a drill press and how is it used?
- What are the benefits of using the drill press as opposed to an electric hand drill?
- What safety rules are specific to the use of the drill press?
- What part does the operator play in working safely on the drill press?
- What is the drill press used for other than drilling holes?
- When purchasing a drill press for home, how do you know what to buy?
- How did technology change the way people lived? How does it affect our world today?
- Is there a "best way" to solve a problem?
- How do we know we have the proper information and knowledge to solve a problem?
- What makes a group more efficient?
- What makes a leader effective?
- How has the workplace changed in the 21st century? How has it remained the same?

**Objectives**

**Students will know:**

- Key terms and tool names
- The most common types of drill bits currently available on the market
- How to recognize drilling and boring tools including the Spade bit, Twist bit, forstner bits and expansion bits
- How to select the correct drilling or boring tool for the intended use
- How to use drilling and boring tools safely
- How to care for and maintain boring and drilling tools
- The safety rules pertaining to the operation of the drill press
- How the drill press is used in industry
- What types of drill bit can be used in the drill press
- What features and quality to look for when purchasing a drill press for personal use

**Students will be able to:**

- Answer the essential questions
- Demonstrate the ability to self-assess and seek out needed resources
- Demonstrate the proper use of both the table saw and the radial arm saw
- Choose the correct drill bit for a given drill
- Drill all of the appropriate holes in their project parts using an electric drill
- Demonstrate the proper procedure for plugging in and unplugging an electric tool as well as how to store it safely
- Demonstrate the insertion and removal of drill bits from a drill chuck
- Correctly name the drill and bit types used in class
- List 10 safety rules concerning drilling and boring tools
- Identify the major parts of the drill press and name it's parts
- Demonstrate the correct procedure for setting up and drilling on the drill press
- Develop using the internet, a list of safety regulations governing a school workshop
- Relate the safety rules for the drill press to other machines in the shop
- Demonstrate the procedure for attaching a minimum of 2 attachments to the drill press and demonstrate their use

## Evidence of Learning

| | | | |
|---|---|---|---|
| **Assessment** | | | |
| Common Assessment 5.1 | | | |
| **Competencies for 21st Century Learners** | | | |
| x | Collaborative Team Member | x | Effective Communicator |
| x | Globally Aware, Active, & Responsible Student/Citizen | x | Information Literate Researcher |
| x | Innovative & Practical Problem Solver | x | Self-Directed Learner |
| **Resources** | | | |
| **Suggested Resources:** | | | |

# Unit 6: Sanding, Surface Preparation and Finishing

**Content Area: Industrial Technology**

**Course & Grade Level: Woodworking I Elective, Grade 7**

## Summary and Rationale

The woodworking course is for all students. The program applies problem solving strategies and proposes rational solutions to human problems and human adaptation to the environment. The process brings human and material resources together to solve problems and extend human potential. The approach appeals to the diverse learning styles of middle school students who can develop and create their own ideas, make choices and apply previously learned knowledge, while studying and building things that evoke their natural curiosity, To accomplish this, students must understand what resources are available, how these resources are processed and what can be expected as results. The processes of technology require that the students solve problems, think critically and make decisions regarding purpose, design, construction, tools, materials and energy. Students can begin the process as used in industry to produce, develop and maintain systems, create new products and techniques and perform complex tasks.

The woodworking program at the Middle School believes that its primary purpose is to prepare students, who are users and creators of technology, for a productive and meaningful life, both now and beyond their schooling years. They must 'learn how to learn'. This involves the application of mathematical, scientific, social science and communication principles and skills to understand, select, process and evaluate the technology around them. Students must be taught to understand and evaluate the impacts, tradeoffs and consequences of their technological choices.

Cooperative learning and teamwork are emphasized to encourage social development and sensitivity to others. Students communicate their individual knowledge and creativity through graphics, the written and spoken work and by the construction of models. Products designed and constructed are the result of the students' effort and creativity, which enhances their self-esteem and encourages lifelong learning. Success is demonstrated through design solutions, effectiveness, accuracy, and excellence in production.

In this unit, students will learn what type of electric hand sanders and stationary type sanders are available, and the procedures to operate them safely. They will learn about the evolution of the electric sander and the impact the new generation of sanding machines have on woodworking today. Students will learn about the health and safety risk involved with sanding wood. Students will learn about the proper storage and maintenance of sanders as well as how to make educated choices when choosing and purchasing sanders. They will also learn to select the correct abrasive and grit required for a given sanding purpose. Students will learn about the finishing process. They will learn how to apply a stain and polyurethane to a piece of properly sanded bare wood. Students will learn about the advantages and disadvantages of the various types of finishes as well as the advantages and disadvantages of a sprayed on finish. Students will be made aware of the safety concerns with toxic finishes. They will learn about environmentally and physically safer finishing materials. Students will learn about other types of finishes as well and have the opportunity to experiment with them. Students will learn how to safely apply finishes at home as well as how to dispose of finishes properly. Students will learn about the many careers in the furniture finishing industry and learn how to recognize a well-done finish.

## Recommended Pacing

15 Days

| State Standards | |
|---|---|
| **8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:**<br>All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment. | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| **8.2.8.A.1** | Research a product that was designed for a specific demand and identify how the product has changed to meet new demands (i.e. telephone for communication - smart phone for mobility needs). |
| **8.2.8.A.2** | Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system. |
| **8.2.8.A.3** | Investigate a malfunction in any part of a system and identify its impacts. |
| **8.2.8.A.4** | Redesign an existing product that impacts the environment to lessen its impact(s) on the environment. |
| **8.2.8.A.5** | Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system. |
| **8.2.8.B.1** | Evaluate the history and impact of sustainability on the development of a designed product or system over time and present results to peers. |
| **8.2.8.B.2** | Identify the desired and undesired consequences from the use of a product or system. |
| **8.2.8.B.3** | Research and analyze the ethical issues of a product or system on the environment and report findings for review by peers and /or experts. |
| **8.2.8.B.4** | Research examples of how humans can devise technologies to reduce the negative consequences of other technologies and present your findings. |
| **8.2.8.B.5** | Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries and societies. |
| **8.2.8.B.6** | Compare and contrast the different types of intellectual property including copyrights, patents and trademarks. |
| **8.2.8.B.7** | Analyze the historical impact of waste and demonstrate how a product is upcycled, reused or remanufactured into a new product. |
| **8.2.8.C.1** | Explain how different teams/groups can contribute to the overall design of a product. |
| **8.2.8.C.2** | Explain the need for optimization in a design process. |
| **8.2.8.C.3** | Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer. |
| **8.2.8.C.4** | Identify the steps in the design process that would be used to solve a designated problem. |
| **8.2.8.C.5** | Explain the interdependence of a subsystem that operates as part of a system. |
| **8.2.8.C.5.a** | Create a technical sketch of a product with materials and measurements labeled. |
| **8.2.8.C.6** | Collaborate to examine a malfunctioning system and identify the step-by-step process used to troubleshoot, evaluate and test options to repair the product, presenting the better solution. |

| | |
|---|---|
| **8.2.8.C.7** | Collaborate with peers and experts in the field to research and develop a product using the design process, data analysis and trends, and maintain a design log with annotated sketches to record the developmental cycle. |
| **8.2.8.C.8** | Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers. |
| **8.2.8.D.1** | Design and create a product that addresses a real world problem using a design process under specific constraints. |
| **8.2.8.D.2** | Identify the design constraints and trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation, design portfolio or engineering notebook. |
| **8.2.8.D.3** | Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution. |
| **8.2.8.D.4** | Research and publish the steps for using and maintaining a product or system and incorporate diagrams or images throughout to enhance user comprehension. |
| **8.2.8.D.5** | Explain the impact of resource selection and the production process in the development of a common or technological product or system. |
| **8.2.8.D.6** | Identify and explain how the resources and processes used in the production of a current technological product can be modified to have a more positive impact on the environment. |

## Instructional Focus

**Unit Enduring Understandings**

- Any tool is inherently dangerous.
- Electric sanders are designed for fairly specific purposes.
- Improper maintenance will drastically reduce the life of a sander.
- Sanding machines have changed the way in which furniture is produced today.
- Worn abrasive paper will do more harm to a project than good.
- Extreme care must be taken when using a “seemingly safe” electric sander.
- Many finishing materials are flammable, combustible and toxic.
- Personal protection must be used when in contact with finishing materials.
- Improper disposal of finishing materials can have very serious results, including fire, explosion and poisoning.
- Finishing materials must be only used in well-ventilated areas.
- All finishing materials have very specific manufacturer directions.
- Stain will change the appearance of a piece of wood, usually making it darker.
- A beautiful finish can only be achieved if the surface it is place don is smooth and dust free.
- Suspended particles of finishing materials in the air when spraying a finish create numerous safety concerns.
- Technology has played a key role in human development since the beginnings of time (e.g. spear, farming, wheel, writing, etc.).
- The ability to recognize a problem and apply critical thinking and problem-solving skills to solve the problem is a lifelong skill that develops over time.
- Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
- Collaboration and teamwork enable individuals or groups to achieve common goals with greater efficiency.

- Leadership abilities develop over time through participation in groups and/or teams that are engaged in challenging or competitive activities.
- The nature of the 21st-century workplace has shifted, demanding greater individual accountability, productivity, and collaboration.

**Unit Essential Questions**

- Why is finishing important to the quality and function of a wood project?
- What safety concerns are specific to wood sanding and finishing?
- What is a belt sander and how do you use it?
- What is meant by the term "finishing"?
- How is a surface prepared for finishing?
- What is the difference between a belt sander and a drum sander?
- How do you know which grit and type of abrasives to use for the different sanders?
- What affect will worn abrasives have on your wood?
- How do you know if it's time to change the abrasive on a machine?
- What safety concerns are specific to sanding machines?
- Are there any health concerns to be concerned about when sanding wood?
- How have sanders evolved over the years and how has this evolution affected to woodworking industry?
- How did technology change the way people lived? How does it affect our world today?
- Is there a "best way" to solve a problem?
- How do we know we have the proper information and knowledge to solve a problem?
- What makes a group more efficient?
- What makes a leader effective?
- How has the workplace changed in the 21st century? How has it remained the same?

**Objectives**

**Students will know:**

- The safe operating procedures for sanding surfaces, edges and ends of lumber on the stationary belt sander, the drum sander and the portable hand held electric sanders
- How to select the appropriate grit for a specific type of sanding operation
- The basic care and maintenance of the stationary belt sander, the drum sander and the portable finishing sander
- How to recognize the signs of a worn abrasive
- The proper safety gear and safety precautions to use while operating an electric sander

**Students will be able to:**

- Answer the essential questions
- Demonstrate the ability to self-assess and seek out needed resources
- Identify the various sanders in the shop
- Know the proper safety precautions to take before using an electric sander
- Demonstrate the correct procedure for setting up and using both the vertical belt sander and the horizontal drum sander
- Take the safety rules learned for other machines and relate them to the electric sanders
- Demonstrate proficiency in setting up and operating the stationary sanders
- Safely apply a stain
- Use the internet to research the types of finishes available in today's market and make a list using a spreadsheet of the most environmentally friendly finishes readily available today
- Clean up and dispose of staining products
- Apply polyurethane
- Setup and apply a spray finish

- Follow personal safety precautions when applying finish
- Know what wood filler is how to apply it

## Evidence of Learning

**Assessment**

Common Assessment 6.1

**Competencies for 21st Century Learners**

| | | | |
|---|---|---|---|
| x | Collaborative Team Member | x | Effective Communicator |
| x | Globally Aware, Active, & Responsible Student/Citizen | x | Information Literate Researcher |
| x | Innovative & Practical Problem Solver | x | Self-Directed Learner |

## Resources

**Suggested Resources:**

# Unit 7: Furniture and Cabinet Construction

**Content Area: Industrial Technology**

**Course & Grade Level: Woodworking I Elective, Grade 7**

## Summary and Rationale

The woodworking course is for all students. The program applies problem solving strategies and proposes rational solutions to human problems and human adaptation to the environment. The process brings human and material resources together to solve problems and extend human potential. The approach appeals to the diverse learning styles of middle school students who can develop and create their own ideas, make choices and apply previously learned knowledge, while studying and building things that evoke their natural curiosity, To accomplish this, students must understand what resources are available, how these resources are processed and what can be expected as results. The processes of technology require that the students solve problems, think critically and make decisions regarding purpose, design, construction, tools, materials and energy. Students can begin the process as used in industry to produce, develop and maintain systems, create new products and techniques and perform complex tasks.

The woodworking program at the Middle School believes that its primary purpose is to prepare students, who are users and creators of technology, for a productive and meaningful life, both now and beyond their schooling years. They must 'learn how to learn'. This involves the application of mathematical, scientific, social science and communication principles and skills to understand, select, process and evaluate the technology around them. Students must be taught to understand and evaluate the impacts, tradeoffs and consequences of their technological choices.

Cooperative learning and teamwork are emphasized to encourage social development and sensitivity to others. Students communicate their individual knowledge and creativity through graphics, the written and spoken work and by the construction of models. Products designed and constructed are the result of the students' effort and creativity, which enhances their self-esteem and encourages lifelong learning. Success is demonstrated through design solutions, effectiveness, accuracy, and excellence in production.

In this unit, students will learn what type of electric hand sanders and stationary type sanders are available, and the procedures to operate them safely. They will learn about the evolution of the electric sander and the impact the new generation of sanding machines have on woodworking today. Students will learn about the health and safety risk involved with sanding wood. Students will learn about the proper storage and maintenance of sanders as well as how to make educated choices when choosing and purchasing sanders. They will also learn to select the correct abrasive and grit required for a given sanding purpose. Students will learn about the finishing process. They will learn how to apply a stain and polyurethane to a piece of properly sanded bare wood. Students will learn about the advantages and disadvantages of the various types of finishes as well as the advantages and disadvantages of a sprayed on finish. Students will be made aware of the safety concerns with toxic finishes. They will learn about environmentally and physically safer finishing materials. Students will learn about other types of finishes as well and have the opportunity to experiment with them. Students will learn how to safely apply finishes at home as well as how to dispose of finishes properly. Students will learn about the many careers in the furniture finishing industry and learn how to recognize a well-done finish.

## Recommended Pacing

15 Days

| State Standards | |
|---|---|
| **8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:**<br>All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment. | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| **8.2.8.A.1** | Research a product that was designed for a specific demand and identify how the product has changed to meet new demands (i.e. telephone for communication - smart phone for mobility needs). |
| **8.2.8.A.2** | Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system. |
| **8.2.8.A.3** | Investigate a malfunction in any part of a system and identify its impacts. |
| **8.2.8.A.4** | Redesign an existing product that impacts the environment to lessen its impact(s) on the environment. |
| **8.2.8.A.5** | Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system. |
| **8.2.8.B.1** | Evaluate the history and impact of sustainability on the development of a designed product or system over time and present results to peers. |
| **8.2.8.B.2** | Identify the desired and undesired consequences from the use of a product or system. |
| **8.2.8.B.3** | Research and analyze the ethical issues of a product or system on the environment and report findings for review by peers and /or experts. |
| **8.2.8.B.4** | Research examples of how humans can devise technologies to reduce the negative consequences of other technologies and present your findings. |
| **8.2.8.B.5** | Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries and societies. |
| **8.2.8.B.6** | Compare and contrast the different types of intellectual property including copyrights, patents and trademarks. |
| **8.2.8.B.7** | Analyze the historical impact of waste and demonstrate how a product is upcycled, reused or remanufactured into a new product. |
| **8.2.8.C.1** | Explain how different teams/groups can contribute to the overall design of a product. |
| **8.2.8.C.2** | Explain the need for optimization in a design process. |
| **8.2.8.C.3** | Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer. |
| **8.2.8.C.4** | Identify the steps in the design process that would be used to solve a designated problem. |
| **8.2.8.C.5** | Explain the interdependence of a subsystem that operates as part of a system. |
| **8.2.8.C.5.a** | Create a technical sketch of a product with materials and measurements labeled. |
| **8.2.8.C.6** | Collaborate to examine a malfunctioning system and identify the step-by-step process used to troubleshoot, evaluate and test options to repair the product, presenting the better solution. |

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| **8.2.8.C.7** | Collaborate with peers and experts in the field to research and develop a product using the design process, data analysis and trends, and maintain a design log with annotated sketches to record the developmental cycle. |
| **8.2.8.C.8** | Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers. |
| **8.2.8.D.1** | Design and create a product that addresses a real world problem using a design process under specific constraints. |
| **8.2.8.D.2** | Identify the design constraints and trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation, design portfolio or engineering notebook. |
| **8.2.8.D.3** | Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution. |
| **8.2.8.D.4** | Research and publish the steps for using and maintaining a product or system and incorporate diagrams or images throughout to enhance user comprehension. |
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## Evidence of Learning

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## Resources

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