ONTARIO COUNCIL FOR TECHNOLOGY EDUCATION

Technology and the Skilled Trades

Grade 9,TAS1O / TMJ1O

2024

Students Will Design and Create a Tool Label.

takeTECH

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Introduction

Course Code: TAS1O / TMJ10

Broad Base Technology: Manufacturing

Destination: Open

Grade Level: 9

Online Project Name: Tool Labels

BBT Covered in the Activity

This activity will primarily cover Manufacturing topics. The project can be modified by the teacher to include other components from other broad based technological areas that are connected to the teacher's long term plan. One example would be to include components from Tech Design by focusing on the research and development of the drawings and procedures required to complete the label.

Project Outline

Student Problem to Solve: Industry revolves around profit and profit is consistently lost through inefficiency and time wasted. Mismanagement of tools and time spent trying to find tools can be very costly over a long period of time. How can we make it easier for employees/students to locate tools when needed and be able to properly return a tool when they are finished using it?

Students will work on both numeracy and literacy skills throughout the project. Students will demonstrate learning skills that include responsibility, organization, independent work, initiative and self-regulation. Students will be required to choose from a predetermined list of tools in this Manufacturing shop and create a label for this tool from a pre-cut metal blank. Students will be required to come up with the location of specified processes and give a reason why as well as create an orthographic drawing that reflects these decisions. The final label will be required to mirror the drawings and research completed prior. This project should take 12-14 hours to complete.

Student Activities

Activity #1: Introduction to Machine Shop Tools

Activity #2: Procedure Research

Activity #3: Orthographic Drawings

Activity #4: Label Manufacturing

Planning Notes

In a BBT specific course this activity should occur at the beginning of the course to allow the students to grow their knowledge of all the tools found in the shop while creating their label.

This collection of activities is designed as a complete set. But you have the ability to run each one individually as stand alone lessons or a combination of any of the above. Below is a list of materials that will be required for each activity to help guide the facilitation of the activities.

Activity #1: Introduction to Machine Shop Tools

- Access to computers with Internet
- Access to all machines and tools
- Machine/Tool Definitions Sheet (Appendix A)

Activity #2: Procedure Research

- Access to computers with Internet
- Access to the shop for demonstrations
- Procedure List Activity Sheet (Appendix B)

Activity #3: Orthographic Drawings

- Access to computers with Internet
- Graph Paper, Rulers and Pencils
- Orthographic Activity Examples (Appendix C)

Activity #4: Label Manufacturing

- Access to all tools/machines in the shop
- Create Label (Appendix D)

Overall Expectation

These overall expectations listed here that are covered in this package assumes you are completing all four activities in this package. If you only do some of the activities, understand that you will not meet all the expectations listed.

Overall Expectations Covered

Overall TAS1O Expectations Met by the Lesson

A. Design Processes and Related Skills

A1. Initiating and Planning: Demonstrate understanding of fundamental technological concepts by planning projects.

Activity: 1 and 2

A2. Designing and Performing: Develop projects creating products/services using resources and techniques.

Activity: 2 and 3

A3. Analyzing and Refining: Evaluate and refine processes, products, and/or services.

Activity: 3 and 4

A4. Following Health and Safety Practices: Apply understanding of health and safety practices.

Activity: 4

B. Technology, the Environment, and Society

B1. Fundamentals of Technological Development: Understand how needs and social, economic, and environmental factors drive technology.

Activity: 2

B3. Careers and Pathways in Technology and the Skilled Trades: Explore and describe career opportunities and pathways.

Activity: 2

This ensures that students gain a comprehensive understanding of the integrated aspects of research, design and procedures aligned with the TAS1O curriculum expectations.

Engineering Design Process

The engineering design process will allow students to demonstrate their learning through a design process connected to the broad based technology classes.

This engineering design process has been modified from the Ministry of Educations model and as part of the expectations this step-by-step guide was developed to help the educator meet those expectations This engineering design process is to use as the basis of the activity below.

Students will go through the process of Initiating and Planning, Designing and Performing, and Analysing and Refining a project based on a real world problem.

Any engineering design process can be used. Connect with your board to implement the engineering design process that is currently being used in your district.

Universal Design for Learning

Multiple Means of Representation: provided various ways to present research processes, concepts and techniques, such as visual demonstrations, written instructions, videos, and hands-on Practices. Use of diverse materials, tools, and resources to accommodate different learning styles and preferences.

Multiple Means of Engagement: Offer options for learners to explore and engage with the label project based on their interests and motivations. Incorporate interactive elements, creative challenges, and personalization opportunities to foster engagement and ownership of the learning process.

Multiple Means of Expression: Allow learners to demonstrate their understanding and creativity in different ways. Encourage Self-expression through diverse design choices, techniques, and styles. Provide opportunities for reflection, feedback, and revision to support continuous improvement and skill development.

Indigenous ways of knowing, doing and learning

The author has suggested an activity that honours the place from where it was written.

Please consult your school boards First Nation, Metis and Inuit curriculum and / or cultural support team to inform content or activities relevant to communities in your area.

Indigenous Inventions and Innovations

Potential for Community Partnership

Community partnerships can greatly enhance a Manufacturing project by providing support, resources, and opportunities for collaboration. Label creation could also take place for a community partner in some capacity if the opportunity came up.

- Machine Shops

- Local Small Businesses
- Scrap Yards
- Other Secondary Schools

Innovations and Emerging Technologies

High school manufacturing shops are embracing innovations like computer numerical control (CNC) machines, enabling students to create precise and complex parts. Additionally, additive manufacturing technologies such as 3D printing are revolutionizing prototyping and customization capabilities within these educational settings. These advancements not only prepare students for future careers in manufacturing but also foster creativity and problem-solving skills through hands-on experience with cutting-edge tools.

Career Opportunities

The skills and knowledge learned by completing this project will be of great benefit to students when pursuing a career in multiple areas of the Manufacturing industry as well as other industries. Some additional examples are:

- General Machinist
- Tool and Die Maker
- Millwright
- Sheet Metal Worker
- Mould Maker
- Pattern Maker

Apprenticeship and Skilled trades information was collected through skilledtradesontario.ca please ensure to check the website to ensure you are accessing the most recent updated information.

Trade Name	Trade Code	Classification	Exam	Red Seal	Trade Details
General Machinist	429A	Non-Compulsory	YES	YES	Details
Tool and Die Maker	430A	Non-Compulsory	YES	YES	Details
Industrial Mechanic Millwright	433A	Non-Compulsory	YES	YES	Details
Welder	456A	Non-Compulsory	YES	YES	Details

Assessment and Evaluation

Evidence of student achievement for evaluation is collected through this project from different sources using multiple sources to evaluate student learning. Student products will be in the form of assignments for evaluation. Assignments for evaluation include rich performance tasks,

demonstration, research, and projects based on real world settings. Assessment will include the categories of knowledge/understanding, thinking, communication and application.

Experiential Learning

Students learn best by doing. Providing genuine, hands-on opportunities for students to engage with the world around them is a powerful way for teachers to facilitate deeper learning and allows students to make meaningful connections between themselves and the curriculum. Experiential Learning is a student-centered, inquiry-based pedagogy that promotes active learning.

Reflection of Learning

When making the metal label, reflection on learning can be enhanced by documenting each step of the process, including challenges faced and solutions implemented. Take time to review the initial design concept compared to the final product, noting any improvements or adjustments made along the way. Finally, discussing the experience with peers or instructors can provide valuable insights into different approaches and techniques, fostering a deeper understanding of the manufacturing process.

Health and Safety Considerations

- Personal Protective Equipment (PPE): Ensure students wear appropriate PPE such as safety glasses, gloves, and closed-toe shoes to protect against hazards like flying debris and chemical spills.
- Machine Safety: Educate students on the safe operation of machinery, including emergency shutdown procedures and proper guarding to prevent accidents involving moving parts.
- Ventilation and Air Quality: Maintain adequate ventilation to minimize exposure to fumes and dust generated during manufacturing processes, especially when using materials like metals or chemicals.
- Emergency Preparedness: Have protocols in place for responding to accidents or injuries, including access to first aid kits and clear evacuation routes in case of emergencies like fires or chemical spills.

Activity 1

Introduction to Machine Shop Tools

A1.1, A1.2, A3.1, A4.1

Activity Breakdown:

This activity is great to start off any semester or rotation. The emphasis of this activity is to familiarize the students with the shop and its tools. Understanding the location and purpose for each machine/tool is the foundation for this project and all projects to follow. Students will be given the worksheet digitally, they will be required to complete a definition and uploaded image for each machine/tool with a safety tip. This will ensure they have a basic understanding of what each machine does and what it looks like. Once completed, they will choose one of the tools from the list to create their label for.

Key Points:

- Customize the machine/tool list to what is in your shop
- Point form is best for the definition to avoid copy and pasting from Google
- Uploaded photos of the actual machine/tool is best, but Google images can be accepted for equity issues with personal devices
- Limit 2 students per label

Learning Goals:

- Accurately identify all machines and tools in the shop
- Specify the purpose of each machine/tool

Success Criteria:

- Machine/tool worksheet is fully complete
- Tool for label has been chosen

Resources:

Hand tool classification

https://tendsupplies.com/blog/introduction-to-hand-tools-definition-importance-and-classifications/#:~:text=There%20are%20several%20classifications%20of,for%20specific%20tasks%20and%20projects.

Activity 2

Procedure Research

A1.2, A1.3, A1.6, A2.1, A2.2, A2.5

Activity Breakdown:

In this activity the students will be researching the procedures that will be used for the label. Although they will all be completing the procedures uniquely to their design, the process of each machine/tool will be the same. Students will be given the procedure worksheet digitally, they will be required to research the machine/tool and give a brief description of the step by step process of how it will be used. Full class or small group demonstrations of the more complex machines/tools will help the students to understand and elaborate in the worksheet. This will prepare the students for when they are ready to start their label and help them to start thinking about how they would like to build it.

Key Points:

- Customize the procedures to what you have in your shop
- Make it clear that they will be required to use each process for their label
- Demonstrations, textbooks, hands out and internet research can be used
- Explain the final label product to help them start to think about their design while they research the process

Learning Goals:

- Correctly explain how to use a machine/tool from start to finish
- Able to envision how they will use this machine/tool on their label

Success Criteria:

- Detailed instruction is completed for each process
- Students are prepared to start their design

Resources:

Basic Manufacturing machines

https://www.britannica.com/technology/machine-tool/Basic-machine-tools

Activity 3

Orthographic Drawings

A1.2, A1.3, A1.4, A2.2, B1.1

Activity Breakdown:

This activity is where the students will be creating a drawing for the label they are intending to build. You will review the fundamentals of an orthographic drawing and lay out the specifics that you will be looking for. Revisit the procedure research to ensure they are aware of each process and how that would be represented in the drawing. Students will be utilizing this activity to customize their design to be unique to them. They will choose the size and location of each process and will be required to give reasoning as to why they chose what they did.

Key Points:

- Understanding orthographic drawing basics
- Utilizing a pencil and ruler
- Incorporating proper dimensions with correct units of measurement
- Adding in all detail notes and specifics
- Incorporating each process at least once

Learning Goals:

- Correctly complete an orthographic drawing
- Create a student specific design for their label

Success Criteria:

- Orthographic drawing is complete and meets all requirements
- Student has a personal design for their label that incorporates all required processes

Resources:

Orthographic Explanation

https://youtu.be/SdLegfoMXNA

Activity 4

Label Manufacturing

A2.4, A2.5, A2.6, A2.7, A4.1, A4.2, A4.3, A4.6, B1.1, B3.1, B3.3

Activity Breakdown:

This activity is the practical component of this project. Students will use their knowledge learned from researching all tools and machinery to complete a personalized label. The layout and measurement component in the preparation of their label should be closely monitored and exact. Each student's label should be unique to the design that they created. Conversations should be had daily throughout this component of the project to help students understand the practical aspect of each process and how it can relate to real world scenarios. If scrap material is available, it would be useful to have students practice certain processes on this before they complete the task on their label. When students are complete, the labels can be hung or fastened at the correct location in the shop for a duration of time.

Key Points:

- Safe and correct use of all machines and tools
- Correct measurement/layout are incorporated
- Correlation between procedures and real world scenarios
- Individual design is reflected correctly from drawing to label

Learning Goals:

- Students should be able to correctly use all machines and tools
- Understanding layout and measurement procedures
- Connections made to real world

Success Criteria:

- All procedures are completed correctly
- Label matches orthographic drawing
- Students can explain when a process would be used in industry

Resources:

OCTE SafeDocs

https://legacy.octe.ca/application/files/9016/6794/4610/Manu_2022.pdf

Appendix A: Machines

Machines

Name	Image	Process	Safety
Lathe **Example**		Used for turning various materials with a cutting tool	Always wear proper eye protection
Milling Machine			
MIG Welder			
Arc Welder			
Band Saw			
Drill Press			
Bender			
Break			
Plasma Cutter			
Pedestal Grinder			
Hand			

Grinder			
Hammer			
Drivers			
Snips			
Wrenches			

Appendix B: Tool / Equipment Setup / Procedure

Please Provide a basic setup and procedure list for the following machines and tools.

Tool/Machine	**Setup/Procedure**
Drill Press Example	• Set table height and tighten to column • Secure bit into the chuck • Properly align and clamp your work • Pre drill if needed • Drill hole with smooth even feed rate • Use coolant to keep bit and material cool • Brush away chips with a brush • Debur both sides of the hole • Clean up workspace and put away all tools
Band Saw	
Mig Welder	
Arc Welder	
Angle Grinder: Cutting Disk	
Angle Grinder: Flap Wheel	
Hand Tools	
Lathe	
Milling Machine	
Plasma Cutter	
Bender	

Appendix C: Orthographic Drawing Examples

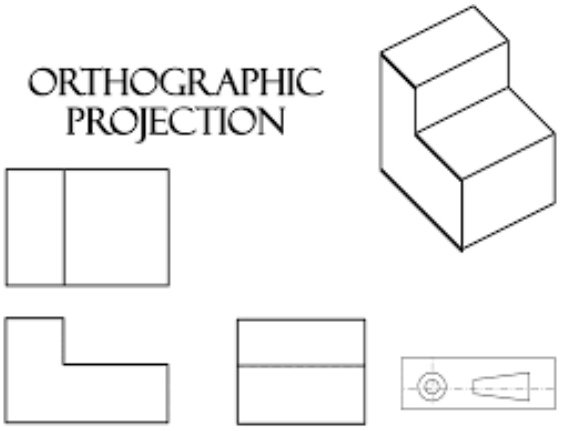
Drawing Requirements:

- Ruler and pencil
- Top/Front/Side view aligned in correct order
- All notes and specifications included
- All procedures Incorporated

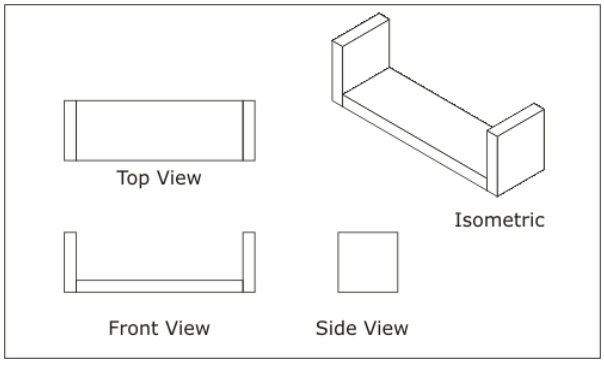
Procedures to Incorporate:

- Band Saw cut
- Drill Press hole cut
- MIG Welder used to write label designation
- Arc Welder used to a boarder
- Cutting disk used for an angle cut
- Flap wheel used for a specific bevel
- Hand tools used for deburring and finishing

Orthographic Examples :



https://www.coursehero.com/tutors-problems/Civil-Engineering/30468105-can-you-help-me-how-to-with-this-this-is-the-example-thank-you-so-muc/



https://www.cdli.ca/courses/grade8control/ds2/t06/02knowledge-skills/act-01a.htm

Appendix D: Create Label Rubric

Label Manufacturing:

- Take time each day to explain a specific procedure and how it relates to workplace scenarios
- Give students time to practice procedures on scrap before their project
- Engage in meaningful discussions individually and as a class regarding procedures and safety
- Have students work in small groups to enable them to complete as well as observe the procedures

Utilize and customize this TAS Rubric to help you evaluate the completion of the label.

Knowledge and Understanding – Subject-specific content acquired in each course (knowledge), and the comprehension of its meaning and significance (understanding)				
Categories	**50–59%** **(Level 1)**	**60–69%** **(Level 2)**	**70–79%** **(Level 3)**	**80–100%** **(Level 4)**
	The student:			
Knowledge of content *(e.g., facts; use and function of equipment and tools; technical terminology; materials; concepts, processes, safety procedures)*	demonstrates limited knowledge of content	demonstrates some knowledge of content	demonstrates considerable knowledge of content	demonstrates thorough knowledge of content

Understanding of content *(e.g., safety procedures, fundamental technological concepts, processes, industry standards)*	Demonstrates limited understanding of content	demonstrates some understanding of content	demonstrates considerable understanding of content	demonstrates thorough understanding of content
Thinking – The use of critical and creative thinking skills and/or processes				
Categories	**50–59%** **(Level 1)**	**60–69%** **(Level 2)**	**70–79%** **(Level 3)**	**80–100%** **(Level 4)**
	The student:			
Use of planning skills *(e.g., identifying a need or problem; generating and evaluating ideas; selecting strategies, tools, and resources; scheduling; budgeting)*	uses planning skills with limited effectiveness	uses planning skills with some effectiveness	uses planning skills with considerable effectiveness	uses planning skills with a high degree of effectiveness

Use of processing skills *(e.g., analyzing and interpreting information, forming conclusions)*	uses processing skills with limited effectiveness	uses processing skills with some effectiveness	uses processing skills with considerable effectiveness	uses processing skills with a high degree of effectiveness
Use of critical/creative thinking processes *(e.g., engineering design, service design, problem-solving, decision-making, diagnostic, and quality assurance processes)*	uses critical/ creative thinking processes with limited effectiveness	uses critical/ creative thinking processes with some effectiveness	uses critical/ creative thinking processes with considerable effectiveness	uses critical/ creative thinking processes with a high degree of effectiveness
Communication – The conveying of meaning through various forms				
Categories	**50–59%** **(Level 1)**	**60–69%** **(Level 2)**	**70–79%** **(Level 3)**	**80–100%** **(Level 4)**
	The student:			

Expression and organization of ideas and information *(e.g., clarity, logic, coherence)* **in oral, non-verbal, visual, and/or written forms, including digital and media forms** *(e.g., demonstrations, technical descriptions/instructions, presentations, reports, flowcharts)*	expresses and organizes ideas and information with limited effectiveness	expresses and organizes ideas and information with some effectiveness	expresses and organizes ideas and information with considerable effectiveness	expresses and organizes ideas and information with a high degree of effectiveness
Communication for different audiences *(e.g., peers, clients, suppliers, colleagues, supervisors, the public)* **and purposes** *(e.g.,*	communicates for different audiences and purposes with limited effectiveness	communicates for different audiences and purposes with some effectiveness	communicates for different audiences and purposes with considerable effectiveness	communicates for different audiences and purposes with a high degree of effectiveness

to inform, to persuade, to collaborate) **in oral, non-verbal, visual, and/or written forms, including digital and media forms**				
Use of conventions *(e.g., standards, symbols, units of measurement, acronyms)*, **industry-related vocabulary, and terminology of the discipline in oral, non-verbal, visual, and/or written forms, including digital and media forms**	uses conventions, vocabulary, and terminology with limited effectiveness	uses conventions, vocabulary, and terminology with some effectiveness	uses conventions, vocabulary, and terminology with considerable effectiveness	uses conventions, vocabulary, and terminology with a high degree of effectiveness
Application – The use of knowledge and skills to make connections within and between various contexts				

Categories	50–59% (Level 1)	60–69% (Level 2)	70–79% (Level 3)	80–100% (Level 4)
	The student:			
Application of knowledge and skills *(e.g., manipulation of materials; application of concepts and processes; safe use of tools, equipment, technology, and techniques)* **in familiar contexts**	applies knowledge and skills in familiar contexts with limited effectiveness	applies knowledge and skills in familiar contexts with some effectiveness	applies knowledge and skills in familiar contexts with considerable effectiveness	applies knowledge and skills in familiar contexts with a high degree of effectiveness
Transfer of knowledge and skills *(e.g., manipulation of materials; application of concepts and processes; safe use of tools, equipment, technology, and*	transfers knowledge and skills to new contexts with limited effectiveness	transfers knowledge and skills to new contexts with some effectiveness	transfers knowledge and skills to new contexts with considerable effectiveness	Transfers knowledge and skills to new contexts with a high degree of effectiveness

techniques) **to new contexts**				
Making connections within and between various contexts (*e.g., connections to everyday personal situations; connections to social, economic, environmental, ethical, and cultural issues; connections between technological education and other disciplines; connections to potential careers and related postsecondary pathways, including apprenticeship)*	makes connections within and between various contexts with limited effectiveness	makes connections within and between various contexts with some effectiveness	makes connections within and between various contexts with considerable effectiveness	makes connections within and between various contexts with a high degree of effectiveness

References:

SCDSB Indigenous Resource, 2024

Indigenous Inventions and Innovations

Hand tool classification (Blog), 2023

https://tendsupplies.com/blog/introduction-to-hand-tools-definition-importance-and-classifications/#:~:text=There%20are%20several%20classifications%20of,for%20specific%20tasks%20and%20projects.

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https://www.britannica.com/technology/machine-tool/Basic-machine-tools

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https://youtu.be/SdLegfoMXNA

SAFEDocs for Manufacturing Technology (OCTE), 2017

https://legacy.octe.ca/application/files/9016/6794/4610/Manu_2022.pdf

Orthographic Explanation (Forum), 2024

https://www.coursehero.com/tutors-problems/Civil-Engineering/30468105-can-you-help-me-how-to-with-this-this-is-the-example-thank-you-so-muc/

Understanding Technical Drawings (Article), 2006

https://www.cdli.ca/courses/grade8control/ds2/t06/02knowledge-skills/act-01a.htm