

Lesson C2-1

Identify Manufacturing Tools, Equipment, and Technologies

Unit C. Basic Technical Skills

Problem Area 2. Identify Tools and Equipment

Lesson 1. Identify Manufacturing Tools, Equipment, and Technologies

Illinois State Goal and Learning Standard. This lesson is correlated with the following State Goal and Learning Standard:

State Goal 1: Read with understanding and fluency.

Learning Standard C: Comprehend a broad range of reading materials.

Performance Descriptor I/4: Identify and analyze the meanings of specialized vocabulary/terminology.

State Goal 3: Write to communicate for a variety of purposes.

Learning Standard A: Students who meet the standard can use correct grammar, spelling, punctuation, capitalization, and structure.

Performance Descriptor E/6: Demonstrate appropriate use of various parts of speech.

State Goal 5: Use the language arts to acquire, assess, and communicate information.

Learning Standard C: Students who meet the standard can apply acquired information, concepts, and ideas to communicate in a variety of formats.

Performance Descriptor G/4: Design and present a project (e.g., written report, graphics, visuals, multi-media presentation).

Standards for Technological Literacy. Standard 19: Students will develop an understanding of and be able to select and use manufacturing technologies. Performance elements F, L: Manufacturing systems use mechanical systems that change the form of materials through the processes of separating, forming, combining, and conditioning them. Servicing keeps products in good operating condition.

Workplace Skills: D/1: Communicating on the Job; communicate orally with others. J/8: Demonstrating Work Ethics and Behavior; demonstrate a willingness to learn.



- **Student Learning Objectives.** Instruction in this lesson should result in students achieving the following objectives:

- 1 **Explain the difference between hand tools, power tools, and equipment.**
- 2 **Identify the processes performed by tools and equipment.**

- **List of Resources.** The following resources may be useful in teaching this lesson:

Fales, J., Sheets, E., Mervich, G., & Dinar, J. (1986). *Manufacturing: A Basic Text*. Encino, CA: Glenco.

Komacek, S. A., Lawson, A. E., & Horton, A. C. (1990). *Manufacturing Technology*. Albany, NY: Delmar.

www.grainger.com

www.Shopzilla.com

- **List of Equipment, Tools, Supplies, and Facilities**

- ✓ Overhead or PowerPoint projector
- ✓ Visual(s) from accompanying master(s)
- ✓ Copies of test, lab sheet(s), and/or other items designed for duplication
- ✓ Materials listed on duplicated items
- ✓ Computers with Internet access and printer (color preferred)
- ✓ Classroom resource and reference materials
- ✓ Various technological journals related to the specific subject area (two or three per student)

- **Terms.** The following terms are presented in this lesson (shown in bold italics):

- ▶ coating/finishing
- ▶ combining
- ▶ conditioning
- ▶ equipment
- ▶ forming
- ▶ hand tool
- ▶ measuring
- ▶ power tool
- ▶ separating

■ **Suggested Tools and Equipment List** (Additional tools and equipment may be included as determined by the instructor.)

- ✓ aviation snips
- ✓ ball peen hammer
- ✓ band saw
- ✓ belt/disc sander
- ✓ caliper
- ✓ center punch
- ✓ chisel
- ✓ clamps
- ✓ claw hammer
- ✓ CNC machine
- ✓ conveyor
- ✓ die
- ✓ divider
- ✓ drill bit
- ✓ drill press
- ✓ electric drill
- ✓ electric shear
- ✓ file
- ✓ hack saw
- ✓ hand grinder
- ✓ hand saw
- ✓ injection molder
- ✓ jig saw
- ✓ jointer
- ✓ mallet
- ✓ marking gauge
- ✓ metal lathe
- ✓ micrometer
- ✓ pedestal/bench grinder
- ✓ Phillips screwdriver
- ✓ planer
- ✓ pliers
- ✓ power hack saw
- ✓ radial arm saw
- ✓ robot
- ✓ router
- ✓ rule
- ✓ scribe
- ✓ scroll saw
- ✓ soldering iron
- ✓ spray gun
- ✓ standard screwdriver
- ✓ table saw
- ✓ tap
- ✓ tape measure
- ✓ tin snip
- ✓ try square
- ✓ vacuum former
- ✓ wood lathe
- ✓ wrenches

■ **Interest Approach.** Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situation. A possible approach is included here.

Have students verbally list manufacturing tools and/or equipment they have used or personally seen someone else use. Record these on the board or an overhead. After a list of approximately 20 items has been recorded, ask students to identify which ones are hand tools, which are power tools, and which are equipment.

SUMMARY OF CONTENT AND TEACHING STRATEGIES

Objective 1: Explain the difference between hand tools, power tools, and equipment.

Anticipated Problem: How are hand tools, power tools, and equipment different?

- I. Clarify the difference between hand tools, power tools, and equipment.
 - A. **Hand tool**—An implement that acts as an extension of the human hand and is human powered
 - B. **Power tool**—An implement that acts as an extension of the human hand and has its own power source
 - C. **Equipment**—A machine or tool that is so large it cannot be easily carried or used by hand. It may be human powered, such as by a foot pedal or lever/crank, or it may have its own power source.

Many techniques can be used to help students master this objective. As an example, students could use Chapter 7 in Manufacturing Technology. Use VM–A to provide students with examples of common hand tools. Use VM–B to provide them with examples of common power tools.

Objective 2: Identify the processes performed by tools and equipment.

Anticipated Problem: What are the processes performed by tools and equipment?

- II. Processes performed by tools and equipment
 - A. **Measuring**—Using a numerical system to indicate the dimensions of a part or material
 1. Measuring systems: English and metric
 - B. **Separating**—Removing part of the original material while leaving the required size and shape
 1. Types: chemical and mechanical (by shear force, chip removal, etc.)
 - C. **Forming**—Shaping materials or components of products
 1. Bending, twisting, rolling, compressing, etc.
 - D. **Combining**—Putting components together into subassemblies or finished products
 1. Chemically, mechanically, thermally, by adhesion, by fusion (welding, brazing, soldering)

- E. **Conditioning**—Producing a nonvisible change to the structure of materials or parts of products
 - 1. Subjecting metals to heat treatment (hardening, tempering, annealing, etc.)
- F. **Coating/finishing**—Covering one material with another
 - 1. Dipping, spraying, plating

*Many techniques can be used to help students master this objective. As an example, students could use Chapter 3 in *Manufacturing: A Basic Text*. Use VM–C to illustrate different types of tools commonly used in measuring.*

- **Review/Summary.** Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. Questions at the ends of chapters in the textbook may also be used in the review/summary.
- **Application.** Application can involve the following student activity:
 - ◆ Ask students to provide examples of tools and equipment and to list the processes they perform. (See Assessment.)
- **Evaluation.** Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activity. A sample written test is provided.
- **Answers to Sample Test:**

Matching

1. e
2. a
3. g
4. b
5. h
6. d
7. f
8. c
9. i

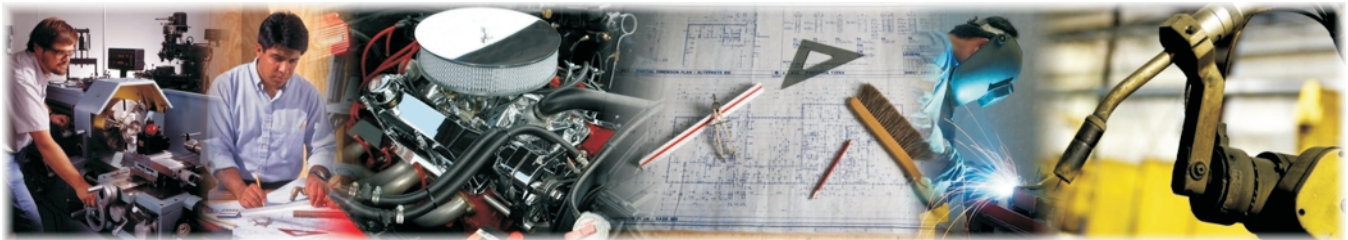
Identify Manufacturing Tools, Equipment, and Technologies

► Matching

Instructions: Match the term with the correct definition.

- | | |
|-----------------|----------------------|
| a. forming | f. power tool |
| b. combining | g. hand tool |
| c. separating | h. equipment |
| d. conditioning | i. coating/finishing |
| e. measuring | |

- ____ 1. Using a numerical system to indicate the dimensions of a part or material
- ____ 2. Shaping materials or components of products
- ____ 3. An implement that acts as an extension of the human hand and is human powered
- ____ 4. Putting components together into subassemblies or finished products
- ____ 5. A machine or tool that is so large it cannot be easily carried or used by hand
- ____ 6. Producing a nonvisible change to the structure of materials or parts of products
- ____ 7. An implement that acts as an extension of the human hand and has its own power source
- ____ 8. Removing part of the original material while leaving the required size and shape
- ____ 9. Covering one material with another



Identify Manufacturing Tools, Equipment, and Technologies

Performance Standards 1C.I , 3A.E, 5C.G

Procedures

1. In order to read with understanding and fluency, write to communicate for a variety of purposes, and use the language arts to acquire, assess, and communicate information, students should experience sufficient learning opportunities to develop the following skills:

- ◆ Identify and analyze the meanings of specialized vocabulary/terminology
- ◆ Demonstrate appropriate use of various parts of speech
- ◆ Design and present a project (e.g., written report, graphics, visuals, multi-media presentation).

Students employed in various IT/manufacturing careers are required to identify by name and select/utilize the proper tooling for a given job/process. This assessment aligns with each of the following: STL 19, Students will develop an understanding of and be able to select and use manufacturing technologies. IWPS D/1, J/8, Communicating on the job, communicating orally with others. Demonstrating work ethics and behavior, demonstrating a willingness to learn.

2. IT students will review and discuss the assessment task and how the rubric will be used to grade their work.
3. Each student will perform research using either the Internet or technological journals to find 15 photos of manufacturing technologies (tools and equipment). Each student will provide the research results as explained in LS–A, citing the process performed by each tool or item of equipment. The student will also categorize each item as hand tool, power tool, or equipment. Students will provide the research results to the class.
4. Each student's performance will be evaluated by using the rubric and adding the student's scores to determine the performance level.

Time Requirements

- ◆ Student Information: $\frac{1}{2}$ class period
- ◆ Lab Activity Research: $\frac{1}{2}$ class period
- ◆ Lab Activity: 1 or 2 class periods

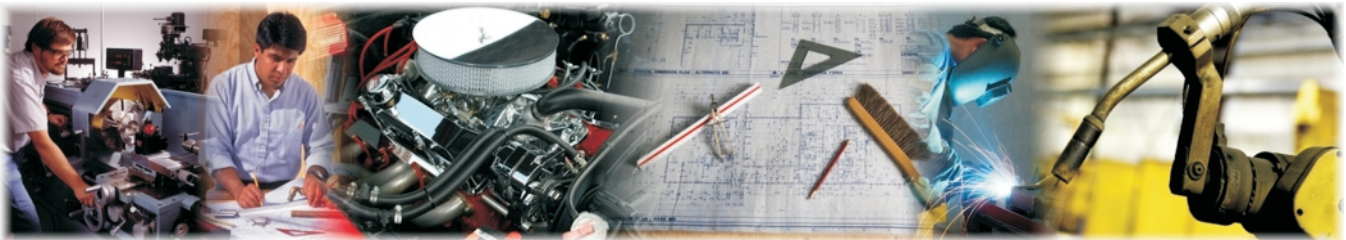
Resources

- ◆ References (newspapers, magazines/journals, the Internet)
- ◆ LS–A: Student Instructions
- ◆ Scoring Rubric

Identify Manufacturing Tools, Equipment, and Technologies—Instructions

At the conclusion of this lesson, you will complete a “visual” project (poster board or PowerPoint) that contains 15 pictures of manufacturing tools and equipment. Each item must be identified by type and by the process it performs.

1. Conduct research using the Internet or two or three journals related to the field of manufacturing technology.
2. Find as many photo examples of manufacturing technologies (tools and equipment) as time allows ($\frac{1}{2}$ class period).
3. “Cut and paste” the photos into a PowerPoint document or physically cut them from the journals and paste or tape them onto poster board.
4. Label each photo to indicate the following: the process the item performs (combining, measuring, forming, etc.) and the category to which the item belongs (hand tool, power tool, equipment). See the accompanying chart.
5. Present the resulting visual on manufacturing tools and equipment to the class.
6. At the end of this activity, your teacher may wish to provide a compilation of the tools and equipment you and your classmates have chosen and may add items no student has found.



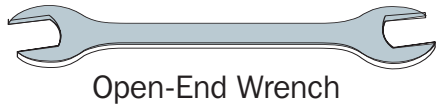
Hand Tools	Power Tools	Equipment
Tool Photo—	Tool Photo—	Equipment Photo—
Tool Name & Process	Tool Name & Process	Equipment Name & Process
Tool Photo—	Tool Photo—	Equipment Photo—
Tool Name & Process	Tool Name & Process	Equipment Name & Process
Tool Photo—	Tool Photo—	Equipment Photo—
Tool Name & Process	Tool Name & Process	Equipment Name & Process
Tool Photo—	Tool Photo—	Equipment Photo—
Tool Name & Process	Tool Name & Process	Equipment Name & Process
Tool Photo—	Tool Photo—	Equipment Photo—
Tool Name & Process	Tool Name & Process	Equipment Name & Process

Identify Manufacturing Tools, Equipment, and Technologies

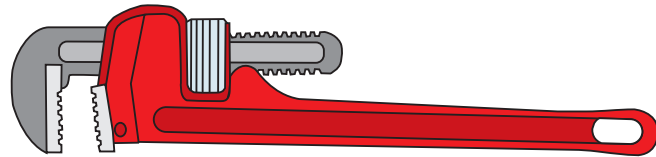
- ◆ Exceeds standard (12 total points)
- ◆ Meets standard (9–11 total points)
- ◆ Approaches standard (6–8 total points)
- ◆ Begins standard (5 total points)

	Performance Standard Label each photo with the name of each tool or item of equipment.	Performance Standard Identify the type (hand tool, power tool, equipment).	Performance Standard Identify the process performed by the tool or equipment (measuring, separating, forming, combining, conditioning, coating/finishing).
4	<ul style="list-style-type: none"> • Student correctly identifies 13–15 tool and/or equipment names. 	<ul style="list-style-type: none"> • Student correctly identifies 13–15 tool and/or equipment types. 	<ul style="list-style-type: none"> • Student correctly identifies 13–15 processes performed by tool and/or equipment.
3	<ul style="list-style-type: none"> • Student correctly identifies 11–12 tool and/or equipment names. 	<ul style="list-style-type: none"> • Student correctly identifies 11–12 tool and/or equipment types. 	<ul style="list-style-type: none"> • Student correctly identifies 11–12 processes performed by tool and/or equipment.
2	<ul style="list-style-type: none"> • Student correctly identifies 9–10 tool and/or equipment names. 	<ul style="list-style-type: none"> • Student correctly identifies 9–10 tool and/or equipment types. 	<ul style="list-style-type: none"> • Student correctly identifies 9–10 processes performed by tool and/or equipment.
1	<ul style="list-style-type: none"> • Student correctly identifies 7–8 tools and/or equipment names. 	<ul style="list-style-type: none"> • Student correctly identifies 7–8 tool and/or equipment types. 	<ul style="list-style-type: none"> • Student correctly identifies 7–8 processes performed by tool and/or equipment.
Score			

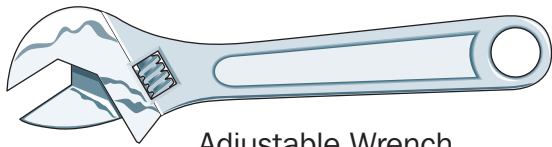
EXAMPLES OF COMMON HAND TOOLS



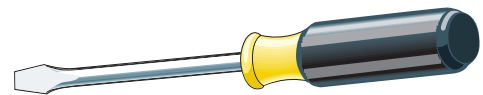
Open-End Wrench



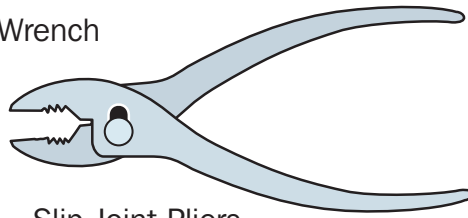
Pipe Wrench



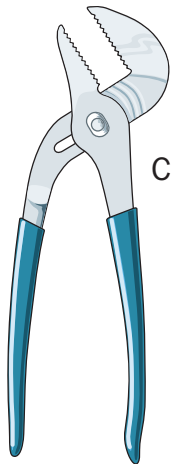
Adjustable Wrench



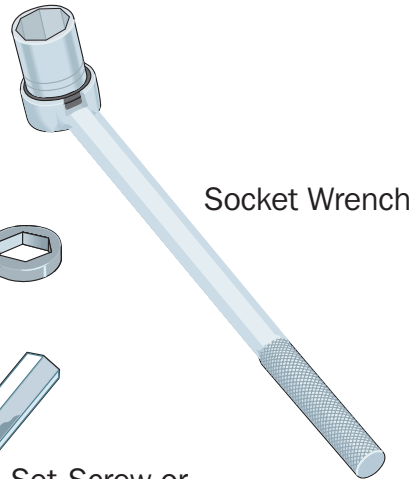
Standard Screwdriver



Slip Joint Pliers



Channel Lock Pliers



Socket Wrench



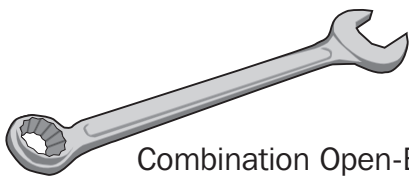
Box-End Wrench



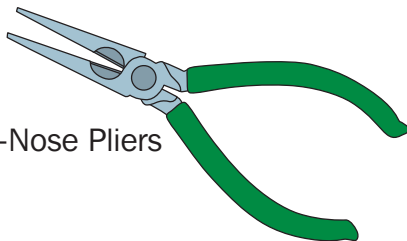
Phillips Screwdriver



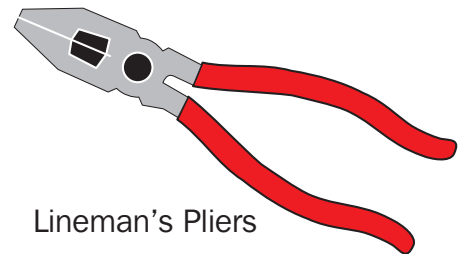
Set-Screw or Allen Wrench



Combination Open-End Box-End Wrench



Needle-Nose Pliers

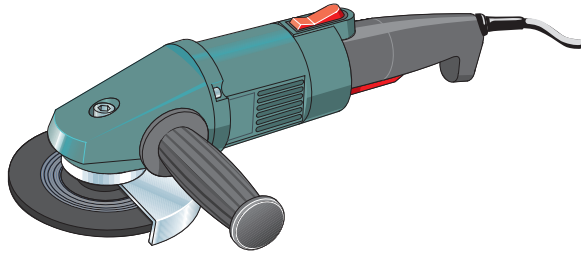


Lineman's Pliers

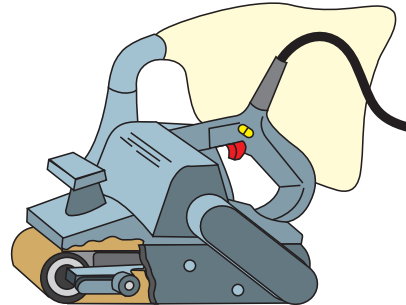


Locking Pliers (Vise Grips)

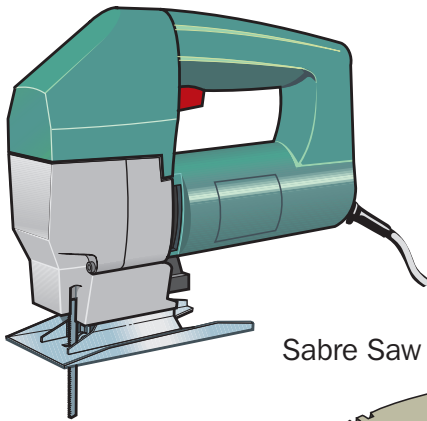
COMMON POWER TOOLS



Portable Disc Grinder/Sander/Buffer



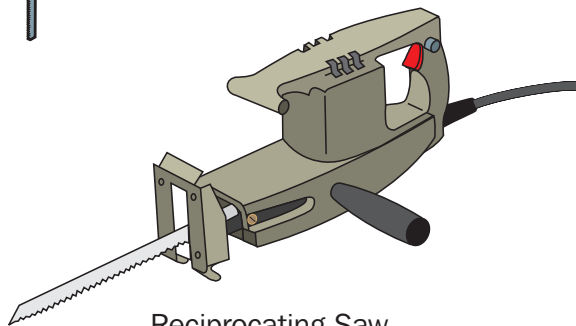
Belt Sander



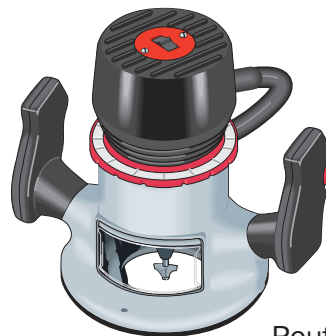
Sabre Saw



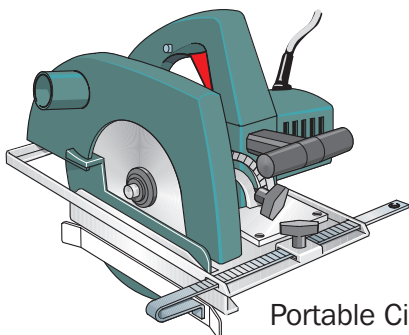
Portable Plug-in Drill



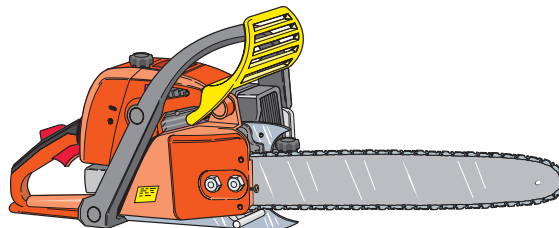
Reciprocating Saw



Router



Portable Circular Saw



Chain Saw

TOOLS COMMONLY USED IN MEASURING

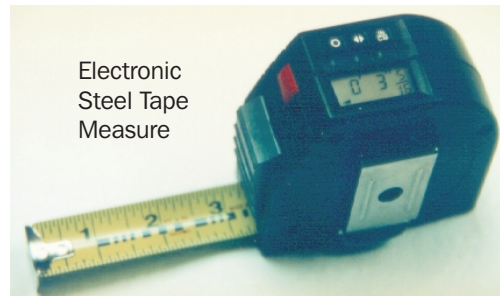
Zigzag Folding Wood Rule



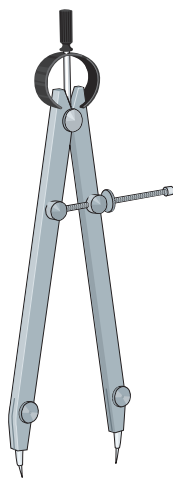
Self-Winding Steel Tape



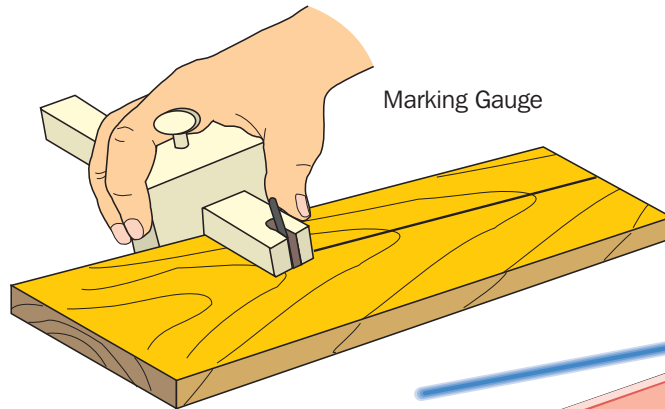
Electronic Tape Measure



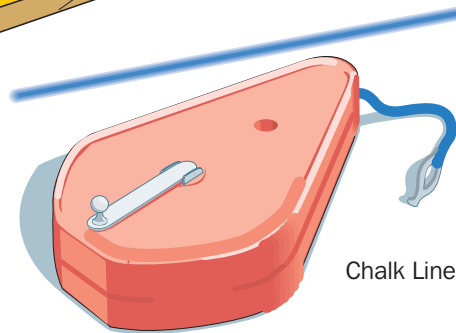
Electronic Steel Tape Measure



Divider



Marking Gauge



Chalk Line

Identify Manufacturing Tools, Equipment, and Technologies

Purpose

The purpose of this lab activity is to develop an understanding of manufacturing tools, equipment, and technologies in order to begin developing the ability to select and use them properly.

Objectives

1. Understand the difference between hand tools, power tools, and equipment.
2. Identify the processes performed by tools and equipment.
3. Utilize proper terminology when using tools and equipment.

Materials

any of the following presentation media:

- ◆ overhead projection system
- ◆ PowerPoint projector
- ◆ 2' × 3' poster board
- ◆ computers with access to the Internet and with printers (color preferred)
- ◆ 2 or 3 manufacturing technology journals per student
- ◆ choice of markers or writing utensils
- ◆ scissors
- ◆ glue/paste or tape
- ◆ copies of student instructions

Procedure

1. Provide each student with access to the Internet or with two or three journals related to the field of manufacturing technology.
2. Ask each student to find as many photo examples of manufacturing technologies (tools and equipment) as time allows ($\frac{1}{2}$ class period).

3. Have the student either “cut and paste” the photos into a PowerPoint document or physically cut them from the journals and paste or tape them onto poster board.
4. Have the student label each photo to indicate the following: the process the item performs (combining, measuring, forming, etc.) and the category to which the item belongs (hand tool, power tool, equipment).
5. Have each student present the resulting visual on manufacturing tools and equipment to the class.
6. Complete a master list of all tools and equipment covered that the students are expected to know. If necessary, supplement the list with additional items that the students did not find but that should be included.