Safety Instruction

Contents

Introduction

In many districts the teacher is the only "expert" on safe use of the tools and equipment in the shop. The burden will fall on the teacher to ensure that every student receives safety instruction and understands this instruction. The teacher must always model safe practices in the classroom (shop). The teacher must also ensure that conditions in the shop are safe.

Trip hazards such as cords or air lines should be removed.

Liability

While one would hope that the student's welfare is the primary reason for proper safety instruction, however legal liability is also a reason. In the event of an injury, particularly a serious one a lawsuit may be filed. Commonly the teacher and the school district will be named as defendants. However, teachers can mitigate the likelihood of a successful lawsuit by providing and documenting proper safety instruction and a safe working environment.

The law places a very strict duty of care upon teachers and school districts with respect to students in shop classes. Proper instruction in the use of dangerous machinery is critically important to the safety of students. Safe equipment must be provided by school districts. Careful supervision of students is required by teachers. Judges have determined there is a high probability of a serious accident if safety instructions are not given clearly and carefully to students receiving education in the use of power tools and woodworking machinery. Consequently, if an accident happens and a student is injured, the courts may well judge relatively minor omissions in instruction to be negligent. They may find the teacher, and thus the school district as employer, responsible or partially responsible for a student's injuries.

To mitigate liability:

- Give careful instructions to students on all aspects of the operation of equipment that is dangerous if used improperly. Describe the risks and dangers clearly. Use a list of hazards so you can document your instructions.
- Teach safety rules clearly, repeat them often until these rules become second nature to the students.

- Test the students thoroughly in writing to ensure they understand all aspects of the operation, any and all risks associated, and rules for safety for each piece of equipment they will use. Ensure these examinations are signed by the student, dated and retained for reference should an injury occur. This may be valuable evidence needed to defend a teacher should a lawsuit result. (See recordkeeping below.)
- Publish the safety rules and the consequences for violations (typically suspension of shop privilege). Strictly enforce safety rules. Discipline violators. Develop administrative support for your policies.
- Ensure safety equipment is available and fully functioning. Lawsuits can occur after accidents where machines were improperly guarded or out of adjustment. (See Facilities).

Safety Expectations

The teacher should set their safety expectations at the beginning of the term. Review your safety expectations with your administrator as they need to be aware of your practice and support your punishments. Publish them in the course syllabus along with the consequences of failing to work safely. Students can be required to sign a copy of the safety expectations. This not only creates a record, it also puts students on notice in a formal way of your expectations.

Communication of Safety to Parents/Guardians

Shop teachers have commonly used "permission slips" that were sent home and signed by the parents/guardians permitting their child to participate in the laboratory. Many teachers believed that these "policy statements" relieved them of some or all of their responsibilities and liability should an accident occur. They do neither of these. However this type of letter does:

- Inform the parent/guardian of his/her child's participation in the activity and that there are risks and the student has a responsibility.
- Outline the safety instruction and procedures followed by the teacher and the district.
- Obtain from the parent/guardian relevant information regarding any health problems having a bearing on the student's performance.
- List the parent/guardian's telephone number(s) where he/she can be reached during school hours and list the name of the family doctor. Note: The district may already maintain this information.

Sample Letter to Parents

Safety in Agriculture Mechanics Education

Mr. Jones, Agriculture Instructor (530)-555-1212 bjones@svsd.k12.ca.us

To the parent or guardian of _____,

Your son/daughter is enrolled in our agricultural mechanics program and will have the opportunity to use various tools and equipment. Appropriate instruction in their safe operation is given and close supervision is maintained at all times. Although every precaution is taken to prevent accidents, a certain risk is involved due to the nature of the experience, the age of the student, and the learning environment. We are asking you to impress upon your child the importance of being careful. We believe this will support the instruction that is given in school. You are invited to visit our school and the agricultural program. These visits can be arranged by calling _____

In order to promote a safe working environment for your child and other students we have established the following expectations:

- Safety glasses will be worn at all time in the shop.
- Student will dress appropriately (long pants and closed toed shoes).
- Student will use the appropriate personal protective equipment (PPE) for task being performed.
- Student will exhibit appropriate behavior (no horseplay) when working in the shop so as not to endanger other students.

Failure to follow these expectations will lead to disciplinary action such as temporary suspension of shop privileges to removal from the class.

Thank you very much for your help and assistance in providing your son/daughter with the "hands-on" experience of agriculture in a safe working environment. Please complete this form and return to your child's teacher.

I have read the attached communication and I understand the type of program that my child is enrolled in. I will stress the safety aspects of this program to my child. I will encourage my child to participate fully in his/her agricultural education program.

_____ _____

Parent or guardian date

_____ _____

home phone work phone

Please identify any health problems that may have a bearing on your child's participation in this class.

_____

_____

_____

_____

I agree to observe all safety rules and procedures for safe operation and conduct in the school agricultural education program and will wear approved eye protection at all times while in the shop or other areas where eye protection is required in accordance with state law.

_____ _____

Student date

General Shop Safety Instruction

All shops are different. General instructions should be tailored for the shop and can include:

- Location of exits and how to exit. Where to assemble in case of a fire.
- Location and use of fire extinguishers. (PASS)
- Location and use of safety equipment such as eye washes and fire blankets
- Location of the first aid kit and rules regarding its use. Teachers need to know of any injury.
- Ventilation systems.
- Location of electrical panels in case power needs to be cut off.
- Safety zones around tools.
- Working around other students. Tasks such as grinding and open arc welding can endanger other students. Students should be aware of those around them when working in the shop.
- Noise in the shop. Some shops are inherently noisy and hearing protection should be worn at all times. Location of ear plugs and other hearing protection equipment.
- Safety glasses should always be worn, but additional eye and face protection may be required for some operations. Point out the location of this equipment.
- Appropriate dress. Loose clothing, long hair, jewelry, etc.

Promote a safety culture. This is a common industry practice and has proven to reduce accidents. Encourage students to remind others to work safely. Incorporate a safety question into the topic of the day.

Personal Protective Equipment (PPE)

PPE and appropriate dress should be always used by every student. The teacher should model this practice as well. Safety glasses are required. They should be always worn even when using another type of protection such as a face shield. Ideally each student should purchase or be issued a pair of safety glasses. The student should be responsible for storage and care of the safety glasses (an old sock makes a good case).

Appropriate dress for shop work is at a minimum long pants and closed shoes. Students that are not appropriately dressed should not be allowed to work in the shop. Use of coveralls can be encouraged.

The district should provide additional PPE where required. Common PPE for use in agricultural mechanics shops are:

PPE	Use
Safety Glasses. Prescription glasses and dark glasses are **not** a replacement for safety glasses. Safety glasses have side shields and meet the CSA Z94.3 and ANSI Z87.1 standards,	All shop activities

Face Shields	Stationary and portable grinders
Hearing Protection (ear muffs and ear plugs)	Portable grinder, power equipment
Arc Welding Helmets. Self-darkening helmets are easier for students to use but are more costly. They must be maintained. The darkness setting needs to be set for the appropriate process.	SMAW, GMAW, GTAW (with appropriate lens shade)
Gas Welding Goggles or Face Shields. Note that shade 5 face shields are easier for students to use over safety glasses and provide more protection.	Gas welding and plasma cutting
Welding Gloves. Have a variety of sizes.	Welding, grinding
Welding Jackets. Cloth jackets are less expensive than leather and will work fine for occasional use. Leather PPE is more durable and better choice for welding classes. It is important to have a variety of sizes.	Arc Welding
Dust Masks	Sanding
Nitrile Gloves	Painting, Solvent / Fuel use.
Hard Hats	Construction involving overhead hazards

Examples of PPE

<table>
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<td> 
Common safety glasses</td>
<td> 
For students that wear prescription glassed this model is designed to be worn over them.</td>
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Welding gloves. Can also be used when hand protection is required for other processes.</td>
<td> 

These come in a variety of sizes.</td>
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<td> 
Ear muffs are useful to place at stations like a chop saw. Ear plugs are disposable and better for</td>
<td> 
Face shields should be place by the tools where they are needed. Shade 5 face shield can be used for gas</td>
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fabrication class.	welding and plasma cutting.
 Arc welding helmets are required for arc welding. Auto darkening helmets are easier for students, but are more expensive, require checking to see that the shade setting is set to, and may require batteries.	 Dust makes should be used for operations that create fine dust such as sanding.
 Cloth welding jacket are a less expensive alternative to leather but will not hold up as well. They are appropriate for classes where welding is just part of the instruction.	 Leather welding jackets are durable and should be used for welding and metal fabrication classes.

PPE should be easily available to students and placards posted to prompt PPE use. For example having a face shield and ear muff hanging at the chop saw. Custom placards can be easily made using card stock and color printer.

PPE such as jackets and gloves should be stored where they are accessible and protected. All PPE should be regularly inspected and damaged items discarded.

Methods

Safety instruction tends to be tedious for students. A good practice is to begin the term with general safety instruction for working in the shop setting. Items such as wearing safety glasses, appropriate dress, keeping the shop clean, and the location/use of safety equipment such as eye washes and fire extinguishers should be covered. (See general safety above.)

Safety instructions by tool should be given as the tool is introduced in the curriculum. This practice not only ensures that the instruction is given concurrent with the tool use it also breaks up the safety instruction helping keep the students focused on the importance of safety. For example if you are starting a unit on plumbing you might cover:

- Hazards using PVC cement (skin contact, fumes and fire).
- Burn hazards using a propane torch.
- Threaded steel pipe can be sharp.
- Cutting oil left on the floor can be a slip hazard.
- A threading machine can create a wrapping hazard.

The teacher should assess which hazards apply to their instruction and tailor the instruction appropriately. Using the above example the teacher might omit the wrapping hazard of the threading machine if that tool is not used.

A safety test should be administered and passed before students are allowed to use tools and processes.

Talking About vs. Showing

A sound safety lesson will include a demonstration. For example the teacher might talk about using a push stick with a table saw, however this alone leaves the student room to interpret the use and technique. Safety should always be part of any demonstration. For example if a project requires the use of a drill press part of the demonstration might include a demonstration of clamping the work and the reason why. Good lessons typically include a summary at the end. The summary should include a recap of the safety items.

Reinforce! Many tools like a drill press will be used for multiple projects. The main safety lesson on a tool will be given with its first use. It is good practice to hit the key points in subsequent demonstrations to reinforce the hazards associated with the tool.

In person demonstrations are generally more effective than videos because they can be altered to meet the needs of the tooling in the shop, the project being constructed, and the students. However video demonstrations do not require the teacher and as such can be an effective way to provide instruction to students that missed the initial demonstration or need remedial help. If using videos created by other be sure they cover the safety items appropriate to your shop.

Students with special needs

Safety tests may be difficult for some special needs students. Accommodation should be discussed to ensure the student understands the safety issues in the shop and this accommodation documented. Note that safety is not something that can be “waived”. If a student cannot work safely in the shop alternatives should be sought. Such students are a hazard to themselves and to other students.

Fabrication Classes

In some classes students will all work on the same projects so safety instruction will be tired to the activity. In fabrication type classes where students are building individual projects this is not the case. Students will use different tools depending on the projects. For this type of class consider:

- Never assume that all students have had previous safety instruction in a prior class. Review safety and assess in each term.
- All students will need general shop safety instruction. Stress the need to be aware of others in the shop as students will be working more independently.
- Consider periodic "safety meetings" such as those commonly used in industry.
- Give safety tests based on the tooling used. If all students are experienced (from previous classes), just do a quick review before the test.
- You still need to document safety instruction for every student.

Safety Curriculum and Assessment

Many resources are available for accessing safety instruction (see resources). Teachers should develop a safety curriculum for their program. Using a list of hazards (see below) for instruction ensures that the teacher covers all the items as well as documents what instruction was given.

Band Saw Example

- Wear proper clothing. Remove jewelry, eliminate loose clothing, and confine long hair.
- Wear safety goggles or glasses.
- Always keep guards in place. Both upper and lower wheels, as well as most of the blade itself, shall be guarded.
- Adjust the guard to about 1/4 inch above thickness of stock.
- The upper and lower guides shall be properly adjusted when machine is stopped completely, so that there will be a minimum of blade breakage.
- A clicking or cracked blade should be stopped immediately.
- The saw shall be allowed to stop itself naturally in order that the blade may not be damaged.
- Plan your cuts carefully; layout and make release cuts before cutting long curves.
- If the stock binds or pinches the blade, do not attempt to back out until power has been shut off and the machine stops.
- Proper blade width for the diameter of work being cut shall be used. Avoid cutting a radius to small for the blade width and pinching the blade. (see table)
- The right side of the machine is generally the most dangerous place to stand in case of blade breakage.
- Proper blade tension shall be maintained.
- The blade shall be sharp and properly set at all times.
- Remove scrap material from saw table with a stick or brush.
- If the blade breaks, shut off power and stand clear until machine stops entirely.
- Make cuts always under power--never while machine is coasting.
- Leave the machine only after power is turned off and blade has stopped moving. This is especially important with the band saw.

Posting a table on the machine can reinforce the importance of not making too small a radius cut.

Blade Width	1/8"	3/16"	1/4"	3/8"	1/2"	3/4"	1"
Cut Radius	3/16"	5/16"	5/8"	1 1/2"	2 1/2"	5 1/2"	7"

Safety tests should be tailored to your instruction and aligned with the safety instruction. While True/False (T/F) questions are commonly used Multiple Choice questions are generally considered a more rigorous form of assessment. For example:

T/F Safety glasses must be worn in the shop.

or

Safety glasses must be worn:

a. Only when grinding metal
b. Only when operating a tool such as a table saw
c. At all times in the shop
d. Only when not wearing a face shield or welding helmet.

Commonly teachers will require a student achieve 100% to be allowed to work in the shop. Students should be allowed to re-take the test until they achieve a passing score.

Example Safety Tests

The examples below use a variety of question types. When developing a safety test be sure to always include the key points from the safety curriculum.

General Safety Rules

1. T F Approved eye protection must be worn at all times when working in the AGET Shop.
2. T F Clothing of <u>any</u> type may be worn as long as it is work clothing.
3. T F All special set-ups must be checked by the instructor before the power is turned on.
4. T F Inspection of power tools for satisfactory operating conditions is not necessary immediately after another person has used it.
5. T F Open-toed shoes are not permissible while working in the AGET shop.
6. T F Work areas must be left clean and damaged tools repaired or reported to the instructor before you can consider the area safe to leave.
7. T F Exits must be kept clear at all times.
8. T F Long hair may be worn in any style that the student enjoys.
9. T F The choice of the tool for the job is not a significant consideration in safe shop operations.
10. T F Sharp cutting tools are safer than dull ones.
11. T F Properly grounded outlets and equipment are essential for shop safety.
12. T F All injuries, no matter how small, must be reported to the instructor.
13. T F All guards must be in place, in operating order, and used at all times.
14. T F Students can wear any jewelry they wish in the Ag. Mechanics shop.
15. T F Any liquids spilled on the floor should be wiped up immediately.

16. T F Loose hammer heads are not a hazard in the shop.
17. T F Chisels and punches are allowed to have mushroomed heads as large as 1/8".
18. T F Files without handles are permitted for some jobs.
19. T F Screwdrivers may also be used as pry bars.

Router Safety Quiz

1. Always wear safety glasses and hearing protection.
   T/F
2. _____ should always be disconnected before making any adjustments or changes.
3. The bit should be securely mounted in the _____ and the base should be tight.
4. Ensure stock is free from_____ before starting work.
   a. Nails
   b. Staples
   c. Screws
   d. Foreign objects
   e. All of the above
5. All cords should be kept clear of the cutting area.
   T/F
6. Both hands should always be used on the router.
   T/F
7. When routing around outside edges the router should be guided counter clockwise around the work.
   T/F
8. If the wood is hard use two or more passes to prevent wood from burning or kickback.
   T/F
9. Always test depth of cuts on a piece of _____ lumber.

Foot Shear Safety Quiz

1. The shear must be operated by:
   (a) several students at once;
   (b) an advanced student and the shop foreman;
   (c) one student and a helper; or
   (d) only one person at a time.
2. You should make sure that the foot that is not being used to operate the foot treadle of the shear is kept:
   (a) on the treadle;
   (b) under the treadle;
   (c) clear of the treadle; or
   (d) away from the floor.
3. When using a shear, you should keep your fingers:
   (a) near the clamp and blade;
   (b) under the clamp and blade;
   (c) away from the clamp and blade; or
   (d) between the clamp and blade.
4. After pushing down on the shear's treadle for a cut, you should allow the treadle to:

(a) stay down;
(b) return to its normal position as fast as possible;
(c) return only part way; or
(d) return slowly to its normal position.

5. The shear must be operated by only one _____ .
6. You should make sure that the foot that is not being used to operate the foot treadle is clear of the _____.
7. When using the shear, you should keep your fingers away from the clamp and_____.
8. After pushing down on the shear's treadle for a cut, you should _____ allow the treadle to return to its normal position .

Assessment Methods

Hand scored tests are simple to create. Fill in questions can be used. The trade-off is of course the time it takes to score them.

Machine scored tests such as a Scantron type can also be used. The scoring is fast and saves time. It is limited to T/F or MC type questions. Always save a copy of the test when filing the answer sheets.

Online platforms like Canvas (a learning management system) or Google forms can be used if students have online access. These can provide automatic scoring and instant feedback to the student. On some systems fill in questions are possible. Be cautious when using scored fill questions in as correct answers may not be scored correctly. When using these systems be sure to save the scoring results and the test form for your records. These systems provide an export option to capture the results of the assessment.

Record keeping

Keeping good records of your safety instruction is very important should the need arise to provide documentation. Copies of all safety tests should be maintained.

A filing system should be established for completed safety tests. In addition, a spreadsheet can be used in the current course to ensure that all students complete the safety test before being allowed in the shop.

If scantron forms are used a copy of the test should be filed with the forms. If online testing is used the test and results should be captured. Often test results can be exported.

For example:

Introduction to Agricultural Mechanics Safety Test Completion Period 4 2023										
Student	General	Plumbing	Cold Metal	Drill Press	Table Saw	Band Saw	Painting	Gas Welding	Electrical	Arc Welding
Alaniz, Gabe	X	X								
Almeida, Justin	X	X								
Anderson, Gage	X	X								
Bergman, Isaac	X	X								
Bourbeau, Carter	X	X								
Cadruvi, Adam	X	X								
Chavez, Christo	X	X								
Cisneros, Marco	X	X								
Cordeiro, Joe	X	X								
Dickison, Aaron	X	X								
Gonzalez, Dafne	X	X								
Gonzalez, Israel	X	X								
Graves, Mary	X	X								
Humble, Michael	X	X								
Hurtado, Adrian	X	X								
Maragos, Matthew	X	X								
Ochoa, Daniel	X									
Perez, Noah	X	X								
Roberts, Jill	X	X								
Romero, Fabian	X	X								
Ruff, Lucas	X	X								
Silva, Jacob	X	X								
Silveira, Cordero	X	X								
Torres, Eduardo	X	X								
Vazquez, Miguel	X									
Vierra, Robert	X	X								
Wilcox, Samuel	X	X								
Yori, Susan	X	X								

This spreadsheet can posted in the classroom.

Record Retention

Proof of satisfactory instruction would include:

- The instructional unit (safety lesson outline). These document what instruction was given.
- The assessment (test) administered.
- Record of the students passing the test with date and score

These records should be retained for some period. Tort law will vary by state but commonly there is a statute of limitations for suits brought under tort law and records should be retained for this period. The period could be longer than 5 years after graduation. In the event of an accident, copies of records should be available to the district and their representatives. If an injury occurs then records must be retained until any possible litigation is resolved.

Records can be filed by year and course. If protected (cloud) electronic storage is available this is an acceptable alternative to paper files.

Accident Reporting

Teacher's must be familiar with the district procedures for accidents. These would include:

- Who to call. This may depend on how serious the accident is.
- The teacher's role.
- Reporting requirements.

References

California Agricultural Teachers' Guide to Safety, ed. Dr. Michael Spiess and Kathleen Reid (2017, at http://www.agedweb.org/TeacherResources/Safety%20Guide.pdf).

Career and Technical Education Health and Safety Education Guide, ed. Robyn Buck (Olympia: Washington Office of Superintendent of Public Instruction, 2009).

Career and Technical Education Laboratory Safety Manual Colorado, ed. Kellie Enns and Michael Womochil (Denver: Colorado Community College System, 2011).

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Safety Guide for Career and Technical Education, ed. Office of the Superintendent for Public Instruction (Olympia: Washington Department of Education, 2002).

Safety Guidelines for Career and Vocational Arts Programs, ed. Summit County Combined General Health District (Akron: Summit County Combined General Health District, 2015).

Trade and Industrial Education Facility Guidelines, ed. Ron Whiston (College Station: Texas A&M University, 2001).

Vocational Education Safety Instruction Manual, ed. Russell Cropley and Susan Sloan Doherty (Juneau: Alaska State Department of Education, Juneau Division of Adult and Vocational Education, 1990).

Safety Guidelines for Elementary Sciences & Technology Education, ed. Pennsylvania Department of Education (Harrisburg: Pennsylvania Department of Education, 2002 [revised 2013]).

Activity #1

Develop an outline for the safety instruction for a push stick wood working project. The project will involve the use of a bandsaw and palm sander and new tools and the drill press that has already had safety instruction (short review only). What are the key safety points for using these tools?

Push Stick

Description:

A push stick is a device made of wood which has a notch on the end. A push stick is used to push or guide stock on a table of a power tool. The use of a band saw and drill press will be taught.

Materials:

1" x 4" #3 Common Pine
Heavy paper (or file folder)
150 grit sandpaper

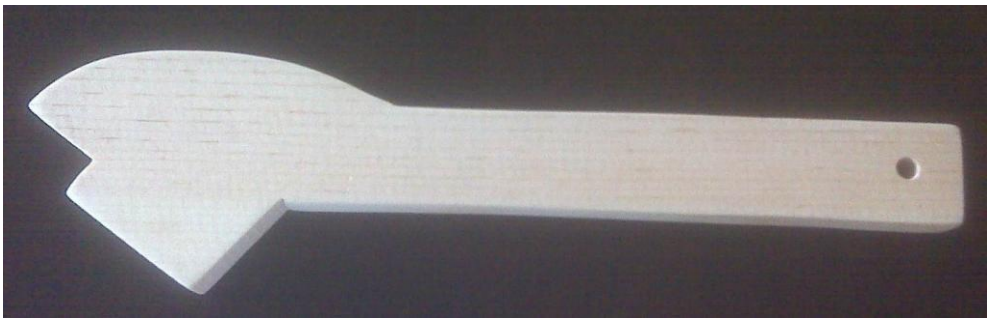
Tools:

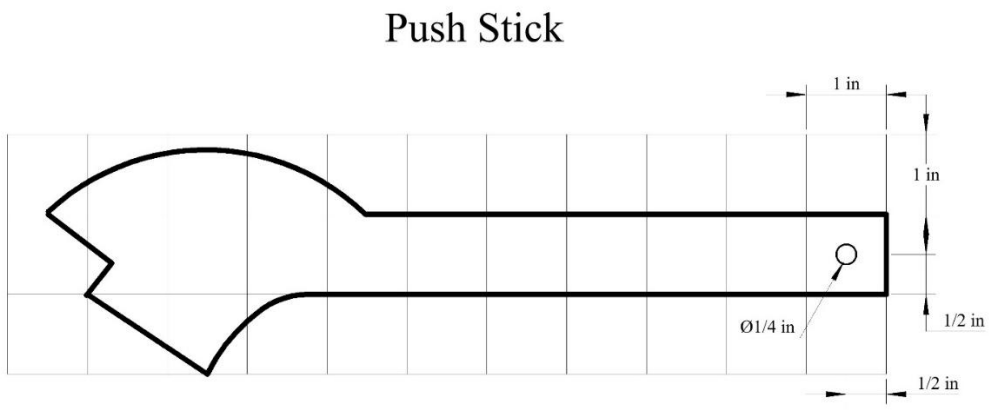
Combination square
Scissors
Band saw
Drill press
¼" twist drill
Palm sander

Procedure:

1. Obtain a piece of 1 x 4 #3 common pine which approximately 12 long."
2. Using a combination square rule layout 1" grids on some heavy paper.
3. Sketch the outline of a push stick as shown in the plan.
4. Cut out this outline and use as a template.
5. Using the template, mark out the push stick on the lumber. Avoid knots.
6. Bore a ¼" hole in the handle using a drill press.
7. Cut out the push stick using a band saw.
8. Sand and finish the push stick with a palm sander.
9. Turn in the finished push stick, your template, and the work sheet for grading.

Photo/Drawing:





Activity #2

Develop a 10 question multiple choice test for band saw safety. Include the key to the test.

Activity #3

You have already provided complete instruction on the use of the cutoff saw. Later in the term you are using it again for a new project. Using the outline below highlight 3 of the most important items to review. Why did you choose them?

Metal Cutoff Saw (Chop Saw) Safety

- Wear eye and hearing protection.
- Wear proper clothing. Remove jewelry, eliminate loose clothing, and confine long hair.
- Wear appropriate gloves when handling the stock.
- Make sure the stock is tightly clamped in place before starting your cut. If it isn't, the blade will grab it and roll it around.
- Keep your hands clear of the path of the blade at all times. Some of these saws cut automatically; on others, you control the cut. In either case, keep your hands clear and out of danger.
- Do not force the cut. There is often a temptation to speed things up by pushing on the saw but this could overload the machine or damage the blade.
- Although these saws cut automatically, you should always watch the cut as it proceeds. The blade could twist or jam, the stock could twist free, or the saw could fail to stop when it should. Be there.
- Take care in handling fresh cut pieces of metal; they could be sharp and hot. Cool and deburr them right away.
- If metal chips or filings build up in the saw, turn it off and clean it with a brush. Never use your hand. Metal slivers really hurt.