

CRITICAL ANALYSIS OF XYZ SECONDARY SCHOOL TECHNOLOGY
EDUCATION INTERNAL SAFETY PROTOCOL

by

Kevin R. Nelson

A Research Paper
Submitted in Partial Fulfillment of the
Requirements for the
Master of Science Degree
in

Risk Control

Approved: 3 Semester Credits



Research Advisor

The Graduate School

University of Wisconsin-Stout

December, 2003

CRITICAL ANALYSIS OF XYZ SECONDARY SCHOOL'S TECHNOLOGY

EDUCATION SAFETY PROTOCOL

by

Kevin R. Nelson

A Research Paper
Submitted in Partial Fulfillment of the
Requirements for the
Master of Science Degree
in

Risk Control

Approved: 3 Semester Credits

Research Advisor

The Graduate School

University of Wisconsin-Stout

Month, Year

**The Graduate School
University of Wisconsin-Stout**

Menomonie, WI 54751

Abstract

(Writer)	Nelson,	Kevin	R.
	(Last Name)	(First)	(Initial)
<hr/>			
Critical Analysis of a Secondary School's Technology Education Internal Safety Protocol			
(Title)			
M.S Risk Control	Dr. Brian Finder	December 2003	59
(Graduate Major)	(Research Adviser)	(Month/Year)	(No. of Pages)
<hr/>			
American Psychological Association, 5 th Edition			
(Name of Style Manual Used in this Study)			

This study will present a critical analysis of XYZ school's technology education internal safety protocol as it relates to loss and loss potential. This study will investigate faculty and staff concerns as well as observations made on assessments of the technology education lab space. Also included is a review on incident documentation at XYZ school.

A literature review will discuss multiple aspects of a complete internal safety protocol as presented in published safety guides from other school districts as well as professional publications. Areas presented include, but are not limited to, room design, illumination, incident documentation, first aid, machine guarding, and personal protective equipment. Industry standards will be reviewed and a need for documented standards and internal protocol will be stressed.

This study will conclude with suggestions and recommendations for the technology education department at XYZ school. The purpose of recommendations made will be to provide a guide for establishing complete documented policies and procedures, assist with resolutions of existing safety concerns, and highlight problem areas with regards to documentation that potentially put XYZ school at risk for loss related to civil litigation. Ultimately, the objective of recommendations made in this study is to assist in providing a safer learning and work environment for students, staff, and faculty.

ACKNOWLEDGMENTS

I would like to acknowledge Dr. Brian Finder for his guidance and expertise and thank him for his profound patience. I would also like to thank my wife Heather for lending her support. Because of her, I wouldn't be where I am today.

TABLE OF CONTENTS

	Page
.....	
ABSTRACT.....	ii
CHAPTER I: INTRODUCTION.....	1
Purpose of the Study	1
Research Objectives.....	2
Significance of the Study.....	2
Limitations	3
Assumptions.....	3
CHAPTER 2: LITERATURE REVIEW	4
The Technology Education Classroom.....	4
<i>Attitudes</i>	5
<i>Facility Design</i>	6
<i>Materials Handling</i>	10
<i>Machine Guarding</i>	12
<i>Personal Protective Equipment</i>	13
<i>Teaching Safe Work Practices</i>	17
<i>Written Safety Policy and Procedure</i>	18
<i>Legal Responsibilities and Documentation</i>	19
<i>First Aid</i>	22
Summary.....	23
CHAPTER 3: METHODOLOGY	25
Description of Information	25

Procedures.....	25
<i>Classroom Assessment</i>	25
<i>Incident Reports</i>	26
<i>Interviews</i>	26
Data Analysis.....	26
Limitations.....	27
Summary.....	27
CHAPTER 4: RESULTS.....	28
Incident Reports.....	28
<i>Format and Content</i>	28
<i>Critical Analysis of Content</i>	30
Interviews with Staff.....	34
<i>Interviews with the Instructors</i>	34
<i>Interviews with Custodial Staff</i>	40
Physical Assessment of the Labs.....	42
<i>September 16, 2003</i>	42
<i>December 5, 2003</i>	43
Summary.....	43
CHAPTER 5: DISCUSSION.....	45
Purpose and Goals.....	45
Methodology.....	45
Conclusions.....	45
Recommendations.....	46

<i>Documented Policy and Procedure</i>	46
<i>Incident Reporting</i>	47
<i>Housekeeping</i>	49
<i>Room Design</i>	50
<i>Safety Education</i>	51
<i>First Aid Kits</i>	52
<i>PPE</i>	52
<i>Attitudes</i>	53
Summary	53
References	55
Appendix A	56
Appendix B	57
Appendix C	58
Appendix D	59

CHAPTER I: INTRODUCTION

Technology education is defined as a subject taught in schools aimed at developing skills and familiarity with tools and machines as well as industry, its products, and their socio-economical/cultural impact (Alkin, 1992). Secondary schools today provide curriculums in technology education with many different types of tools and equipment processes. In the past, it seemed like students and instructors who work in a technology education shop class or lab and manipulate different types of tools and equipment processes are more likely to be exposed to incidents that lead to injuries.

XYZ secondary school is located in a northern midwestern part of the United States in a city with a population of about 60,000. The technology education department has an average of 20 students per class with two full time instructors, one part time instructor, one part time student teacher and two full-time custodial employees who work within the shop lab. XYZ school has two shop labs that possess a variety of tools and equipment for different curriculum. The technology education department has experienced some loss with injuries to students as well as property damage to equipment and facilities. Due to the school's insufficient accident reporting system and lack of documented internal protocol, there are not accurate statistics on the frequency and the cost of the accidents. For these reasons, XYZ middle school's technology education department is at significant risk of experiencing loss and personal injuries.

Purpose of the Study

The purpose of this study is to determine the extent to which effective practices for controlling technology education shop class-related exposure and property loss at XYZ secondary school are present.

Research Objectives

The objectives of this study are to analyze

- The various risk control practices that are being employed by XYZ school's faculty and staff.
- Student/employee injury and property loss reports at XYZ school.

Significance of the Study

Considering a society that is increasingly more litigious, it is critical that XYZ school identify current undesirable conditions, create a plan to correct these conditions, develop effective risk control policy and procedures, and devise detailed reporting and documentation processes for all actual and identified potential loss. In the research collected, statistical information regarding injuries to students and staff, property damage, and other miscellaneous losses are almost non-existent which essentially is the issue at XYZ school. According to Dennis Kozich (personal communication, October 17, 2003), the representing attorney for the State Department of Commerce in which XYZ school resides, absolutely no information is available regarding past inspections of the school district that XYZ school belongs to. Consequently, the safety coordinator for the school district is concerned about such a lack of post-loss as well as pre-loss oriented information.

The school district's safety coordinator is aware of a limited number of documented accident reports with regards to student injuries and is only able to offer word-of-mouth reports with regards to actual property loss. The safety coordinator is concerned that reported incidents might go unresolved and that any resolution would go undocumented. At any time, XYZ school may be liable for technology education

classroom related loss and would have little or no documentation to protect themselves, not to mention that the policy and procedure for safety in such classrooms is scant at best.

Limitations

1. This study was limited to the lack of existence of documentation regarding resolution to incident reports of loss to students, staff, and property at XYZ school.
2. This study was limited due to the minimal statistical information relating to national or statewide student and/or teacher injury rates, property loss rates, and statistics regarding written policy and procedure in school technology education classrooms.
3. This study is limited to XYZ school and it's associated school district.

Assumptions

It is assumed that all information provided by staff at XYZ school as well as all information collected in the literature review and research is accurate and truthful.

CHAPTER 2: LITERATURE REVIEW

Chapter two will review literature that examines technology education classrooms. Primary sources consist of policy and procedure guidelines for various school districts and publications that spoke to the same or similar issues raised in those guidelines. This literature review will closely examine various facets of the technology education classroom and relate them to the literature mentioned.

The Technology Education Classroom

All over the United States it seems as though schools are recognizing the need to have standardized policy and procedure regarding technology education. Research would indicate that having documented protocol for the technology education classroom is becoming standard. Anoka-Hennepin School District in Minnesota has developed a policy and procedure manual for their vocational and technology education programs, in which they include several articles relating to the subject material including one titled *Injuries Sustained by Students in Shop Class* by Stacey Knight (as cited in Anoka-Hennepin, 2003). In her report, Ms. Knight discusses the fact that many if not all machines and equipment used in the industrial arts classroom are designed for adult sized hands and body structure. She goes on to recognize that in the workplace minors (under the age of 18) are not allowed to work with many of the same tools they are allowed to use in the classroom. Ms. Knight concludes that due to this disparity of proportions, the use of such machinery and equipment has a substantial risk for injury. While downsizing circular saws and power-driven woodworking tools to fit the hands and stature of a 13 year old would be ideal, it could be next to impossible logistically and financially. First,

one would have to find a company that would customize such equipment. Secondly, the classroom would have to contain three to four different sizes of the same machine as children develop differently. Finally, if one were able to accommodate both of the previous points, it could be reasonably expected that the cost would be unacceptable to most school budgets. What can be realistically taken from Knight's article is the encouragement to provide a detailed review of technology education classrooms and how they are to conduct a proper safety program.

Since complete, concise, and documented policy and procedure seem to be the standard for schools similar to XYZ, it would only make sense to review policy and procedure being used in other schools. Dr. Terry Bergeson, Washington's State Superintendent of Public Instruction, as well as the Pennsylvania Department of Education and the New Jersey department of Education and other numerous publications have provided guides for the industrial arts classroom and similar atmospheres. While such guides appear to be thorough, they caution that the suggestions and guidelines offered are not absolute. It is with this in mind that these guides are reviewed.

Attitudes

It can be argued that the most important safety tool in the classroom is the attitude toward safety not only of the student, but of the parents and instructor as well. In order to promote a positive attitude, the Anoka-Hennepin School District provides permission slips for the student and parent to sign to participate in the technology education program. This permission slip states that student agrees to a "Safety Pledge," which is an agreement to follow all of the safety rules and to use machinery only if they are knowledgeable about its safety features. Parents agree that they will also be familiar with

the pledge and encourage the student to obey it. Anoka-Hennepin advises that once the permission slip is signed, it is up to the teacher to encourage, teach, and model safe practices. (Anoka-Hennepin Vocational & Technology Education High School Safety Manual, 2003, p.8-9). While permission slips and safety pledges can be useful tools, little is mentioned about consequences for actions that result in poor safety habits other than a grade reduction. Unfortunately, a decrease in grade may not always be enough to stop a troublesome student.

Other schools also support a positive and constructive attitude related to safety in the technology education classroom. The Pennsylvania Department of Education's *Safety Guidelines for Technology Education & Elementary Science/ Technology Education* explains that thorough and detailed safety education develops a level of consciousness in the technology education classroom that is positive and effective in preventing accidents (Pennsylvania Department of Education [PDE]., n. d.). It goes on to point out that safety education regarding attitude is critical in the effort to protect the school and its employees from liability. Bergeson cautions "The task of overcoming the 'it can't happen to me' attitude is a big one and requires safety awareness to be an integral part of the everyday instructional program" (Bergeson, Heuschel, Lahman, Fieldman, Broom, 2002, p.8). While these guides point out the necessity of a positive attitude towards safety, they neglect to provide any suggestions as to how to combat or cure poor attitudes that may already exist.

Facility Design

One basic step towards a safe technology education classroom is the design of the actual space. The placement of machines, tools and work places proper ventilation, dust

collection; and noise reduction are effective ways of ensuring the safety of staff, students, and property alike. While some of the suggestions in the Pennsylvania safety guide and many in the New Jersey safety guide would only be feasible if one were remodeling the space or creating a new room, most of them are simple and could be considered cost-effective.

OSHA could be considered an important resource to use when considering the design of a classroom space. OSHA guidelines are the standard by which the Department of Commerce will inspect XYZ school. XYZ's State Department of Commerce refers to its own *Chapter Comm. 32* for the inspection of industrial arts classrooms (E. Hands, personal communication, October 15, 2003). According to Hands, the public sector safety program manager for the State Department of Commerce, *Chapter Comm. 32* is entirely based on OSHA standards. PDE agrees that OSHA should play an important role; they strongly suggest that all tools and machines in the technology education classroom comply with OSHA standards (n. d.). While many may agree that OSHA standards are appropriate for the classroom, the guides mentioned in this paper failed to include specific OSHA guidelines relating to any machine, tool, or other matters in the technology education classroom.

Many machines in a technology education class such as planers and saws can create the kickback of stock or raw material. It is recommended by PDE and others that such machines be placed in a way that the movement of stock would not enter into areas where one may be standing (n. d.). Bright lines should be painted around these areas as well as other potentially dangerous zones. Proper spacing between equipment, in aisles, and around areas where students or staff may congregate is also critical in creating a safe

environment and, as such, a student to floor space ratio of 100 to 125 square feet to one student is suggested. A master cut-off switch for all machines must be present and easily accessible in an emergency. A general guide to the amount of square footage suggested is helpful, however a more detailed description of the amount of space that should be allotted around any particular piece of equipment could be more informative.

PDE gives multiple noise reduction suggestions that are easy to use and would most likely be considered budget friendly. Regular maintenance of equipment including proper alignment and sharpening of blades, looking for alternative procedures and equipment that are quieter, and the use of sound absorbing materials are strongly suggested (n. d.). The use of proper ear protection is essential, especially when a normal speaking voice is unable to be heard from two feet away. Hearing protection, in the form of personal protective equipment, will be discussed later on in this chapter.

Two very basic suggestions are offered by PDE with regards to dust collection; scrupulous cleaning of machines, tools, and workplace and the use of simple dust masks by staff and students when needed. Other ideas include the addition of dust collectors to specific machines or portable power tools. If the lab area is air-conditioned, a central dust collection system is a must (n. d.). Specific chemicals such as surfactants or alcohols that should be used in cleaning, or even a specific schedule for such activities are not discussed. Dust collectors are only mentioned briefly and do not specify as to which tools they should be used on. It may be suggested that for these matters one should be referred to the owner's manual on all equipment.

Clean air is an important source the human body uses to work properly and PDE recognizes this providing an extensive outline for ideal ventilation in the classroom (n.

d.). This outline reviews two forms of mechanical ventilation; localized exhaust and general dilution ventilation systems. Local exhaust ventilation is defined as “...ventilation [that] removes the hazardous materials at or near their point of origin and prohibits them from being drawn through the breathing zone of the worker” (p.72). Local exhaust ventilation systems are ideal when welding, woodworking, using solvents or resins, or whenever a large volume, of contaminated air may be created. Pennsylvania’s manual does provide a few suggestions as to the specific types of ventilation to be used, however, they are not explained well.

General dilution ventilation is described as a process that requires a large amount of air passing through the affected area in order to dilute the contamination to a safe level (PDE, n. d.). Due to the fact that general dilution ventilation may require a fair amount of fresh air to work effectively, the Pennsylvania guide advises that it is best used in classrooms that generate small levels of essentially non-hazardous substances and should not be used in areas where especially volatile chemicals or large amounts of contaminated air would be present. When looking to choose an appropriate form of ventilation, it may be wise to consult an industrial hygienist.

With regards to ventilation, PDE suggests that at no time should unqualified personnel attempt to modify ventilation systems as it may do more harm than good (n. d.). It is reasonable to assume that incorrect repair or modifications may contaminate the air more, become a fire hazard, or create other significant complications. PDE emphasizes that due to the particular nature of air quality control and ventilation and the need to be accurate in all measurements, an industrial hygienist or mechanical engineer should be consulted in matters regarding ventilation systems. Proper ventilation is an

extremely critical area and should not be compromised by school budgets or attitudes as this can only lead to a negative effect on someone's health.

Appropriate lighting must be present in order to be able to properly see what one is doing. Kobylarz and Olender of the State of New Jersey make suggestions for illumination or lighting in the technology education classroom. The statement is made that while the "Illuminating Engineering Society" sets lighting standard for a technology education lab, Kobylarz and Olender feel that stronger illumination is needed (1983; refer to Appendix A). Adequate lighting could be viewed as an easy and cost effective way to prevent injury and would be far less expensive than a trip to the emergency room.

Materials Handling

It is likely that many people have poorly stacked wood only to have it tumble on top of them or have carried too heavy of a load and injured their back. Proper material handling is yet another cost effective way to move raw stock from storage to final product while preventing injury (Kobylarz & Olender, 1983.). Essentially what this section is referring to is the appropriate manner in which materials in the classroom should be lifted, carried, and stored. According to the New Jersey safety guide, 13% of all reported school accidents between 1978-1979 were related to poor material handling and storage. While this statistic is 25 years old, it is probably one that could still argue the importance of proper body mechanics and material storage today. This idea is supported by a more recent 1993 publication titled *The Complete Manual of Industrial Safety* in which Mansdorf points out that industrial engineers spend most of their careers mastering materials handling (1993). This one task is viewed as a major part of many

risk control jobs and can be considered one of the single most important skills in preventing broad-spectrum physical harm.

Mansdorf outlines some primary reasons as to why materials handling is such a critical area. First and foremost, the possibility of back strain, lacerations, contusions, and joint injuries are associated with the improper movement of items (1993). In addition, poor movement and storage could cause spillage resulting in a slip or fire hazard and improper storage may cause the tumbling or falling of materials resulting in physical harm (p. 203). Thus, proper materials handling is critical in preventing many different accidents from occurring.

The New Jersey safety guide states that in order to reduce risk related to materials handling, the teacher should evaluate this area carefully (Kobylarz & Olender, 1983). Efforts made to improve materials handling should center on preventing traffic congestion, unnecessary accumulation of materials or scraps, and inefficient use of available space. Included with this statement is a list of suggestions and guides when seeking to improve material handling in the classroom (see Appendix B). The reader is also referred to the National Safety Council recommendations for safe storage of materials, tools, chemicals, and fire safety, stating that this resource is the standard to be used in the lab. Given the detailed nature of these guides, it would seem reasonable that efforts should be made to develop written procedure regarding materials handling to standardize a system.

Machine Guarding

The term machine guarding is used to describe the parts of a machine that prevent material from being thrown and protect fingers, hands, and other body parts from sharp blades or instruments (Asfahl, 1999). PDE views machine guarding as one of the most crucial areas of safety in the technology education classroom (n. d.). According to the Pennsylvania safety guidelines, the two most common types of guards in educational settings are fixed enclosures and adjustable enclosures. Fixed enclosures are permanent guards that will allow entrance of the material being worked on, but not allow access of human extremities to the dangerous movable mechanics of the machine. Adjustable enclosures have kickback features, chip removal capabilities, and other safety accessories that are typically found at the processing point. It should be noted that adjustable enclosures would not stop access to moveable mechanics like a fixed enclosure. PDE points out that the student and instructor should be well versed as to which safeguarding system is being used on any particular piece of equipment. It may also be a good idea to print a brief safety and machine-guarding list next to a particular machine so that one is not relying on memory alone when using safety features.

PDE recommends using OSHA regulations for machine guarding in the classroom (n. d.). Appendix C includes a list of the suggested OSHA requirements as printed in the Pennsylvania Safety Guidelines. The best way to use proper guarding is to refer to the owner's manual of each piece of equipment. In addition, students should be tested accordingly before using them. It should also be stated that proper lock-out or tag-out devices be used when a machine guard is in poor working order (or when the machine is in general disrepair). Every year it seems as though new stories are reported about

significant injuries related to poor machine guarding. When properly used, machine guards may save a limb or even a life.

Personal Protective Equipment

Once a teacher or a school has designed and modeled the technology education classroom with safety in mind, has confirmed that proper machine guarding is in place and that materials are being stored and transported with caution, personal protective equipment (PPE) becomes next on the list when devising a classroom safety plan. According to the Anoka-Hennepin School District, PPE in an educational setting similar to that of XYZ school is usually limited to appropriate and protective clothing (no bare midriffs, shoes that cover the entire foot, etc), hearing protection, and eye protection (2003). It is important to accurately assess student attitudes towards wearing PPE and address them appropriately (p.6). It is possible that in certain situations students may be resistant to wearing PPE. In this circumstance it may be wise for a teacher to uncover the reasons why and to discuss them openly with the students.

Regulating appropriate attire for the industrial arts classroom today may be a difficult challenge, but one that is defiantly worth pursuing. The New Jersey safety guidelines describe the appropriate clothing to be dense enough to provide protection from possible projectiles (Kobylarz & Olender, 1983). It goes on to state that clothing should be comfortable without being loose, have short sleeves or the ability to roll up the sleeves securely, be in good repair so as not to snag on machinery, have cuffless pants, and should not have any attached accessories. Kobylarz and Olender also advise that at no time should neckties, scarves, or jewelry be worn in the classroom. Proper footwear is a must; shoes with open toes, worn without socks, or shoes that have a high heel are not

an option in a technology education classroom. It should be noted, however, that the New Jersey neglects to mention that wearing baseball caps or hats may impair vision and should not be worn.

In addition to appropriate clothing, gloves are another important form of PPE that should be included. As outlined in the New Jersey guide, gloves can prevent burns, lacerations, abrasions, and other common hand injuries. Heavy-duty leather gloves are suggested for woodworking and handling, a flameproof type gauntlet for welding, and appropriately selected rubber gloves for the manipulation of irritating chemical substances (Kobylarz, Olender, 1983, p.59-66). While the use of this form of personal protective equipment can prevent chemical-based skin damage, it may be beneficial for teachers to be aware of possible allergic reactions that have been reported to occur with latex-type gloves.

People rely extensively on their sense of sight it is for this reason that extra precaution should be taken to protect one's eyes. Mansdorf states that

The OSHA standard for eye and face protection (29 CFR 1910.133) requires that protection be used if there is a reasonable chance injury will occur. Eye and/or face protection needs to be provided if machines or operations present the following hazards: flying objects or particles, airborne dusts, glare, splashing liquids, ultraviolet radiation, and any combination of these hazards" (p. 155).

Thus, the staunch position that OSHA takes on this issue gives credence to the requirement that eye protection be worn when a student or staff member is working with machinery as well as chemical and biological hazards in the lab.

There are several forms of eye protection that technology education instructors can select from. Mansdorf (1993), discusses spectacles which are described as being made out of plastic or hardened glass and are recommended when being exposed to situations that would generate an frontal impact such as hammering. Side shields should be added to spectacles when there is a possibility of material entering the eye laterally. The density of the shield should depend on the size of the expected particles. While many types of protective eyewear may possess universal application, the type of eye protection worn should be re-assessed on an ongoing basis as the need for different types may change as a project progresses or as equipment in the technology education lab changes.

Because of their enclosing type design, goggles could be preferable in areas where liquids are a hazard to the eye (Mansdorf, 1993). Goggles are generally tight fitting cups with ventilation fashioned around the cups to prevent fogging. Face-shields cover the entire face and are generally made out of a hard plastic or wire mesh. Face-shields are useful when preventing a splash exposure, but are not recommended when preventing impact related events. In regards to welding helmets, Mansdorf states that they should be equipped with a shaded window to protect the eyes from radiation. He also states that they should be used at all times during any welding operation. A good fit should be assured on all eye protection as the size of the face and head may differ greatly from one student to another.

There is considerable debate about individuals wearing contact lenses in a technology education setting. Both the New Jersey and Pennsylvania guides advise against it (PDE, n. d.; Kobylarz & Olender, 1983), but without giving specific reasons as

to why. More recently, Mansdorf (1993) states that wearing contacts in such a setting is acceptable if the supervisor, or in this case teacher, is aware of the individual's use of contact lenses and that all parties are informed that wearing contacts is not advisable when around certain chemicals. In emergency situations, staff administering first aid should be aware of when to remove contact lenses and how to do so safely. Keeping liability in mind, it may be a wise idea to have parents or guardians sign a release form which gives their approval for the student to wear contact lenses in a technology education lab.

Hearing loss is another possible risk that students may be exposed to in the technology education classroom and it is one that is likely to be the most preventable. Kobylarz and Olender (1983) provide a detailed assessment of hearing protection that is most commonly available in the classroom. Three categories of hearing protection are mentioned in their guide. The first is a muff type of protector that is described as thick cups that molds around both ears and are typically connected by a thick headband. Muff type protection is noted as probably the most effective in protecting hearing, however it can be quite cumbersome and one may prefer other options if deemed appropriate. Due to the likelihood for younger people to have reduced head size, the muff style protection may be uncomfortable for smaller students.

A soft cushion-type of protector is another form of hearing conservation equipment that Kobylarz and Olender recommend (1983). This form of hearing protection provides a soft pad that completely covers the entrance to the ear canal without covering the entire ear. The headband is thin and more lightweight than the muff type protection, however sizing is an issue, as the pad must fit appropriately. In addition, it

has been found by the researcher that the headband tends to conduct noise/impact noise to the ear pads.

Finally, disposable earplugs are generally sponge-type devices that fit inside the ear canal and are designed for one-time use only (Kobylarz & Olender, 1983). The primary complication of disposable earplugs is the fit. The New Jersey guide notes that they can be particularly uncomfortable for people with exceptionally small ear canals and therefore, may be unsuitable for younger student use. While Kobylarz and Olender do not mention it, it is conceivable that proper cleaning of ear muffs is important in preventing transmission of lice or similar afflictions and great care should be taken to do so.

Teaching Safe Work Practices

Having a technology education classroom with the latest and best in safety planning, equipment, and PPE is essentially useless without a thorough working knowledge on how to properly use the equipment. One source that was found to have an excellent outline for teaching standards in safety is the *Anoka-Hennepin School District Vocational & Technology High School Safety Manual* (2003). This manual provides examples of exams and instructional plans for the machinery in a given classroom such as construction technologies or electrical technologies. Anoka-Hennepin requires that the student achieve a 100% score before being allowed to operate the machinery in the classroom. The teacher is then instructed to observe the students vigilantly. If a particular student is observed to have poor or incorrect safety procedures, that behavior should be deducted from their final grade or, in extreme circumstances, the student

should be removed from the classroom (section C-E). A suggested format for this grading system from Anoka-Hennepin is also available in their safety guide.

The teaching and testing formats suggested by Anoka-Hennepin appears to be complete. They review each piece of equipment used in detail and then require a test on each. The grading form provided displays a helpful grid for deducting appropriate percentages for unsafe acts, but has no space for a detailed description of these acts which may be helpful when meeting with parents or other staff members. Detailed accounts may also be helpful when developing teaching strategies in the future.

Written Safety Policy and Procedure

As stated in the beginning of this chapter, the presence of written policy and procedure appears to be the standard among schools with technology education curricula. According to the safety coordinator for the school district that governs XYZ school (personal communication, November 10, 2003), XYZ school has only one written policy regarding safety. This policy was written in the mid-1970's and it only concerns eye protection. Due to a lack of other written guidelines as well as the dated nature of their eye protection policy, it could be argued that XYZ school is at risk for a variety of accidents. Teachers are left to determine their own standards of safety and procedure, which may be unpredictable in quality. This lack of documentation can lead to possible legal issues when a student or teacher is seriously hurt and such policy and procedure comes into question.

According to Anoka-Hennepin school district, the state of Minnesota was scrutinized for its policy and procedures in a recent WCCO "I-Team" report. A memo printed in the 2003 safety from the Anoka-Hennepin school district to technology

education teachers and staff, stated that in response to the WCCO “I-Team” report, Minnesota was in the process of updating the technology education facilities with machine guards and safety switches. The communication also mentioned that due to the report, awareness had developed regarding lawsuits in school districts that came about due to injuries that took place in technology education labs outside of the school day. As a result, it was to become written policy that Anoka-Hennepin labs were no longer to be used by staff, students, or citizens without direct instructor supervision. The direct nature of this communication illustrates Anoka-Hennepin’s stance on updating written policy and procedure as well as employing proper safety measures. Noted is the perceived increasing amount of civil actions taking place as well as news media involvement. Clearly, formal protocol is needed to protect not only the students and staff, but also the school itself.

Legal Responsibilities and Documentation

All of the safety guides and sources mentioned in this paper address issues relating to children being injured on school grounds with the plaintiff alleging that the school is liable. The Pennsylvania safety guide outlines the instructor’s role in preventing negligence (PDE, n. d.). Negligence is defined as

Conduct that falls below a standard of care established by law or profession to protect others from unreasonable risk of harm, or the failure to exercise due care.

It should be noted that in the absence of specific laws or local policies, the profession sets the standard of care expected (p. 11).

In other words, a lack of formal legislation does not release one from the obligation to provide care or services that meet general professional standards (PDE, n. d.). It could be

suggested that if a large number of schools across the nation are requiring formal protocol, for example, then XYZ school should follow suit or expose themselves to the possibility of being found negligent in a court of law.

With regard to the minimization of negligence, PDE states that it is the responsibility of the school board, teacher, and administrators to provide safe conditions (n. d.). It is the teacher's responsibility to perform three basic duties to prevent negligence: proper and complete instruction, vigilant supervision, and maintaining facilities and equipment at an optimal level. Failure to perform these duties could result in a teacher or administrator being liable for damages. In Appendix D, PDE outlines these three duties, which could be considered a standard that has been set and should be followed. As mentioned earlier, failure to meet the standard could result in negligence, which is why this list of duties has validity.

Dr. Terry Bergeson, the Washington State Superintendent of Public Instruction, provides a detailed plan for legal documentation in Washington's *Safety Guide for Career and Technology Education* (2002). Bergeson stresses the importance of teachers, administrators, and school district being fully aware of all state laws that govern technology education classrooms and be continually updated on legislative changes. He encourages detailed, written accounts of incidents that omit opinions and stick to the facts. It is also noted that incident reports should be made immediately after the event has taken place to prevent forgetfulness and that copies of such should be given to the principal and district safety coordinator. Examples of safety forms and releases are also provided with the caution that waivers and permission slips are not a substitute for sound safety precautions. It may also be wise to foster an environment where incident

reporting is used as a learning tool rather than an instrument used to point fingers or to blame.

Suggested safety forms and releases include:

1. **Permission Form:** A form signed and dated by the parent or guardian allowing a student to participate in class. The form should include emergency phone numbers.
2. **Statement of Acknowledgement:** This is a form the student signs stating that they have been given and understand instructions on how to operate equipment safely and correctly.
3. **Student Medical Information Sheet:** To be filled out by the parents, this document includes such information as parents/guardians names, phone numbers, the student's primary doctor, medications, allergies, and any pre-existing condition that may affect the student's performance with relation to safety.
4. **Authorization to Consent to the Medical Care of a Minor:** A form to be filled out by the parent/guardian giving permission for the school to give consent to treat their son/daughter in an emergency situation (Bergeson, et al., 2002, p. 28).

A new law entitled the Health Information Privacy Protection Act (HIPPA) makes it federal law to keep personal student information confidential. According to Heather Nelson RN, BSN, a registered nurse at Sacred Heart Hospital in Eau Claire (personal communication, November 12, 2003), HIPPA prohibits confidential information from being released to anyone but the parents, guardians, or those with written permission

from the parents or guardians. She also states that great care should be taken when discussing students medical concerns with other appropriate staff as any overheard conversation may be repeated and would be in violation of the new law. Thus, the requirements/implications of HIPPA should be reviewed by all teachers and school administrators as well as school nurses as it relates to handling student medical information.

First Aid

Anoka-Hennepin School District requires that a phone with 911 access and a first aid kit be available in technology education classrooms. It also states that teachers should have a basic knowledge of first aid and know cardiopulmonary resuscitation. Contents that should be included in the first aid kit according to Anoka-Hennepin (2003) include one box of adhesive bandages, two (8x10) pressure pads, one triangular bandage, one roll of adhesive tape, one scissors, one elastic bandage, two eye pads, two packages of rolled gauze, four absorbent pads, one First Aid flip chart, one instant cold pack, six vinyl gloves, and one CPR mouth barrier. In addition the guide states that, "First aid boxes should be maintained in each cafeteria, custodial office, physical education locker room, science class area, art class area, and each industrial tech class area. They should be cleaned and restocked at least once each school year" (p. 4). At first the above list may seem complete but a few adjustments may improve the quality of the first aid kit. The first item noted to be open to critique would be the six pairs of vinyl gloves, it may be wise to include them in various sizes as too small a glove is impossible to use and too large may be cumbersome and get in the way. Another item would be an absorbent powder or clumping agent that forms liquid spills into a jelly; this would be useful in the

safe cleanup of blood and body fluids. Eye protection or a face shield would be another item to consider adding to the kit, as they would possibly prevent blood and body fluid exposure to the eyes. Finally, a biohazard sharps container would be a consideration as a means to dispose of any sharp objects that may have blood on them.

Automatic external defibrillators (AED) are currently being installed in malls, airports, or anywhere a large amount of people can gather. According to Heather Nelson RN, BSN (personal communication December 2, 2003), while AEDs are gaining popularity in the public sector, they could be dangerous in a technology education setting like that of XYZ school. If children were to be electrocuted, and their heart sent into a lethal rhythm, the AED would pick this up and advise the operator to deliver a shock. Nelson states this could be dangerous as AEDs are designed to deliver electricity to an adult heart and the heart of a 12 or 13-year-old child could be overwhelmed and stopped by an adult dose of current. As a result, it is not advisable to include an AED in a first aid kit for possible use in a high school, much less a technology education classroom setting.

Summary

School is a time where children should be helped to grow up into knowledgeable adults. It is however, unfortunate that many of the tools we use to teach children in the technology education classroom are designed for adults and possess grown-up forms of hazards as well. This fact then puts the task in front of teachers and administrators to develop appropriate safety plans, protection, and teaching materials for the students. Teachers are also responsible for observing proper safety protocol and enforcing it. Most importantly, to ensure good safety practices as well as to prevent liability, sound and

thorough written policy and procedure that are developed as enforced by the school system a must, as this now appears to be the standard.

CHAPTER 3: METHODOLOGY

This chapter will describe the data to be collected, the method in which it is being obtained, the sources being used, and how it will be analyzed. Limitations to the described methodology will be discussed and examples of questionnaires and similar material will be provided.

Description of Information

The purpose of this study is to evaluate XYZ's technology education classroom as it compares to the standard set by other schools as well as other entities such as OSHA. In the literature review, many of these standards were discussed. While it would be desirable to review each of these as it relates to XYZ school, time and access limits the comparison to five primary areas: attitudes, machine placement and spacing, materials handling, available personal protective equipment (PPE), and first aid supplies. Also included will be information regarding staff observations and concerns as outlined in questionnaires.

Procedures

Classroom Assessment

While visiting XYZ's technology education classrooms a detailed tour of the facility will take place. Objective notations will be made regarding the areas already mentioned as well as any other observations that are of concern. Any problem areas that are noted will be compared to industry standards and literature, detailed descriptions of such areas will be provided.

Incident Reports

Several incident reports made at XYZ school over the past few years will be examined. The quality of the documentation and the incident report form itself will be examined. Observations made regarding these forms will include how the report was completed and whether or not it was performed as directed. A specific review of the incident discussed in each form will not be included.

Interviews

Physical assessment of the classroom is a critical area of data collection and will be complemented with an inquiry of staff observations and views. To accomplish this, XYZ's technology education instructors and custodial staff responsible for these classrooms will be interviewed. Those being interviewed will select interview times and locations. Appendix H contains a copy of the questions that will be used. Information collected in these interviews will be reviewed and assessed for knowledge of subject matter, school policies and procedures, and safety history and concerns. Statements related to current, past, or potential problem areas will be mentioned and investigated with regards to limitations on time, materials, and access.

Data Analysis

In order for the data collected to have purpose it must have meaning and needs to be analyzed. Subjective and objective data will be related to appropriate literature and information. Recommendations suggested later on will be based on these sources as well as professional knowledge and critique.

Limitations

This study faces many limitations which are the limited number of participants available for interview, the lack of student interviews and discussion, and time and access available for physical assessments. Another limitation is the possibility of contamination by staff, administration, or student population. There is a small concern that since the interviews and classroom visits are scheduled, efforts may be made to temporarily conceal potential risk areas therefore limiting a true and complete report.

Summary

This chapter outlines the methodology being used in collecting data related to the technology education classrooms at XYZ school. Every effort will be made to keep identities confidential and observations objective. Results of the data collection will be found in chapter four and chapter five will discuss recommendations and conclusions.

CHAPTER 4: RESULTS

This chapter contains information collected at XYZ school through interviews of teachers and custodial staff, physical inspection of the technology education classrooms, and incident reports made from 1981-2003. The purpose of collecting this information is to analyze risk control practices at XYZ school as well as their history of incident reports regarding injuries and to make recommendations based on those findings. Suggestions, recommendations, and discussion regarding the findings described in this chapter will be found in Chapter 5.

Incident Reports

XYZ school uses a set format for incident reports, and while this format has changed over the years, it remains an important record keeping and learning tool. In this section, 12 incident reports will be reviewed and analyzed for content, format, and injuries reported. These reports were selected by the safety coordinator for XYZ school and reportedly, selected at random. For purposes of this study all names mentioned in the reports will be kept confidential. It should be noted that on all but one report in which a student was named as a witness the safety coordinator omitted student names (the names of teachers who were injured were not altered or removed by the safety coordinator).

Format and Content

The current incident report form consists of six different sections: name and demographics, a section requiring a description of the incident, nature and extent of injury, medical information, witness list, and, finally, the name of the person completing the report and the principal's signature. This form does not include a section regarding

any corrective action that was used to resolve the matter or to prevent future occurrences, or any area that would document follow-up with the injured party.

In order to properly visualize the incident reporting form, a detailed description is provided. Each section is examined for content and format.

1. Name and demographics: This section requires information regarding the name and address of the injured party, their position (student, staff, general public) address, phone number, etc.
2. Description of the incident: This section titled "about the accident" lists the date and time of injury, the name of the teacher or supervisor present, and what activity the injured party was engaging in when the incident occurred. The area requesting information as to what activity was taking place is limited to three typed lines.
3. Nature and extent of injury: This is where the bulk of the documentation describing the actual incident is to take place. A description of how the accident occurred, the nature and extent of any resulting injuries, contributing factors, and, if an employee, the last day worked and the date of return. It should be noted that the field asking the nature and extent of the injuries requires an exact description of the affected body part and character of injury. Each question requiring description is limited to three typed lines. No direction is given on the form as to how to properly document descriptions requiring more space.
4. Medical information: This section details what medical care was given but does not indicate who delivered the care unless the injured party was brought

to a hospital and seen by a doctor. The area provided for a description of first aid given is limited to two typed lines and does not provide space to document any follow-up.

5. Witnesses: Space is provided for the names, addresses, and phone numbers of those who may have witnessed the event, but not for individual accounts or for documentation regarding any discrepancies.
6. Name and title of person completing form: This section provides an area for the person documenting to fill in their name, the date, and the specific school at which the incident occurred, as well as the signature of the principal.

Critical Analysis of Content

The number of reports reviewed that uses the current form was seven and of those, six were student reports and one reported an injury to a teacher. At the top of the report, the person completing the form is instructed to fill out the form immediately and completely, filling in all spaces and using the word “none” for areas that do not apply. The report is to be typed or filled out in ink and a copy sent to the office of the assistant superintendent.

To protect student confidentiality, the top demographics portion of the report had been cut off. However, on the report that described an injury to a teacher, the demographic section was kept intact. All requirements such as name and address were filled out completely (one requirement was left blank: the area requesting the name of the parent or guardian of the student was left blank, rather than filling in the term “none” as required by the directions).

In all seven of the reports, the second section titled “about the accident” all fields contained the appropriate information. However, in the third section where one is to describe the nature and extent of the injury, documentation was scant and many times not completed according to direction. For example, the first field asks the reporter to describe fully how the accident occurred. In a report made in January of 2001 the reporter simply states that the injured party was cutting cardboard sideways and held on too lightly. This description does not provide information regarding what the student was using to cut the cardboard with, what he or she was holding on to too lightly (the cardboard or the cutting instrument), or exactly which direction he or she was cutting. This same report entirely neglects to fill out the field asking the nature and extent of the injury.

In a report made in February of 2001 the description of the accident simply states that someone lost control of a piece of wood and that it hit a student. This description does not include who lost control of the wood (the injured student or another party) and how, exactly, control was lost. In this report, as well as four others, contributing factors are not listed and the term “none” is not used to fill in the field. Like all of the other six reports, the injury mentioned is to an upper extremity but the detail as to whether the injury is to the arm or hand on the right or left side is not noted, the same is true for two of the remaining six reports.

Descriptions regarding nature and extent of injury are limited in many ways. For example, four of the seven reports describe cuts, but do not indicate whether they are on the inner or outer aspect of the extremity and do not detail how long the cut was. Another report describes a burn sustained on the inside of a student’s wrist but neglects to

mention the size of the burn or how it appeared (if it had a blister or was bleeding). Finally, the field asking the last day of work and date of return was left completely blank on the one form that reported a staff member's injury.

The first aid or medical information section of the form also contains scant documentation. Two of the forms state ice was used to treat the injury but do not indicate for how long. Another two reports state the injury was bandaged but neglect to say what type of bandage was used. In all but one, where the patient was noted as being taken to an emergency room, the treating doctor and hospital fields were left completely blank leaving the reader unsure as to whether further medical treatment was needed or not.

Four out of the seven forms list witnesses to the incident exactly as directed. One has left the entire area blank and does not use the term "none" as directed. Another just lists "students" in the field and does not give specific names or addresses and phone numbers as required. The last report simply mentions one name but does not fill in the address or phone number fields.

Finally, three reports have left the last area on the bottom section of the form requesting the name of the person completing the report totally blank and one of the three does not bear the signature of the principal. The date of the report and the name of the school are present on all seven. None of the reports had any extra pages of text, pictures, or diagrams.

Due to a lack of detailed observations and documentation made on the incident report forms, it is difficult to analyze specific incidents of injury and their causes especially when all twelve of the forms being reviewed either deny any contributing factors or simply left the field blank. For example, three of the twelve forms report back

injuries sustained by the same staff member while lifting heavy objects. In each report contributing factors are not listed, so anyone reviewing the forms is left to wonder if this staff member received appropriate training in proper body mechanics and lifting, if previous injury contributed to current circumstances, or if there was a lack of tools or personnel support to assist this staff member.

Another report details a staff member's finger that was three quarters severed while using a table saw. The description of the event states that the staff member was using a table saw to cut a piece of wood when the piece of wood stopped moving and would not proceed with the rest of the cut. The staff member then used a push-stick to force the wood and when the board moved into the blade, the staff member's finger was apparently too close to the blade and was cut. The report does not mention why the wood could not continue through the saw. It neglects to report if the blade of the saw was sharp, if the machine guard was in good working order, or any other possible reason for this incident. It also does not state if the table saw was locked out or tagged out for repair after the incident. This type of limited reporting and follow-up makes recommending solutions for prevention of future events extremely difficult.

Due to the limited documentation on medical care and the details of the wound on many reports, it is difficult to analyze as to whether or not proper and appropriate care was given for a specific injury. In a 1999 report where a student had burned himself while soldering, the teacher reports that ice was applied to the wound. According to Heather Nelson RN, BSN (personal communication December 10, 2003) the ice may or may not have been appropriate treatment; she states that too many variables are unknown to accurately determine this. Depending on the severity of the wound, ice may have

caused more harm than good as the integrity of the skin was compromised and frostbite may be a result of applying ice to a burn. Without knowing the severity of the burn, how long the ice was applied, or if the ice had a cover around it, Nelson states it is impossible to know if the action taken was appropriate. Thus, with the limited documentation provided, it is again impossible to properly analyze the appropriateness of medical care given to the injury reported.

Interviews with Staff

On December 5th, 2003 and December 9th, 2003 interviews with the three technology education instructors and two custodial staff responsible for cleaning the labs were conducted. The questions posed to these staff members are listed in the text of this paper. Staff were not asked questions outside of those listed on the questionnaire, however, all of the staff interviewed did elaborate on certain questions on their own and were allowed to do so.

Interviews with the Instructors

This section will review the questions posed to the three technology education instructors and their answers. Each question is listed with a summarized account of the responses. The next section will review questions posed to the custodial staff.

- 1. Describe what safety policies and procedures are in place to prevent and/or minimize injuries as well as property related losses.*

All three teachers stated that it was their own responsibility to demonstrate how to use equipment safely. They also stated that they tested each student on the safety rules and features for each piece of equipment in the lab, however, they differed on the passing

standards for these exams. Two out of the three teachers stated that an “A” on the exam was enough to pass providing that the student could explain correct answers to questions they answered incorrectly. The third teacher required a 100% correct score on each exam before allowing the student to proceed with using the machine or equipment in question. All three teachers stated that students were not required to work with a piece of machinery if they were uncomfortable with using it. Two of the instructors interviewed mentioned the fact that they verify that exit signs are working properly, tools are sharpened, eye protection is worn, and machine guards are in place. The same two instructors discussed other policy and procedures as well, however, at no time did they refer to or mention a written manual or check list used to ensure that all proper safety and procedure was followed as required.

2. *Describe the safety training that is provided for the students and staff regarding lab resources (tools, equipment, materials).*

All three instructors outlined training provided to students in the previous section. The instructors stated that there was no formal training provide for them by XYZ school. Each went on to say that their safety training came from previous personal and education experience. One technology education instructor pointed out that the technology education instructors are not CPR or first-aid certified, although he wished they were.

3. *How are safety policies and procedures enforced?*

Once the students have been trained on safety rules it is up to the teacher to enforce them. Each instructor stated that there is a formal three-step process when disciplining a student who chooses not to follow the safety protocol. First, a written or

verbal report or warning is made along with a review of safety procedure. On the second occurrence the student is asked to temporarily leave the lab and is given alternative assignments. Finally, if the problem persists, the instructor may go to the school administrator and ask that the student be removed permanently.

4. *What written records are available to indicate that formal safety training has been conducted and that students and staff have been trained?*

All three instructors stated that they kept the completed exams on file. One teacher stated that he kept the exams for five years or until the student has graduated from high school. The other two did not indicate how long they kept their records. No written documentation was kept regarding the safety education of the teaching staff as there is no formal safety training that is offered.

5. *Have you ever witnessed or has any one ever reported to you an incident in the lab that resulted in an injury or non-injury? If so, please explain.*

The first teacher questioned relayed a story about a student who was working on a drum sander and was using it at a high rotation per minute setting. The student lost control of the material and it hit him in the chin. This same teacher stated that other injuries have occurred in his classroom but were limited to minor cuts, scratches, and burns. The second teacher interviewed said he witnessed a student become injured using a disc sander. Apparently, the student started to engage in horseplay and injured a fingernail, resulting in the loss of the nail. Besides this incident, the teacher only recalled minor slivers that were reported. Finally, the third teacher remembers a student with a learning disability in his class who was cutting cardboard with a knife and accidentally

cut through the cardboard into the palm of his opposite hand. The final teacher was not aware of any other reported injuries.

6. *If you were involved or had witnessed a loss-producing incident, what was done to prevent its reoccurrence? (If applicable)*

The answers given for this question were all the same. First the incident was used as a teaching point, then the related safety rules would be discussed with the individual involved and the rest of the class, again stressing the importance of safety. None of the teachers interviewed stated whether the equipment being used was locked out or tagged out pending a mechanical inspection, nor did they mention if any disciplinary action was taken.

7. *During a regulatory agency inspection of the tech ed. lab facilities, has this department received written recommendation for safety and/or property protection related issues?*

Only two of the instructors interviewed recalled a regulatory agency asking for changes or corrections in the lab. One instructor recalled the suggestion that all the electric drills should be changed to a three-prong plug and that the machine guards on the grinders should be moved closer to the grinding wheel. It was not indicated if these changes were made. The other teacher remembered a situation where an inspector told him that the welding shirts being used had rips in them and needed to be replaced. New welding shirts were purchased and they discarded the old ones.

8. *Are there adverse attitudes among students and staff regarding safety in the labs? If yes, please explain.*

The concern with regards to attitude seemed to be the student attitude towards wearing eye protection. Two of the three teachers stated that this was a constant issue with the third stating that he simply does not allow a poor safety attitude in his classes. None of the three related any poor attitudes related to safety among the staff.

9. *Please list five specific safety issues/property protections you have in the labs that you feel are particularly problematic.*

The first teacher listed that the ventilation was once insufficient, however; it has been remedied. He went on to state that the school is very responsive to concerns and did not believe there were any other issues at this time. The other two teachers listed the following concerns:

- The ventilation system having poor airflow, particularly in the paint room.
- Poor filter maintenance in the ventilation system
- Equipment becoming old and out-dated and not being replaced.
- Low swinging stools used at student tables that are a tripping hazard.
- Poor classroom design - would like to see a more efficient use of space.
- There are four welding areas, of which only three are enclosed. The fourth should be enclosed as well.
- Poor outlining of safety zones around equipment.
- Not replacing safety glasses on a regular basis.

10. If budget wasn't an issue, what do you feel needs to be addressed and/or implemented regarding safety and/or property-based concerns in the tech ed. department?

All three instructors named several items in answer to this question. Below is a list of the items they mentioned:

- Electronic brakes for all of the power equipment.
- Regular replacing of safety glasses.
- Welding masks that darken electronically while welding depending on the intensity of the light produced.
- A brand new ventilation system.
- Earmuffs for hearing protection (one teacher stated that there is currently no hearing protection available at all for the students).
- New dust brooms and mops for housekeeping and cleanup.
- Non-skid flooring.
- Eyewash stations.

11. Do you feel that current policies or procedures in place (if any) hinder your ability to teach as well as enforce safety guidelines?

The answer to this question for all of the teachers was “no”, with one teacher noting that he felt that the policies in place made it easier for them.

12. If there currently isn't a safety policy or guideline in place, how would you feel about being involved in its development and subsequent enforcement?

Again, all three teachers agreed on this question answering that they would definitely wish to be involved in the development of any policy or guidelines as they would be the primary staff members enforcing the new policies.

13. To what extent are you held accountable for safety identification and abatement of hazards in the labs?

One teacher stated that he believed he was only accountable for the material safety data sheets (MSDS) that came with chemicals such as wood stains. Another teacher stated that he was accountable for reporting issues with equipment and other safety concerns. The third stated he believed that he was accountable for all safety issues in the lab regardless of nature.

14. What kind of policy is in place regarding disciplinary action towards students who fail to observe technology education department safety standards?

While this question is very similar to question number three, and essentially the same answers were given, one teacher did mention that a grade deduction was made if students in his class did not follow proper safety procedures.

Interviews with Custodial Staff

Custodial staff were interviewed on December 9, 2003 using a separate questionnaire as seen in the text of this paper. Only five questions were posed to each of the two participants interviewed. Below are summarizations of the answers that were given. The first subject interviewed was the supervisor to the custodial staff, the second was the custodial responsible for cleaning the technology education rooms.

1. *What is your recollection of being personally involved in a lab incident that resulted in an injury and/or property loss?*

Both parties denied having any experience with injuries or property loss in the technology education classrooms.

2. *If you did recall being involved in a lab incident, what was done to prevent the incident from occurring again? (If applicable).*

As a result of the answer given in question number one, both state that question two was not applicable.

3. *Have you ever been required or asked to go through technology education lab safety training?*

Both participants denied having any formal safety training related to the technology education labs.

4. *Do you feel that safety in the technology education department is made a priority by staff, students, and school administration?*

One participant that was interviewed stated that he felt safety was made a priority as displayed by all of the time taken to teach and test the students on safety-related matters. The second participant believed safety issues could be taken more seriously as materials are often not stored appropriately, extension cords and equipment are not put away, and the floor is often dirty and cluttered. However, the second participant did make the statement that the issues mentioned were quickly resolved the day interviews for this study were conducted with the teaching staff.

5. *Please list five specific safety issues/property protections you have in the labs that you feel are particularly problematic.*

Both participants noted multiple concerns which are listed below.

- Old, outdated equipment and machines.
- The need for more electrical outlets in the rooms as extension cords are being used to power machines from remote outlets creating a tripping hazard.
- Inefficient room design and equipment placement.
- Poorly stored materials.
- Inappropriate storage and disposal of flammable materials.
- Poor housekeeping by staff and students.

Physical Assessment of the Labs

Two visits were made to the technology education lab rooms at XYZ school. The first took place on September 16, 2003 during a tour with the safety coordinator and the second was during the interviews with the teaching staff on December 5, 2003. During these visits several areas were assessed, including materials storage, housekeeping, flammable materials storage, machine spacing and general floor design, PPE, and emergency exits. Below is a list of the observations made on both days.

September 16, 2003

1. Floors were dirty with sawdust and cluttered with small pieces of left over material.
2. Materials storage was extremely disorganized with tipping stacks of lumber and material scattered on the floor.
3. A compressed gas tank lying loose on the floor unsecured.
4. Extension cords unsecured in walkways and workstations.

5. No eyewash stations any where in the labs.
6. Hand tools lying about and not being put away after use.
7. Power equipment that was being repaired was not locked-out or tagged-out.
8. Improper materials being disposed of in the flammable disposal can such as aluminum soda cans and paper.

December 5, 2003

On December 5, 2003 a second visit was made to XYZ school and only one of the previously mentioned items had been corrected; the compressed air tank was now being properly secured. The rest of the problems still existed despite the fact that at the last assessment the safety coordinator made note of these findings. In addition, new safety concerns were found on the second visit and are listed below.

1. Poor machine spacing - the students are required to use power equipment in cramped quarters.
2. Low lying stools that swing out from the worktables.
3. Only one room had a first aid box, which consisted of only a few latex gloves and some adhesive bandages.
4. While the researcher was waiting for an interview with an instructor, one student was observed not wearing eye protection (this was not noticed by the teacher).
5. Emergency exits were partially blocked by raw material.
6. No hearing protection was provided.

Summary

Unfortunately, this is a very limited assessment; both visits to the classroom were cut short due to time constraints of class schedules. It is very possible, that if given time,

many more significant issues would have been noticed. Currently, one can see that due to poor housekeeping and materials storage, tripping hazards are one of the leading concerns. Fire hazards are noted with the improper disposal of items in the flammable containers, as well as emergency exits being partially obstructed. Students are not provided with hearing protection and eye protection may not always be worn. First aid kits are under-supplied and not accessible to both rooms.

This chapter raises many concerns with the safety program at XYZ school. The incident reporting forms lack detail and direction, and follow-up or correction is not documented. This appears to be an ongoing problem that goes unnoticed, as the same documentation issues keep reappearing. Teachers and custodial staff receive no formal safety training for technology education labs or equipment and are not updated on new or improved safety techniques or information. First-aid is being administered by uncertified staff with insufficient supplies who could cause more harm than good providing the limited care they do give. Outdated facilities and a lack of proper PPE are putting students at risk and current housekeeping and materials storage practices are an accident waiting to happen. However, most of these concerns can be corrected with little or no cost to the school district. Chapter five will address all of the safety issues raised in this study and make recommendations or suggestions for each.

CHAPTER 5: DISCUSSION

Purpose and Goals

Due to the lack of documented internal protocol, XYZ school's technology education department was found to be at significant risk of experiencing property loss and/or personal injury. The purpose of this study was to determine the extent of effective risk control practices at XYZ school. The objectives of this study included analyzing current risk control practices that are being used by the school's faculty and staff and reviewing of student/employee injury and property loss reports.

Methodology

The methodology used in this paper consisted primarily of three components, interviews with the three technology education teachers and two members of the custodial department, a physical assessment of the classrooms use for the labs, and a review of several incident reports selected by the school's safety coordinator. Unfortunately, this study was limited in its ability to collect significant amounts of data due to time constraints, limited access to the labs and classrooms, an inability to interview the student population, and lack of documentation of past property losses and other information regarding loss and incidents.

Conclusions

Limitations in methodology already mentioned do affect the conclusions of this study. It is difficult to make conclusions on risk control practices in place based on five interviews, twelve incident reports, and two visits to the labs in use. However, significant concerns were noted, and the limitations of the methodology do not appear to diminish those in any way.

Concerns raised from this study include the fact that XYZ school does not have documented policy and procedures with regards to risk control practices in the technology education program and consequently leaving the standard of such practices up to individual staff and faculty members. In addition, the random sample of incident reports analyzed in this study displays poor documentation, a lack of attention to detail, and a misunderstanding of the use and purpose of these reports. Assessments of the laboratory spaces and accounts from teachers and custodial staff clearly identify housekeeping as a significant risk control issue. Outdated room design, faculty safety education, and first aid care and kits were also noted as concerns. Other risk control issues seem to be present at XYZ school. However, since they were only mentioned in passing or lacked consensus, they are not mentioned in these conclusions.

Recommendations

Documented Policy and Procedure

As previously mentioned, documented protocol for risk control practices is appearing to the norm and is setting the standard for technology education policy and procedure. A panel of faculty and staff need to develop policy and procedure similar to that of school districts and states mentioned in Chapter two. Suggested panel members for this process includes the district safety coordinator, a member of the technology education faculty from each school in the district, the director of custodial care and maintenance from each school, and the school district superintendent. It is recommended that this panel convenes as soon as possible and considers using the safety guides mentioned in this report as well as any other appropriate guides as a template for their

own policies and procedures. The panel should also consider a specific deadline, such as one year, for completion of this project.

Incident Reporting

Incident reports are a valuable tool in any risk control program. They are useful when documenting a need for change in current policy, as a teaching tool for prevention, to aid in identifying trends, and to protect oneself from civil litigation. The more detailed the documentation, the better each of these objectives is met. To aid in appropriate and detailed reporting, several changes are suggested for the current form that XYZ school is using.

When asking for a description of the event that occurred, more space should be given for documentation. Instructions should be provided regarding how to properly attach information that does not fit in the space provided. It is also recommended that the student or students involved document and sign their own descriptions including contributing factors in addition to the faculty member completing the form and describing the event as well. Both parties should also note location and activity as well as specific date and time.

A description of injuries sustained should include exact anatomical location, size, nature, as well as type and duration of first aid applied. For example, if a student cut himself or herself with a knife on the hand the preferred description would read as follows: "At 9:00 A.M. the student sustained a laceration to the palm-side of the right hand. The cut was roughly one inch long and 1/10 inch wide. Immediate pressure was applied with a sterile gauze dressing and bleeding was controlled in the first five minutes. At 9:05 the student was escorted by faculty to the nurse's office where further care was

given and the student was directed to the emergency room". Either the person filling out the form or the school nurse should document which hospital the injured party went to, the name of the attending physician, and who escorted the student if applicable. There should also be a note referring anyone reading the report to any existing documentation made by the nurse. Recommendations include providing an anatomical outline for further visual accounts of injuries if deemed necessary as well as adding more room to this section with instructions on how to document the injury if more room is needed. It is also suggested that the financial and legal possibilities of photo documentation of injuries be investigated. In other words, it may be feasible to take pictures of student injuries and place them with the medical record. Regardless of injury, the parent or guardian of an injured student should always be notified of any incidents with the name of the person notified, date and, time should be documented. If the school representative is unable to reach parents or guardians, it should be noted what was done to try to reach them and why such attempts were unsuccessful.

Regarding the witness section of the report, it should be noted whether the witness is a student, staff member, parent, etc. Demographic portions of the report as well as areas for signatures and dates appeared appropriate, however, the area for the principal's signature should include a date. A follow-up report should be made for each initial report detailing what was done to prevent further incidents and the status of the student involved including special treatments needed after returning to school such as crutches or limitations on physical education classes. At no time should any fields be left blank; the term none, not applicable, or N/A should be used to fill in fields that do not apply.

The need to use incident reports in any civil litigation defense is almost certain. It is for this reason that thorough reporting be performed at all times to protect the school and staff. An in-service or teaching situation should be implemented to teach staff and faculty how to properly fill out incident reports. Suggested staff used to instruct on proper documentation should include the safety coordinator and the school nurse. All reports should also be assessed for quality and that they are complete. Any reports found to be insufficient or lacking should be returned to the person who initially filled it out for corrections, updates, or completions.

Housekeeping

Housekeeping includes the proper storage of equipment and materials as well as the general cleanliness of the technology education labs. Since this seems to cover a broad area it may be helpful to assign certain staff with specific responsibilities. For example, faculty should always keep storage areas well organized and clean. They should also be responsible for assuring that all equipment is properly stored. It may be wise to include students in clean-up as well. It is recommended that before students are dismissed from class, that they must put away all tools, equipment, and materials, pick up scraps of material that are on the floor in their individual work areas, and sweep away excess dust and sand. Teachers should canvass the area making sure students are using proper clean up procedures and are disposing of waste appropriately. Custodial staff is then responsible for removing waste from the rooms and other incidental cleaning.

Faculty and the safety coordinator should make inspections of housekeeping and other risk control practices. The interested reader is referred to Anoka-Hennepin school district's safety guide for a technology education safety checklist. It is recommended that

teachers perform a brief inspection at the end of each week and send the results to the safety coordinator. The safety coordinator should make quarterly inspections of the technology education labs and have meetings at the end of each inspection to discuss results and concerns from both faculty and administration. It is recommended that some investigations be unannounced and results (good or bad) be included in faculty and staff performance evaluations.

Room Design

Several concerns were noted during interviews and inspections regarding room design. The most obvious issue was the use of extension cords used to run equipment that were a significant distance from appropriate outlets. These extension cords frequently ran across walkways and were unsecured, thus causing a tripping hazard. Consideration should be given to installing more outlets to eliminate the use of the extension cords altogether. However, if this is financially not possible, the cords should be made to run along the boarder of the room or have appropriate covering over the top of them to prevent tripping.

Teachers and custodial staff recognized the current seating situation as a tripping hazard as well. At the time of this study, short stools swing out from the worktables for students to sit on. They are short enough that one may not see them while walking in-between tables. New tables with stationary seating should be purchased to replace the current tables if that is not possible, a specific path for students to walk around the tables should be devised and posted. A plan for securing or locking the current stools in place should also be created.

Spacing is also an issue as it was noted that many of the machines and equipment are very close to each other. Reducing class size until the labs can be re-modeled with more available space should be considered. It is recommended that bright permanent boarders be painted around danger areas to warn people as to when they are entering a hazardous space and anti-skid tape be placed in front of machines to prevent movement into neighboring danger zones.

Safety Education

It seems that new publications are constantly coming out with updated safety information and innovative ideas. To keep up with new thoughts and technology, it is advised that faculty be encouraged to seek out educational opportunities. If budget allows, teachers should be sent to appropriate conferences or symposiums. Should money be an issue, updated safety texts could be purchased and in-services given on new information by the safety coordinator and faculty. Regardless of how safety education is performed, it should be updated yearly with records kept of what was reviewed.

Another area of staff education that has been neglected is cardiopulmonary resuscitation (CPR) training and first aid training. This should be a must for all faculty and staff, but especially for those teaching technology education. CPR and first aid certification should be updated as recommended by the American Heart Association. It may save on cost to have a certified instructor that is already employed by the school district. Another cost saving idea would be to only certify a few people at a time. Thus, only a small number of materials would have to be purchased and each new group to be certified could check out the materials and return them when such training is completed.

First Aid Kits

Once teachers and staff have been certified in CPR and first aid, the appropriate materials must be present in order to provide adequate care in emergency situations. The reader is referred to Chapter 2 for a list of suggested materials to include in a basic first aid kit. As noted in chapter two, it may be wise to include various sizes of vinyl gloves. Heather Nelson RN, BSN (personal communication, December 8, 2003) advises against using latex gloves due to a high incidence of allergic and anaphylactic reactions to this natural substance. Cleaning agents that clump and gel blood as well as body fluids should also be considered to include in the first aid kit, as they will aid in prevention of exposure. A kit should be available in each technology education lab and should be restocked within 24 hours of being used. To ensure that the kit is always properly stocked, a list of all materials to be included should be taped to the inside cover. An inspection of the first aid kit should be performed weekly by the teacher and be included in a quarterly inspection by the safety coordinator.

PPE

Personal protective equipment is a must in any technology education lab and every attempt should be made to make sure that appropriate equipment is always available and in proper working order. The fact that hearing protection is reportedly not provided at XYZ is distressing. While time did not allow for more investigation into this matter, it is suggested that the safety coordinator study the issue and resolve the matter as quickly as possible.

Safety glasses seem to be a concern with faculty as they report constant problems with students not wearing them appropriately. Teachers should consider contacting

parents and guardians whenever a student is caught without eye protection and implementing a “three strikes you are out” grading policy that fails a student automatically for being caught three times without eye protection. Parents and students may not always be receptive, therefore, education focused toward this group of individuals as to why eye protection is such an important issue will be imperative.

Eye wash stations are absent from the technology education labs. While these may be expensive to install, in the event of an injury requiring an eye wash station, a person’s vision may be saved. The price of installing eye wash stations may also help avoid future civil actions. Therefore, the instillation of eye wash stations in each lab is strongly recommended.

Attitudes

All of the participants appeared to have a positive attitude towards safety. Although the data gathered indicates that instructors seemed to have issues with students not complying with eye protection requirements. While it is unclear whether or not this compliance issue is based on poor attitudes or for other reasons, it is a subject that deserves more investigation. The attitude of the administration or of the school board towards safety was not assessed, however, it should be noted that in matters of safety, it is important to stress the well-being of those involved rather than budget or blame.

Summary

The recommendations and conclusions made in this chapter are comprised of elements stressed in Chapter II as well as information and opinion collected during research. When used together, a comprehensive and effective risk control plan can be developed that will promote solid safety standards. Further analytical and statistical

study is encouraged, as this will continue to improve and perfect new and established risk control protocol.

References

Anoka-Hennepin vocational & technology education high school safety manual. (2003).

Unpublished Manuscript.

Asfahl, C. R. (1999). *Industrial safety and health management.* Upper Saddle River, NJ: Simon & Schuster.

Pennsylvania Department of Education. (n. d.). *Safety guidelines for technology education & elementary science/technology education.* Unpublished Manuscript.

Bergeson, T., Heuschel, M. A., Lahmann, M., Fieldman, R., & Broom, M. (2002). *Safety guide for career and technology education.* Retrieved September 19, 2003, from <http://www.k12.wa.us/careerteched/pubdocs/safetyguide0203/section%201.doc>

Kobylarz, J. D., & Olender, F. E. (1983). *New Jersey industrial arts education safety guide.* Unpublished Manuscript.

Mansdorf, S. Z. (1993). *Complete manual of industrial safety.* Englewood Cliffs, NJ: Prentice-Hall, Inc.

Appendix A

<u>Recommended Minimum Levels Of General Illumination</u>	
Type of Facility	Foot-candles at a Working Surface*
Laboratories	
Drawing	200
Metals	150
Woods	150
Crafts	200
Automotive Technology	150
Graphic Arts	150
Electricity/Electronics	200
General	150
Auxiliary Areas	
Design Center	200
Class Area	150
Teacher's Office	150
Demonstration Area	150
Laboratory Library	150
Student Locker Area	30
Project Storage Room	50
Materials Storage Room	30
Equipment Storage Room	50
Project Assembly area	150
Toilet and Lavatory Room	30
Wash Area	30
Finishing Room	150
Darkroom	50
Materials or Equipment Testing Room	150

* Considered to be thirty inches above floor level.
 Note: Taken from R.D. Brown, Industrial Education Facilities. Boston: Allyn and Bacon, 1979.
 Reprinted by permission for the New Jersey Industrial Education Safety Guide.
 (Kobylarz, Olender, 1983, p. 43)

Appendix B

Guidelines for Material Handling

1. Keep the material moving uniformly through each step of the process.
2. Analyze, and then minimize, any unnecessary re-handling of material.
3. Eliminate heavy manual lifting.
4. Whenever possible, reduce the distance that the material has to be transported.
5. Provide special handling equipment whenever it is practical to do so.
6. Materials to be moved horizontally should not be lowered if they are expected to be raised later.
7. Materials taken from storage should be delivered at the proper height for the first process.
8. A proper lifting system should help eliminate future countless lifts.
9. Vertical lifting and carrying of heavy objects can be eliminated by substituting methods whereby the material can be pulled, pushed, or rolled.
10. When carrying material, clear vision over the load is mandatory.
11. Good housekeeping is important whenever objects have to be moved, therefore, traffic areas must be kept clear.
12. Heavy or awkward loads require two or more persons to lift them safely. When using teamwork, persons should be similar in height and physique. They must also coordinate their actions and motions to avoid any unnecessary burden upon either one.

(Kobylarz, Olender, 1983, p. 45)

Appendix C

OSHA Machine Guarding Requirements

1. The guard must be affixed to the machine, if possible
2. Fans less than seven feet above the floor or working level must be guarded with mesh openings not more than one-half inch.
3. Machines designed for a fixed location must be securely anchored.
4. All V-belts and chain drives must be completely enclosed.
5. Machines must not start automatically when power is restored after a power failure.
6. Shield the feed rolls or other moveable parts of feeder attachments to protect the operator.
7. Table saws must have a hood (guard) that completely covers the saw blade at all times.
8. Except for grooving, dadoing or rabbeting, a spreader and non-kickback fingers or dogs must be provided on a table saw.
9. Radial arm saws must have an upper hood enclosing the top portion of the blade. The sides and the lower portion of the blade are guarded to the full diameter with a device that automatically adjusts to the thickness of the stock.
10. Anti-kickback fingers are also required on a radial arm saw.
11. Direction of a saw blade rotation must be clearly marked.
12. Band saws must be completely enclosed except for the portion from the bottom of the guide rolls to the table.
13. Jointers may not have a knife projecting more than 1/8 inch beyond the cylinder head.
14. Jointer guards must automatically adjust themselves to cover all sections of the head on the working side of the fence and remain in contact with the work at all times. The section of the cutter head behind the fence must also be guarded.
15. Cutting heads on wood shapers must be enclosed with a cage or adjustable guard at least as wide as the diameter of the cutter.
16. Feed rolls on a planer must be guarded by a hood or suitable guard to prevent the operator's hands from coming in contact with the in-running rolls.
17. The blade of a portable circular saw must be hoarded above and below the base plate or shoe.
18. When the portable circular saw is withdrawn from the work, the lower guard must automatically and instantly return to a covering position.
19. Disc sanders require an enclosed disc except for the portion of the disc above the table.
20. Belt sanders require guards at each nip point (where the sanding belt runs onto a pulley). The unused portion of the sanding belt must be guarded against accidental contact.
21. Wood Lathes used for turning long pieces of stock held only between the two centers must have long curved guards, extending over the top of the lathe to prevent the work pieces from being thrown out of the lathe in the event they become loosened.
22. The tops and sides of the router must be covered.
23. Wheel safety guards must cover the spindles end, nut, and flange of a grinder.
24. The exposed end of a grinding wheel should not exceed more than one-fourth of the area of the entire grinding wheel.
25. Hand-held electric power tools must be equipped with "dead man" or "quick-release" control so that the power can be shut off when the operator releases the control.
26. All hand-held portable equipment must have its frame grounded or be double insulated and identified as such.
27. Each employer shall be responsible for the safe conditions of tools and equipment used by employees.

(PDE, n. d., p. 84-85)

Appendix D

Legal Responsibilities as a Technology Education Teacher Relating To Negligence

DUTY OF INSTRUCTION includes adequate instruction before a laboratory activity (preferably in writing) that:

- Is accurate, is appropriate to the situation, setting, and maturity of the audience, and addresses reasonably foreseeable dangers.
- Identifies and clarifies any specific risk involved, explains proper procedures and techniques to be used, and presents comments concerning appropriate conduct in the lab. Instruction must follow professional and district guidelines. A teacher who sets a bad example by not following proper laboratory procedures may be sued if injury results from students following the teachers' bad example.

DUTY OF SUPERVISION includes adequate supervision as defined by professional, legal and district guidelines to ensure students behave properly in light of any foreseeable dangers. Points to remember:

- Misbehavior of any type must not be tolerated.
- Failure to act or improper action is grounds for liability.
- The greater the degree of danger, the higher the level of supervision should be.
- The younger the age of students or the greater the degree of inclusion of special population students, the greater the level of supervision should be.
- Students must never be left unattended, except in an emergency where the potential harm is greater than the perceived risk to students. Even then, risk should be minimized or responsibility transferred to another authorized person if the situation allows.

DUTY OF MAINTENANCE includes ensuring a safe environment for students and teachers.

- Never use defective equipment for any reason.
- File written reports for maintenance/correction of hazardous conditions or defective equipment with responsible administrators.
- Establish regular inspection schedules and procedures for checking safety and first aid equipment.
- Follow all safety guidelines concerning proper labeling, storage, and disposal of chemicals.

By keeping files of all hazard notifications and maintenance inspections, teacher liability in the event of an accident is minimized in cases where no corrective actions were subsequently made.

(PDE, n. d. p. 12)