AN ASSESSMENT OF SAFETY/RISK MANAGEMENT PRACTICES/PERSPECTIVES AMONG HIGH SCHOOL/MIDDLE SCHOOL TECHNOLOGY EDUCATION INSTRUCTORS AND BUSINESS/INDUSTRY PROFESSIONALS

By

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ABSTRACT

While school shop safety is probably a major concern of teachers and parents, it would seem that employers also are concerned that new employees are prepared to perform the jobs for which they were hired. This study looks into how safety/risk management is taught in technology education classes and how applicable these lessons are to prospective employers. The goals of this study were to identify the extent of safety/risk management instruction that current technology education teachers have received and also provide in their classrooms. Another goal of this study was to identify employers' perceptions of recently graduated students' safety risk management knowledge and abilities.

Data regarding teachers' training in and teaching of safety/risk management was collected using a survey distributed to technology education teachers attending the Technology Education Conference at University of Wisconsin-Stout on October 14,

2005. Data regarding employers' perceptions of newly hired employees' safety/risk management training was collected by surveys mailed to members of the Fox Cities Chamber of Commerce, based in Appleton, WI.

Data collected indicated that technology education teachers received their safety/risk management training from a variety of sources, many of which were informal. The data did not identify any clear consistencies between what is being taught in schools and what training is desired by industry. The training required varied wildly between different industrial respondents. No clear pattern of what was required or desired emerged from this study.

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Chapter I: Introduction

Despite a recent trend toward concentration on unsafe conditions, experts still attribute most worker injuries to unsafe acts. Unsafe work habits are deeply rooted, even in young, new workers. Our society and its standards of status, as influenced by the media, especially television, places a premium on high-risk activities. Children learn early on that heroes are people who are daring, lucky, and risk their lives, especially in their life work. In some jobs, such as space exploration, the military, law enforcement, and fire fighting, it is occasionally both necessary and rational to take big risks. These people deserve to be called heroes. Unfortunately, people also take unnecessary risks in situations that do not warrant such risk. Deeprooted unsafe behaviors and lack of knowledge about specific job hazards are major barriers to worker safety (Asfahl, 1999, p. 35-36).

Middle school and high school technology education students are exposed to a rich variety of experiences, working with items as small as a microchip to as big as a house, with an enormous array of objects in between. Many skills from many different classes come together in technology education. Math and reading skills are important skills for students to have, as they are used on a daily basis in the technology education classroom, as well as in life after high school. Safety is another skill taught often in these courses, it's rules and procedures can be applied to other areas in school as well as in life and career experiences outside of the school. Just as a pilot or a carpenter uses basis geometry in performing their job functions, they also need to apply safety skills in these situations. When a carpenter makes a geometric mistake, he or she may waste some

material. If the same person makes a safety error, they or someone around them may be injured or killed.

The level of safety/risk management skills that graduating high school students possess may not align with employers' expectations. This study looked at what is taught in high school technology education classes concerning safety/risk management, what employers expect new hires to know regarding safety/risk management, and what, if any, gaps exist between the two.

Purpose of the Study

The purpose of the study is to determine the gap that exists between the level of safety/risk management training that high school students receive in their technology education courses, versus the safety/risk management abilities that employers expect of new hires.

Goals of the Study

The goals of this study are to:

1. Identify the extent of safety/risk management instruction that current technology education teachers have received.
2. Identify the extent of safety/risk management instruction that current technology education teachers provide in their classroom.
3. Identify the perception of safety/risk management abilities that employers encounter of high school graduate age new employees.

Background and Significance

Above all else, the environment of the technology education shop must be one of safety. Students are there to learn, but the environment must be safe above all else or

learning is hampered. Everyone involved has a portion of the responsibility for safety. Students must be trained in, and conscious of safety, teachers must instruct students in safety and be ever vigilant that hazards in the shop are reduced to a minimum or eliminated completely. The administration must support the teachers by giving them the support and resources they need to deal effectively with identifying and correcting hazards. Parents need to support safety by assuring that their children are prepared to be in school, with an attitude of safety. This attitude needs to be reinforced with safe actions and habits in the home. School shop safety is greatly compromised when students do not follow safety rules when working at home with Dad, Grandpa, or Uncle Jim. The adage of 'It takes a village . . .' also applies to safety. It takes the cooperation of everyone involved to promote and foster safe work habits in the school shop. These safe habits will then, hopefully, be continued on in work outside of the classroom and into personal and professional life.

Assumptions of the Study

This study surveyed teachers attending the University of Wisconsin-Stout Technology Education Conference on October 14, 2005 and industry people in the Appleton, Wisconsin area in the fall of 2005. The survey results may be influenced by state and local laws regarding safety in the workplace. By limiting teachers surveyed to those attending the conference, results may be skewed slightly to the more safety-conscience because the teachers attending may also be the ones who are generally in the forefront of current thoughts, trends and awareness in their profession.

Fox Cities area employers will be hiring mostly people from that area. By limiting the industry survey to companies in this area will lead to responses being

applicable to the schools in that area. Applying information gained from this survey to other schools in the state in general based on what is found in this area may or may not be statistically accurate.

Definition of Terms

Fox Cities: A group of communities in east central Wisconsin at the north end of Lake Winnebago. They consist of "the cities of Appleton, Kaukauna, Menasha and Neenah; the towns of Buchanan, Clayton, Grand Chute, Greenville, Harrison, Kaukauna, Menasha, Neenah and Vandenbroek, and the villages of Combined Locks, Hortonville, Kimberly, Little Chute and Sherwood." (Fox Cities Chamber of Commerce website, www.foxcitieschamber.com)

Iceberg Analogy: The great majority of an iceberg is hidden from view underwater. In the scope of this study, the true cost of injuries is much more than what is immediately visible and includes many different factors.

Industry Survey: A survey instrument distributed to members of the Fox Cities Chamber of Commerce asking about their company's safety training and their perception of newly hired recent high school graduate age employees' training and attitude toward safety.

Teacher Survey: A survey instrument distributed to Technology Education teachers asking about their safety/risk management training, and their school's safety/risk management procedures and protocols.

Chapter II: Literature Review

Introduction

This study examines the level of safety/risk management training that high school students receive in their technology education courses, compared with the safety/risk management abilities that employers expect of new hires. It does so by first identifying the level and type of safety/risk management training received by technology education teachers. It then identifies the amount and delivery type(s) of safety/risk management training these teachers provide to their students. A separate survey measures how well recent high school graduates meet their employers' safety/risk management expectations of them.

James Krenov, the head of the School of Woodworking at the College of the Redwoods in Fort Bragg, CA wrote "I can't give anyone secrets, something that I promise will work, because, finally, it depends on one's skill and intuition, and other methods." (1991, p. 12) Just as Krenov felt that there are no hard and fast rules to his methods, there are no similar standards for delivering safety/risk management training. Ultimately, what is most likely successful depends greatly on the presenter, the learner, and the individual situation.

History of Safety/Risk Management

Evidence of industrial safety awareness goes back to the Code of Hammurabi, circa 2000 B.C. It contained clauses, which are now interpreted as early forms of workers' compensation. Other evidence of early occupational safety and workers' health concerns is found during the construction of Egyptian pyramids and temples, and in Roman engineering projects such as aqueducts, sewage systems, and public bath houses

(Goetsch, 2005, p.2). These early safety concerns helped workers' health, but it is not clear if the originators of them were actually concerned with individual safety, or with keeping workers healthy to improve production.

In the mid 1500's, occupational respiratory and pulmonary diseases of miners, smelters and metallurgists were documented along with the need for ventilation devices in mines and other industrial applications. Bernardino Ramazzini drew conclusive associations between workers' occupations and diseases from which they suffered in his 18th century work, *Discourse on the Diseases of Workers*. Much of his work is still relevant today (Ibid, pp.2-3). A realization started that there are connections between occupations and diseases. These early researchers focused on causes of diseases among certain types of workers.

The Industrial Revolution introduced many great labor saving devices and methods, but also introduced many new hazards to workers. Mechanization and task specialization added to task repetition, increasing the likelihood of boredom and inattentiveness. Machines took much of the brute force out of many tasks, but would also apply that same force to a worker caught in the wrong place at the wrong time, often with tragic results (Ibid, p.3). Mechanization made many tasks easier, but opened workers up to new dangers, and often increased the severity of potential injuries.

The safety movement in the United States got started in the late 1860's with a few scattered safety regulations. A century later, many acts had been passed to protect workers, but they were very limited in focus. In the late 1960's, the U.S. Congress considered that an average of 14,000 workers were killed and 2.5 million workers were disabled annually in connection with their jobs as well as about 300,00 cases of

occupational diseases were reported. The Occupational Safety and Health Act (OSH Act) of 1970 was passed to help address the need for a uniform, comprehensive law to reduce these deaths, injuries and illnesses. This act also established the Occupational Safety and Health Administration (OSHA) (Ibid, p. 62). Prior to the 1970 passage of the OSH Act, safety regulations generally were very specific to a certain task, occupation, or situation. The OSH Act established a uniform code to protect workers.

The OSH Act and its subsequent regulations require that employers provide safety and health training and make information available to workers regarding tests and monitoring of regulated substances. They also give workers the right to information about any aspect of the workplace that may affect their health and safety, including warning labels, training records, and material safety data sheets. Along with legal reasons, employers have a moral obligation to provide safety and health training. New potentially dangerous substances and procedures are constantly being developed; legislation cannot keep up with these new developments. The only way to keep employees well informed about the safety aspects of their jobs is for employers to fulfill their moral obligation to provide training in these areas (Ibid, p.648-650).

According to the National Safety Council, persons conducting training should have the following characteristics: a thorough knowledge of the topics to be taught; a desire to teach; a positive, helpful, cooperative attitude; strong leadership abilities; a professional attitude and approach; and exemplary behavior that sets a positive example. In addition, trainers should be knowledgeable about the processes of learning and teaching methods. This helps ensure that the training is carried out in ways that people learn best (Ibid, p.656-657). Trainers need to be able to help people learn using various

methods. Being thoroughly familiar with the subject material helps trainers to adapt their training methods to particular situations and exemplify proper methods and procedures.

Safety/Risk Management in Schools

While having students demonstrate proficiency before moving on to the next concept is a method of instruction used in many curricular areas, it is especially important in safety/risk management. Many technology education teachers do teach this way, but the standards for proficiency vary and are often set by the individual teacher. Some teachers may teach it, but then not enforce the safety rules in the shop. Some will be stricter than others concerning shop safety. Tucker and Codding (1998, p. 77) stated that "The best way to reverse that course is to set a high standard that is the same everywhere and for everyone and make it clear to all but the most severely handicapped that they are expected by all the adults in their lives to reach that standard. Period." This statement was meant in a general sense, but it is also applicable to safety/risk management programs. A standardized safety/risk management program school-wide, district-wide or even state-wide could have far reaching implications. While it would not alleviate an employer's need to train new hires in content specific to their company or situation, they would know that their new employees would have certain knowledge and skills regarding safety/risk management. This sort of standardized training may not be practical or even feasible on more than a district scale, but incorporating safety/risk management training into a regular part of all technology education classes is essential from a liability standpoint. Experts seem to agree that safety/risk management training is needed, but there is not one specific method of doing this that fits all programs in all locations.

Although prevention of school accidents rests primarily with the school administration, teachers have a primary obligation to keep the equipment that is assigned for his or her use in the best possible condition. If a professional obligation of teachers to maintain equipment that is safe for student use is not sufficient motivation to encourage organizing a comprehensive program of safety engineering, then the fact that shop teachers are legally liable for the welfare of students should aid in his or her motivation. As properly maintained equipment is generally also the safest equipment, equipment maintenance needs to be a part of the overall safety/risk management policies of school districts. Too often, it is looked at solely in the immediate fiscal impact to the department. This shortsightedness can have great financial impact in the long run, from premature wear of machines to serious injury to students or to teachers. Regardless of the professional and legal liability of the shop teacher, there remains an all-encompassing moral obligation, which must be fulfilled. Each teacher must live with his or her own conscience after an accident occurs. The minimum obligation of the school is to attempt to make certain that individuals leave shop programs with a physical and mental condition that is at least as good as it was when they entered. (Williams, 1963, pp. 135-138). Teachers are the first line of safety in a school setting. As such, they need to ensure that student activities are planned and monitored for safe and proper methods and procedures. Teachers also need to verify that equipment needed is in excellent working condition and is appropriate for the task.

The process of making a safe worker is becoming more complex as our society becomes more technologically advanced. It is no longer possible to learn adequate safety habits on the job or at home, there must be some form of safety education. This

responsibility is falling mainly to the schools, where students can be taught safe work habits and practices at an earlier age, and under closer supervision than once they are in the workplace. Safety instruction cannot be taught as a separate subject, but must be a vital part of all instruction, providing competencies necessary to safely operate machinery and fabricate materials in a safe, orderly and efficient manner (Strong, 1975, p.13). Instilling safe habits early on in a person's life can help them determine and identify hazards more readily, thus being more likely to avoid serious injuries. This needs to be addressed across all aspects of a person's experience, including home, school, and work.

DeLuca and Haynie (2000, pp.4-46), suggest using the systems approach to safety. This approach recognizes that each component of a process affects the entire system. If one component fails, the entire system fails. Their components include environment, human factors, tools and equipment, processes, materials, outside influences, and feedback.

The environmental factor is the physical facilities in which the students work. Factors affecting this environment include lighting, sound control, temperature, work zones, and storage areas. Fire prevention and control, housekeeping, first aid materials, and ergonomics are also important aspects of the classroom environment (Ibid, pp.7-12).

Another key area in school safety is human factors. The three domains of human endeavor regarding learning and safety are cognitive, affective, and psychomotor. Students are in a technology education course to learn the proper way of doing certain things, which is the safe way of doing them. Safety needs to become automatic, that is, safe methods and procedures are explained and demonstrated, hazards are pointed out, and students are put to work on the machines. Their memory of the demonstrations and

careful, consistent monitoring help ensure proper safety habits and attitudes develop. Students also need to be working within their physical limitations. As students work within the safety guidelines, they can develop a 'feel' for safety. Safety must be valued above all else in the school shop, including craftsmanship or technical expertise (Ibid, pp.13-21).

Improper use of tools and equipment is associated with many injuries in technology education. Training and supervision are essential for safe handling and operation of tools, equipment, and material. Each student must have a firm knowledge of the safe use of each tool or machine that he or she is expected to use. This includes preparation, operation, and terminating the operation. They must also possess the motor skills necessary to perform the operation safely. Tools and equipment must always be properly maintained. This includes ensuring that all safeguarding is in place and operational at all times. Students must never be allowed to bypass or disable a safety device (Ibid, pp.22-26).

Processes can be classified by naming the machines used to perform the task or, more recently, by defining the type of work being performed. Specific safety rules vary from one course to another, and from one machine to another, whether the comparison is by machine brand or by process or material used. General safety rules can transfer to various machines and different processes. Sources for specific rules and procedures are generally the original machine manufacturers. Providing a safe environment, keeping equipment in good repair and well guarded, teaching safe and correct techniques using accurate information, and careful monitoring are the most important duties of the teacher with regard to safety while teaching about processes (Ibid, pp.27-30).

Materials, along with processes and tools and equipment, are the third major component for producing products. Because many various materials are used in technology education, many different methods of storing and handling them are employed. Teachers should be familiar with appropriate methods and precautions for each material's storage, use, and waste disposal that is used in his or her classroom. Many materials have similar storage requirements from a safety standpoint. For example, a sheet of plastic and a sheet of plywood can be stored in a similar manner (Ibid, pp.31-36).

Outside influences are those not under the direct control of the teacher. Their actual impact is frequently through indirect channels. School administration, public agencies, and the community all play important roles in the safety system of a technology education program. Teachers are the most important custodians of safety for a school technology education program. Maintaining high quality and high levels of activity are good ways to increase visibility and support of a program of any sort, especially a safety program (Ibid, pp.37-41).

Feedback actively integrates content with student activities. The purpose of feedback is to control the hazard potential in technology education programs and to change student behavior so that they act in a safe and responsible manner. Teachers and students are both responsible of safety. Teachers have the responsibility to eliminate hazards as much as possible, include safety instruction in the curriculum, manage the safety system, maintain and analyze records to update content. Students must understand potential hazards and safe procedures, and apply this knowledge to ensure the safety of everyone participating in the program. Generally, the consequence of not learning

subject matter is a failing grade; however, not following safety procedures can lead to serious injuries. Therefore, safety cannot be overrated (Ibid, pp. 42-46).

There are also hidden costs associated with any injury. Safety experts often use the iceberg analogy regarding the real cost of accidents. Just as the majority of an iceberg is hidden from view, much of the total cost of an accident or injury is also hidden. Production slowdown, or complete stoppage, near the accident site, lost work time by the injured employee(s) and by other employees, cost of overtime work necessitated by the accident, cost of damaged equipment and material, attracting and training replacement worker(s), and time spent performing accident investigation and documentation are factors that contribute to the real cost of an accident, including accidents that do not result in any injuries (Asfahl, 1999, pp. 32-35; Goetsch, 2005, p. 31-32). The total cost of an injury or near miss may not be readily apparent. The effects of an incident may last for many years, affecting a worker's entire life. Hopefully, a good teacher will be able to make a positive impact on a otherwise bad situation.

Attitudes are contagious, especially among young people. The development of good safety attitudes in students is one of the most valuable purposes of the (technology education) programs in our country. (Technology education) teachers recognize the tremendous importance of instilling safe attitudes in students not only for their immediate application in school shop situations, but because of their even greater applicability after school hours and after a student leaves school. A good safety attitude may be more important for some students out of school, or off the job, than while in school or on the job. (Williams, 1963 p. 65). Students who learn safe working methods may influence their peers to also develop these habits and also have them carry over to their workplace.

If an attitude of safety above all else is consistently put forth by the teacher, it will start catching on with students, as more students adopt this attitude, peer pressure will help persuade those individuals who are inclined to take short cuts to follow the safety rules and develop safe habits. Students and young adults should not be prevented from learning about something because there may be a danger, but taught to recognize hazards and how to act accordingly around these hazards. Teaching students safety consciousness involves several steps and attitudes, including: motivating students; learn by doing; teach by example; maintain good class control; enforce safety rules; avoid warnings and threats; avoid the fear approach; use positive and negative instructions; and the use of group dynamics. (Strong, 1975, pp. 41-43). Teachers can help students develop safe work habits by consistently exemplifying positive work habits and accepting no less from their students.

One of the best ways to promote safety in the workplace is to provide all employees with ongoing safety training. Initial safety training should be a part of new employee orientation. Ongoing training should be aimed at developing new, more specific and in-depth knowledge and at renewing and updating existing safety knowledge. Safety training serves a dual purpose. First, it ensures that employees know how to work safely and why doing so is important. Second, it shows that management is committed to safety. (Goetsch, 2005, pp.629-630) Ongoing training serves as reminders for existing knowledge and as an introduction of new or updated material.

According to the National Safety Council, some of the reasons why people fail to follow safety procedures or to take reasonable precautions on the job are that workers have:

- Not been given specific instructions in the operation
- Misunderstood the instructions
- Not listened to the instructions
- Considered the instructions either unimportant or unnecessary
- Disregarded instructions

To prevent any of the above lapses from causing an accident, safety training must be conducted efficiently (Laing, 1991, p. 35). Teachers need to pay attention to students' reactions when presenting new safety material. Simply reciting or handing out instructions to students does not ensure that they are understood or will be followed. Verification of students' comprehension and adherence to instructions must be continually monitored.

Workers who know how to do their jobs properly are less likely to have accidents. Operating procedures often are filed somewhere and are not read or followed. These paper plans are not acceptable for safety. There must be training for workers to execute the plan. An effective training plan has four ingredients:

1. Initial training for new operators or new processes
2. Refresher training at prescribed intervals, in any event at least every three years
3. Verification or testing that employees understand the process and safe procedures and are current
4. Documentation to confirm that the training and testing have been carried out (Asfahl, 1999, p. 125).

The above lists by Laing and Asfahl show that to be effective, safety trainers must be sure that they are listened to and understood. A balance needs to be struck between rules that are too general and vague and too many rules to be followed. Instructions need to be clear and concise, with applicable examples and demonstration. Important points need to be stressed so that they stand out from the rest of the training. If everything is stressed as important, nothing will be considered important. Review material especially needs to be cognizant of trainees' prior knowledge. Too minute of detail in the review will bore trainees quickly, resulting in a lack of attention and a poor transfer of knowledge. A method of assessing and documenting trainee's knowledge at the end of the training needs to be implemented, whether it is answering questions asked by the trainer, a written quiz, or demonstrating new skills.

Approximately one third of the adult population in the United States is marginally or functionally illiterate. Jobs today are requiring an increasing amount of technical knowledge and ability. These two facts combine to produce, among other things, a greater potential for safety and health problems in the workplace. As jobs become more technical, more reliance is placed on written information, on labels, instructions, and material safety data sheets. This information is also becoming increasingly technical, requiring higher levels of literacy (Goetsch, 2005, p. 679). There is some irony in the operation of machines that are intended to make a task simpler are becoming increasingly complicated to operate and maintain. Instruction on how to safely operate these machines can no longer rely on simply being shown what to do, but more formal training, including reading sometimes rather technical material, is becoming commonplace. This often requires a higher level of reading comprehension than has been needed in the past.

As well as setting performance standards high for students to earn certain grades, the standards for safety must also be set high to ensure a safe working and learning environment. Federal and state safety laws exist in such great magnitude that even the most diligent teacher would find it difficult if not impossible to keep current on all facets of safety pertaining to the many different areas of technology education. Yet this same person, while also planning and preparing interesting, meaningful lessons and projects for students that will hold their attention, is responsible for knowing and enforcing each law and code to ensure the safety of student (Fortier, 1998). Where teachers gain this expertise in safety is one of the questions being considered in this study.

Summary

A review of literature suggests that students' education in safety is best started when they are young, and it needs to be consistently reinforced and demonstrated by the actions of those around the students. The schools have a primary responsibility to create a safe environment and educate students in the safe manner of performing various tasks. People are naturally curious; this curiosity can sometimes lead a person into a dangerous situation. Proper training can help a person recognize unsafe conditions and either avoid or correct them. Life-long habits of safety, including asking oneself "Is this a safe thing to do?" and "How can I make this safer?" on a regular basis, plus working with others who have similar habits and attitudes, help foster an atmosphere of safety throughout school, personal, and professional lives.

This researcher has found that one of the prime concerns among teachers is student safety, whether they are teaching technology education, social studies, math, or any other subject. It seems that school technology education classrooms contain many

tools and equipment that could easily injure, maim, or even kill a person if used improperly or carelessly. These hazards exist not just to the equipment operator, but probably to other people in the vicinity. Since it is likely technology education teachers have many hazards in their classroom, they would then need to be cognizant of safety/risk management procedures. Thus, it seems reasonable to surmise such educators bear the responsibility for safety education and accident prevention within the classroom.

Chapter III: Methodology

This study examined how teachers received their own safety/risk management training and the level of this training. It also looked at how they teach safety/risk management, and safety/risk management policies and procedures at their school. This study also surveyed selected members of the industrial community regarding their perception of the effectiveness of this training and students' ability to apply their safety/risk management knowledge that they received in their technology education courses. The extent of safety/risk management training that technology education teacher receive and, in turn, provide to their students should be of a high enough caliber that the students are able to identify potentially unsafe situations and act to rectify them. Students should also be able to apply their safety training to other situations. Employers should feel confident that these students have this training already, and can use this training as a foundation to build on with more detailed and specific safety/risk management training needed to perform the jobs for which they will be hired.

Subject Selection and Description

The subjects for the teachers' survey were selected on the basis of attendance at the University of Wisconsin-Stout Technology Education Conference. This group was chosen because they were a statistically significant size group, gathered together that fit the target audience. The subjects for the industry survey were selected from the membership roster posted on the Fox Cities Chamber of Commerce website (www.foxcitieschamber.com). Selection was based on the category under which the businesses were listed. Categories included: construction; manufacturing; auto service, auto sales, machine shop, warehousing, transportation, and others. These categories were

chosen because the types of work performed by employees of these companies utilize the skills taught in many technology education classes. Surveys were mailed to the industry group with a letter of introduction and a postage paid return envelope. Both groups were presented with the opportunity to complete the survey and were informed that they were under no obligation to do so.

Instrumentation

Two surveys were used to collect data for this study. One survey was given to technology education teachers. The other survey was distributed to business and industry professionals in the Fox Cities area. The teacher surveys asked basic demographic questions about the individual and his or her school district. It then asked questions regarding the teacher's training in safety/risk management, and in the teacher's training of students in safety/risk management. The survey continued with questions about district policies regarding safety/risk management. A copy of this survey can be found in Appendix B.

The industry survey asked basic demographic questions about the company, then asked about their safety/risk management program and the respondent's experience with and perception of safety/risk management skills, attitudes and habits of newly hired, high school graduate age employees. A copy of this survey can be found in Appendix D.

Since no source was found for an existing survey that fit into the research question posed, the two surveys were created using many different sources, including textbooks, OSHA guidelines, other research problems, and discussions with members of industry, other teachers, and safety experts. Much of the basic direction of this research

came from experiences and concerns of the researcher and his discussion with the research advisor.

Data Collection Procedures

The teacher survey was distributed to teachers attending the 2005 University of Wisconsin-Stout Technology Education Conference on October 15, 2005. Completed surveys were returned to the researcher the same day. Industry surveys were mailed to selected members of the Fox Cities Chamber of Commerce. Members were selected based on the type of business as listed on the chamber's website. These categories included auto dealers, auto repair facilities, construction, transportation, warehousing, manufacturing, machine shops, welders, and others.

Data Analysis

Data was analyzed by tabulating the different responses to each question and then calculating the percentages of each response. Based on these responses, the researcher could draw conclusions on the extent of safety/risk management training teachers have received and give to students, trends on the training received and given to students, and employers' general attitude towards safety/risk management and satisfaction with newly hired employees' level of safety/risk management competency. Several questions were compared among those who answered one question a certain way for trends regarding their answers to other questions.

Limitations of the study

The teacher survey was limited to participants of the 2005 Technology Education Conference at University of Wisconsin-Stout. This may eliminate some of the teachers who are from less affluent districts or districts that are further away from Menomonie,

Wisconsin due to travel expenses. As people who attend these types of seminars and conferences are usually also the ones who are more likely to be on the forefront of innovations and trends, this research may also be in favor of teachers who already are trained in and using strong safety/risk management programs.

The industry survey was limited to certain members of the Fox Cities Chamber of Commerce. Non-members or members listed in other categories than those selected would have no chance of receiving a survey. Many companies, especially very small ones and those not located within the physical boundary of the Fox Cities were therefore excluded from participation in this survey. Non-respondents may have felt that their own safety/risk management program may be somehow judged by this survey, despite assurances to the contrary, that they were too busy, or just did not feel that their participation in this study was important. Some may have felt that several of the questions did not apply to their particular business and not returned the survey.

Another limitation of this research was that the people being hired for these jobs are most likely from communities nearby the employer and, therefore, attended schools in or near the Fox Cities area. This is a much more restricted range than that of the teacher survey. The two surveys were not necessarily of people from the same geographical area. This should not be a problem as the basic educational requirements for teachers and schools covered in this survey are all set forth by the same governing body, the state of Wisconsin.

Summary

This study looked at how teachers received their own safety/risk management training, how they then disseminate that information to their students, how well prepared

students are in safety when they join the world of work, and what other safety related training employers require of their employees. This training will vary greatly, based on the type of work performed, both by the company, and by the individual employee.

Chapter IV: Results

This study examined the level of competence and expertise with which safety/risk management is taught in Wisconsin Technology Education classrooms and the safety/risk management competency levels expected in business settings. A survey was given to Technology Education teachers seeking to identify their own training in safety/risk management, safety/risk management training methods they use in their classroom, and school district attitude toward safety/risk management. This survey was distributed to participants at the University of Wisconsin-Stout Technology Education Conference on October 14, 2005. Of the 97 surveys distributed, 55 were returned for a response rate of 56.7%.

A second survey was given to members of the Fox Cities Chamber of Commerce asking about their perceptions of high school graduates' safety/risk management knowledge and the levels of training they provide to their employees. Two hundred sixty-eight copies of the industry survey were distributed by U.S. Postal Service or hand delivered. By the termination date of November 19, 2005, 91 surveys were returned for a return rate of 34%. Of those, 9 were sent back with a note explaining that the survey did not apply to their situation. If there was further explanation of the note, it was because the company was either a sole proprietor or they performed strictly office work, with no shop or field type of activities. This left 82 usable surveys, for an adjusted return rate of 31%.

Presentation of Collected Data from Teacher Survey

The responses of the teacher survey were tabulated and analyzed. Many questions were related to each other and were compared to determine patterns among practices within schools and by individual teachers.

1) Your age

Twenty-seven percent responded that they are 35 years old or less, 33% responded that they are between 36 and 45 years old, 31% responded that they were 46 to 55 years old, and 9% reported being 55 or older. The responses to this question showed a fairly even distribution among the age categories, tapering off near retirement age.

2) Years teaching

Two percent did not answer this question. Twenty percent reported having taught five years or less, 15% reported having taught for six to ten years, 18% reported that they have taught for ten to fifteen years, 16% reported that they have taught for sixteen to twenty years, and 29% reported that they have taught for at least twenty years. Again, an even distribution among experience, but with an increase in participation among more experienced teachers.

3) Is teaching your first career?

Fifty-five percent responded that they had experience in other careers before they started teaching. This experience can be very valuable in the technology education classroom; as such teachers are to be training students for the world of work. They can teach from experience, not just from their instruction or research. These people are a great resource for students, not just for their knowledge and experience that they bring to their classrooms, but also for their industrial connections, which can be valuable resources for their students.

4) If you answered NO to the above question, what other career(s) have you had?

Respondents listed thirty-three different types of jobs; many listed more than one previous career. Some of the careers that occurred most were auto technician (5%), construction (24%), engineering (11%), machinist (9%), and sales (11%). A great variety of different careers were listed, most of them were quite technical and almost all required a significant amount of specialized training and expertise to perform the tasks needed in those jobs.

5) How would you classify your school district?

Two percent of respondents did not answer this question, 29% reported teaching in a small district, 36% reported teaching in a medium size district, and 33% reported teaching in a large school district. There was a fairly even distribution among school district sizes.

6) Are you trained in first aid?

Twenty-five percent reported that they have never had first aid training, 58% reported having first aid training, but that they do not hold a current certificate, 16% reported having a current first aid certification. Considering the equipment Technology Education teachers use daily in their classrooms, and the potential for injury, the low number of current certification holders could be a cause for concern.

7) Does your school offer first aid training for teachers?

Eleven percent of respondents did not answer this question, 31% answered no, 7% said that their districts would reimburse for the training, 51% of school districts offer some type of first aid training. The majority of districts (58%) offer first aid training, or will reimburse for the training, but most teachers do not take advantage of it. Only 22% of

teachers from districts that offer first aid training to their staff have a current first aid certificate. Not taking a training offered by the district could become a potential liability issue in the event of an injury where the skills taught in the training may have made a difference in the outcome of the accident.

8) Does your school have a set protocol for treating injuries?

Four percent of respondents did not answer this question, 15% reported no set protocol, 45% reported that their district has a set protocol but that it is not followed, and 38% of the respondents report that their district has a plan that is reviewed and followed. The great majority (74%) of surveyed teachers report that they don't have, don't know, or don't follow an injury treatment plan. Almost half of the respondents do not follow their district's established protocols. Eighty-four percent of teachers reported that their districts have a set protocol for treating injuries, but only 46% of those with set policies reported that they are followed. Established protocols for treating injuries may protect the district. Not following established procedures opens the individual teacher to personal liability in the event of an injury, especially if a pattern of disregarding them can be shown. If the district is aware of the policies not being followed, it has an obligation to remedy that non-compliance. Failure to follow district policies can be much more damaging to the teacher than if this person took the same actions without a set protocol in place.

9) Are you trained in shop safety/risk management? Mark all that apply

Sixteen percent of respondents did not report any safety/risk management training, 44% reported having informal training with 36% have had informal training only, 18% had safety training at a previous job, 11% list this as their only training, 20% have had safety

in-services as part of teaching, 11% list this as their only training, 25% have had safety/risk management coursework. Thirty-six percent of respondents report having received some sort of safety training related to teaching. Fifty-two percent reported no formal training in safety/risk management.

10) Do you think that safety/risk management training is an important part of teacher preparation?

Four percent of respondents answered no or no answer, 95% of respondents think safety/risk management training is important, 80% feel it is vital to have. Many teachers are reporting that they understand the importance of safety/risk management training, but have not seemed to do much to assure that they are properly able to provide such training to their students. Teachers may well be very knowledgeable on the subject, but could this expertise be documented, if the need arose? While informal training, or on-the-job training, may be most effective in many situations, the content, timeframe, and level of understanding may or may not be documented. A paper trail of safety training is good protection against personal liability in the event of an accident.

11) Do you teach safety/risk management as part of your regular curriculum? Mark all that apply.

Five percent of respondents did not answer this question, 9% answered that they do not teach safety/risk management, of these, 80% explained how they do it in question 14. Eighty-two percent teach equipment based procedures and hazards, 42% teach hazard and risk identification and abatement, 13% teach personal protective equipment, and 11% cover other administrative or engineering control measures. Nine percent report using all of the above categories when teaching shop safety. Some may have misinterpreted the

question as asking if they teach safety/risk management as a separate topic of the curriculum, as 80% of those reporting that they do not teach safety/risk management identified the methods they use to teach it in a subsequent question.

12) Do you teach shop maintenance as part of your regular curriculum?

Seven percent of respondents did not answer this question, 49% do not teach shop maintenance, 44% do teach it. Again, some may be teaching this as part of the overall curriculum without listing it as a separate topic.

13) How often do you review safety/risk management with students?

Seven percent of respondents did not answer this question, 7% report training students only once, 4% review after an accident or injury, 15% report yearly reviews, 56% report training students as new concepts are introduced, 38% report reviewing safety with students each semester or quarter, depending on class length.

14) How do you conduct your training? Mark all that apply

Nine percent of respondents did not answer this question, 78% use lecture (4% lecture only), 75% demonstrate (5% demonstrate only), 65% use handouts, 71% quiz students. 62% report using all methods listed, 9% use lecture, demonstrations and quizzes, and 4% use lecture and demonstration only.

15) Where did you or your school obtain materials for student safety training?

Five percent of respondents did not answer this question. Two percent use no training materials, 82% use instructor developed material, (47% exclusively instructor developed), 35% obtained material from machinery manufacturers (2% use this exclusively), and 18% purchased material from vendors (4% cited this as their only source). There were no reports of teachers using outside sources to train students, other

sources cited by respondents include material obtained from other districts (2%), textbooks (2%), and instructor having a safety minor (2%).

16) Do you keep records of student safety training and reviews separate from grade records?

Five percent of respondents did not answer this question, 15% reported not keeping separate records, and 80% said that they keep separate records. This question did not specify if the record was kept by the teacher or by the school, so there might be some inaccuracy in the answers due to inconsistent interpretation of the question.

17) Are students empowered to perform hazard abatement?

Four percent of respondents did not answer this question, 45% do not empower students, 51% empower students to identify, but not correct problems, 4% empower students to identify and correct hazards. Student empowerment may help make a safety program more successful, because students will be able to take ownership of the program. Changes need to be approved by an instructor to verify that the hazard is indeed eliminated and not simply replaced with another hazard.

18) Are hazards and operator stations clearly marked?

Five percent of respondents did not answer this question, 27% reported that neither are marked, 29% reported that hazards are marked, but not operator stations, 40% report marking both. A possible reason for the high percentage of teachers reporting that they do not mark operator stations is that their shop is of a flexible design, where machines and, consequently, operator stations are not in one, fixed location.

19) Who does shop accident investigation at your school? Mark all that apply

Seven percent of respondents did not answer this question, 4% wrote in that they do not know, 76% reported that the teacher involved investigate (29% reported that he/she is the sole investigator), 16% involve the department head (2% list this as the sole investigator), 42% involve the principal (4% list this as the sole investigator), 15% involve an administrator other than the principal (7% list this as the sole investigator), 4% utilize the teacher involved and a safety committee.

20) Do you have a safety committee at your school?

Five percent of respondents did not answer this question, 62 percent reported that they do not have a safety committee at their school, 31% report that they do. Twenty-three percent of those with a safety committee have the safety committee perform accident investigation.

21) If you answered yes to above, who is on the committee? Mark all that apply

Sixty-seven percent of respondents did not answer this question. Of those with safety committees, 6% answered the committee is made up of technology education teachers only, and 12% reported that the committee is made up of administration only. The rest of the respondents reported that their safety committees are made up of people from various areas of the school, 76% include technology education teachers, 35% include department head, 59% include the principal, 35% include another administrator, 59% include other teachers, 47% include the custodian, 29% include school board members, and none reported members from outside of the school.

22) Do you have regular safety inspections? This does not include fire inspections.

Five percent of respondents did not answer this question, 33% reported no regular safety inspection, 38% report utilizing an outside inspector, 25% report using an inside

inspector, of these inspectors, 16% are technology education teachers, 16% teach other subjects, 8% are safety officers, 16% are an insurance inspector, 28% are custodians, and 8% are administrators.

23) Are the results of the inspection documented? Mark all that apply

Eighteen percent of respondents did not answer this question, 24% report no documentation, 38% report documentation kept in a binder, 4% post in common area, 11% distribute to affected staff, 5% report a copy in a binder and copies to affected staff. The responses to this question may be inaccurate due to some of the respondents not knowing their school's complete distribution policy.

24) Is there follow-up to the inspection?

Twenty percent of respondents did not answer this question, 29% report no follow-up, 27% report follow-up with no specified timetable, and 24% follow-up with a specific timetable.

Presentation of Collected Data from Industry Survey

Responses from the industry survey were tabulated and analyzed, with answers to several questions compared to identify perceptions and patterns in safety practices.

1) Type of business

Nineteen percent of respondents reported being in construction, 20% in manufacturing, 11% in distribution, and 50% reported being in other areas. Written responses for 'other' varied from retail to medical to engineering to computer consulting, with no large amount of any one category reported.

2) Size of your company

Thirty-five percent of the respondents employ less than 20 people, 19% employ 21-50, 14% employ 51-100, 10% employ 100-200, 23% employ 200 or more. Several respondents specified local and corporate numbers that were wide ranging; for example, one respondent noted a local workforce of 21-50 and a corporate workforce of over 25,000 worldwide. The local numbers were used for those surveys.

3) Do you provide safety/risk management training to your employees?

Eighteen percent of respondents do not provide safety/risk management training, 6% provide it to new hires only, 67% provide it on an ongoing basis, and 10% provide safety/risk management training both to newly hired employees and ongoing to veteran employees.

4) If you answered, "Yes, ongoing" to the question above, how often is the ongoing training conducted?

Twenty-three percent of respondents did not answer this question, this is approximately the same number as answered 'no' or 'new hires only' to question 4. Eighteen percent responded that they provide training as needed, 4% provide training occasionally; this did not specify what timeframe 'occasionally' covers. Ten percent provide weekly training, 14% provide monthly training, 10% provide quarterly training, 11% provide yearly training, 7% reported 'other', without specifying any timeframe, and 3% specified various intervals, depending on topic being considered. Different people may have interpreted this question differently, companies may have training sessions every week, month, quarter, or year, but the frequency of offering a specific topic would vary. Some respondents may have considered safety training in general, while others may have interpreted the question as asking about training for specific topics.

5) What safety/risk management topics do you regularly provide to your employees?

Answers to this question were quite varied; many simple stated that they provide many topics without being specific. One respondent noted, "Everything under the sun." Most listed several topics. Common topics cited include: material safety data sheets; blood-borne pathogens; personal protective equipment; forklift safety; machine safety; confined space entry; lockout/tagout; vehicle safety; weather; lifting; emergency planning; OSHA requirements; water safety; construction related; 3 point contact; confidentiality; fall protection; ladders & scaffolding; aerial lifts; fire safety; personal safety; safety manual review; electrical; excavation safety; chemical spills and hazards; CPR/first aid; and those which are DOT-related. Many report that their employees receive job-specific training by their customers, often at the customer's site.

6) Is first aid a regular part of this training?

Eight percent of respondents did not answer this question. Fifty-two percent do not provide first aid training, while 40% do provide it. Some of the comments indicated that the company has a first responder system, and those people are trained, or that the type of job or the location of their job determined whether or not a specific employee was eligible for first aid training by the company.

7) If no, does your company offer another avenue for first aid training?

Thirty-eight percent of respondents did not answer this question. Forty-two percent answered that they do not offer employees another avenue for obtaining first aid training, 8% will reimburse employees for training on their own time, 1% will give them time off for training, and 11% provide training on company time

8) Do you feel that high school graduate age newly hired employees have adequate safety/risk management skills and knowledge?

Twelve percent of respondents did not answer this question. 2% said that they do not hire high school graduates, but require at least a bachelor of science in engineering of their employees. Sixty-three percent said that high school students do not have adequate safety/risk management knowledge, 21% said their skills are adequate to build on, 4% said that their skills are good, and none said that they are excellent.

9) Who is responsible for safety in your company?

Six percent of respondents did not answer this question. Forty-three percent said supervisors are responsible for safety, 4% said a safety officer, 1% said the safety committee, 7% specified other, and 14% said everyone is responsible for safety. Four percent cited supervisors and safety officers.

10) Does your company have a set protocol for treating injuries?

Two percent of respondents did not answer this question. Twenty-nine percent said that they do not have a set protocol, 14% said that they do, but it is not well known or followed, and 55% reported that it is reviewed regularly and followed.

11) Do you think that safety/risk management training should be part of employee preparation?

Six percent of respondents did not answer this question. Four percent said safety/risk management training should not be part of employee preparation, 25% said it should be a small part, and 65% said it is a vitally important part of employee preparation.

12) How do you conduct your training? Mark all that apply

Twelve percent of respondents did not answer this question. Thirteen percent use lectures only, 2% demonstrations only, 2% use handouts only, and 7% use quizzes only. Eight percent, use lectures and demonstrations, 17% use lectures, demonstrations, and handouts, 2% use lectures, demonstrations, and quizzes, 5% use lectures and handouts, and 4% use lectures, handouts and quizzes. Two percent use demonstrations and handouts, 1% use handouts and quizzes, and 36% report using all four methods listed Approximately two thirds of the respondents report using multiple delivery methods to train their employees.

13) Where did you or your company obtain materials for employee safety training?

Eleven percent of respondents did not answer this question. Eight percent responded that they don't use any materials, 14% use instructor developed material exclusively, 7% use material purchased from educational vendor, 4% purchased from vendor specializing in safety equipment, supplies and training, 5% have an outside source provide their training, 11% use instructor developed material along with material obtained from machinery manufacturers and other vendors. Eight percent cited other sources.

14) Do you keep records of employee safety training and reviews separate from personnel records?

Thirteen percent of respondents did not answer this question. Twenty-seven percent answered no, and 60% answered that safety training records are kept separate from personnel records.

15) Are hazards and operator stations clearly marked?

Twenty-three percent of respondents did not answer this question. Several of these stated that this question does not apply to their workplace. Thirteen percent said neither hazards

nor operator stations are marked, 18% specified having hazards marked, but not operator stations, while 46% responded that both are clearly marked.

16) Who does shop accident investigation at your company? Mark all that apply

Fourteen percent of respondents did not answer this question. Six percent specified the employee involved, 21% specified the injured employee's supervisor, 4% specified another supervisor, 7% specified a safety officer, and 1% specified the safety committee. Forty percent specified multiple investigators, of these, 17% include the injured employee, 36% include the employee's supervisor, 15% include another supervisor, 26% include human resources, and 15% include safety committee representation.

17) Do you have a safety committee at your company?

Six percent of respondents did not answer this question. Fifty-eight percent answered no, and 36% reported having a safety committee.

18) If you answered yes to above, who is on the committee? Mark all that apply

Sixty-one percent of respondents did not answer this question. Two percent said employees at large make up their safety committee, 2% said supervisors, while 3% said safety officers. Thirty percent reported that their committee is made up of people from multiple categories, including 23% reported that employees at large make up a portion of the committee, 19% cited supervisors, 24% cited safety officer, 14% cited human resources, and 5% cited other people make up the safety committee.

19) Do you have regular safety inspections? This does not include fire inspections.

Eight percent of respondents did not answer this question. Twenty-six percent said that they do not have regular inspections, 39% report using in-house personnel for safety

inspections, 11% use an outside inspector, while 14% use a combination of inside and outside inspectors.

20) Are employees required to perform these inspections or accompany an outside inspector?

Thirteen percent of respondents did not answer this question. Forty-eight percent answered no, while 39% answered yes.

21) Are the results of the inspection documented?

Fourteen percent of respondents did not answer this question. Thirty percent reported that they do not document inspections, 14% post results in a common area, 36% distribute results to affected staff, 2% do both, 2% discuss the results at safety meetings, and 2% simply said yes, with no other action specified.

22) Is there follow-up to the inspection?

Fourteen percent of respondents did not answer this question. Twenty percent reported no follow-up, 19% did not specify a follow up time, 45% reported that there would be a specific timetable for remediation, and 1% responded that it depended on the problem specified.

Comparison of the Two Surveys

The two surveys were analyzed, with attention paid to comparisons of how well the respondents to the industrial survey thought that students are being prepared for the workplace in regards to safety training and practices, versus what teachers report teaching to students in the classroom.

Discussion

Educators seem to feel that they are doing a better job at educating students in safety/risk management than what people in industry think that they are doing. Most people in this society tend to not worry much about safety outside of very narrow, specific settings. Much is said about student safety, but these discussions generally center on freedom from harassment or abuse, not the safe methods for performing certain tasks. Safety in technology education classrooms is, and should be, a concern among all who are involved in them, from students and parents, to teacher, administrators, and school boards. Teachers may be trying to teach meaningful lessons while having an administrator who does not know the specific processes that are used or necessary in his or her classroom critiquing their actions, while also trying to stay current on legal issues such as safety and liability. Adding overcrowding, students who don't care and students who are not able to do the required work for whatever reason to a room full of instruments that are sharp, designed to cut, heat, weld, shoot, and a host of other potentially dangerous things and this situation can get very dangerous. Proper training, from the top to the bottom, can alleviate much of this danger.

Graduating students are supposed to be prepared for the world of work. As part of this process, teachers should ask employers what is needed from employees so that students can be better prepared to work when they leave school. It is clear from the survey responses that employers feel that high school graduates are not well prepared in terms of safety and risk management. The business people were almost unanimous in the opinion that students need to be better trained in these areas. Prior studies by Kratochvill and Nyren have shown a lack of required safety courses in Technology Education teacher certification programs, although some courses do cover safety specific to their subject

matter. Almost all of the teachers surveyed for this study reported that at least some their safety/risk management training came from other places than directly related to their teacher training. Most reported that all of their safety training was not related to teaching. As our society becomes ever more concerned with assigning liability, teachers may be called on to justify where and how they learned what they are teaching in their classrooms, and to prove that they back up their teaching with actions. Industry has become very aware of the benefits of a safe, well trained workforce, school technology education programs need to continue to evolve to help meet this need.

Chapter V: Conclusions and Recommendations

This study examined teachers' perception of, training in, and presentation of safety and risk management, as well as employers' safety/risk management training needs and their perception of how well prepared newly graduated employees are in these areas. Teachers and people in industry were surveyed regarding these issues, and their responses were analyzed for trends.

Many respondents to each survey feel that there is more that can be done in terms of safety/risk management. Teachers are limited by many factors, including lack of time to offer these types of training, what to teach and how detailed should this training get and the possible lack of student enrollment if they did offer them. The more specific the offered training gets, the smaller the audience will probably become. Employers realize that much of their training is specialized; hazards in a paper mill are not the same as hazards encountered on a construction site, which are completely different than what are encountered in a retail setting. Employers have an obligation to train his or her employees to do the specific job required of them. Each job involves different skill sets, including awareness of different hazards. Although many of theses skills overlap, training needs to be tailored to specific jobs. A common, basic foundation in general safety/risk management practices among trainees would shorten the training process, but assuming trainee knowledge that in fact does not exist could eliminate any time saving or lead to the creation of other safety hazards. Offering a standardized, safety course to all high school students is not a viable option. Assuring that students who do take technology education courses receive some training in safety as part of these courses, and

assimilate these lessons into their everyday lives can greatly help create a safer workplace as they become part of the workforce.

Conclusions

Teachers seem to be doing an adequate job training their students in safety as it applies to their classroom. But this training does not seem to be getting applied outside of the classroom, further study needs to be done to determine if the material presented is inadequate, if students are not transferring the knowledge from one situation to another, or if students simply are not ready to handle the subject matter.

There seems to be little consistency in how accidents are handled, investigated, and documented among schools. As long as people know what their school's protocols are for such things, this is probably not an issue. What schools need to do, is have a plan and be sure people are aware of it and follow correct procedures. Teachers' safety attitudes are far reaching. Students pick up on whether they are just being told to do something because 'the rules' say they are supposed to do it this way, or if it is heartfelt. Knowing what to do in an emergency, and doing it, goes a long way to keeping order in stressful times, just saying, "somebody call the office." when a student is injured is probably going to result in no action being taken. Knowing how to care for the injured student, and what other steps need to be taken, both immediately and in the future, help keep other students calm and confident of the teacher's abilities overall, not just his or her first aid skills. Further study may be needed to determine whether teachers should be trained in first aid, and how this should be implemented. Many districts already provide first aid training to their staff, or will compensate their staff for taking the courses on their own time.

Recommendations

The foremost recommendation from this study is that teachers need to be aware of their schools' policies regarding student safety, and follow them. Not doing so can be potentially dangerous for the teacher, both personally and professionally. Disregarding school policies can result in disciplinary action against the teacher, regardless of his or her knowledge of the violation. This can also open the teacher to personal liability in the event of a student injury. If their school does not have an established safety/risk management policy, they may suggest that one be developed, and help in its creation to assure that it is applicable to the unique environments of the technology education classroom and shop.

As part of safety awareness and being prepared for potential problems, additional safety/risk management training, including some sort of first aid training, for teachers and administrators would be beneficial. This additional training may be able to be incorporated into continuing education requirements for teacher recertification. As noted in the teacher survey, less than one in four teachers surveyed report having a current first aid certificate, despite their district providing this training. This percentage is much lower among those whose districts do not provide first aid training. Knowing what to do in an emergency can greatly help in the teacher's ability to keep calm, and maintain order in the class during this time. Also, educating school administration on safety/risk management practices in the technology education shop may help them understand better what is and what is not a hazard in these classes. It can also help strengthen relationships between teachers and administrators.

Teachers should evaluate their current courses regarding safe practices in their instruction. Machinery placement, tool and material storage, workflow patterns, and separation of incompatible processes are just some of the items to be considered. Stressing safety in small ways on a daily basis can generate large improvements in the overall safety of a technology education shop. This could be as simple as changing the wording of course and lesson objectives to include safety. For example, an objective may be changed from 'students will be able to crosscut a board' to 'students will be able to safely crosscut a board'. In creating or revising curriculum, teachers should seek input from businesses that use the proposed skills and concepts being taught regarding current best practices.

Employers should work with schools to help students learn the proper methods of performing many of the skills students will need as they join the workforce. Proper skills and habits can be learned fresh much easier than changing bad habits. A concerted safety effort between schools and employers can make both places, and the community as a whole, a safer environment in which to live and work. These efforts can include helping teachers improve and adapt their teaching, supporting school efforts toward safety training by enforcing common safety rules, and share safety and training information.

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Appendix A: Consent Form

Consent to Participate In University of Wisconsin-Stout Approved Research
Title: Safety/Risk Management in Middle School/High School Technology Education

Investigator:
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Research Sponsor:
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Description:

The purpose of this study will be to analyze the safety/risk management practices of middle school and high school Technology Education teachers regarding level of training, appropriateness and applicability to future employment.

The objectives of this study are to:

- Identify common practices in safety/risk management training delivery and frequency
- Identify levels of safety/risk management training received by teachers
- Identify levels of safety/risk management training received by students
- Identify level of risk management concern at the class, school and district levels
- Identify level of transportability of this training to industrial applications after the students' school experience ends.

Safety/risk management is a big issue in schools and in industry and is only going to gain in importance. Teachers, administrators, parents and students all need to be aware of the risks involved in school activities, especially where there exists a real danger to the safety of students and teachers. Risks must be identified and minimized or eliminated. Not all risks can be eliminated, so teachers, students and anyone else who may be exposed to hazards will need to be trained in how to lessen their exposure to risks and what to do if they or someone near them are injured.

In order to analyze their practices, surveys will be given to Technology Education teachers regarding safety/risk management policies, procedures, teacher training and student training. Surveys will also be distributed to industry representatives regarding the level of safety/risk management training attained by high school graduate age newly hired employees.

The results of these surveys will be examined, tabulated and recommendations made to improve the level, appropriateness and accountability of safety/risk management training programs.

Risks and Benefits:

Risks could include supervisory retaliation for less than optimal answers marked. This risk will be minimized by distributing the survey in a setting other than at the participating teachers' school, and having the surveys returned during the conference.

Benefits include the potential for

- Improvement in safety/risk management training of teachers and students

- Examination and improvement in school safety/risk management programs and policies
- Adjustments in student instruction to better educate them in regards to practical application of knowledge

Time Commitment and Payment:
Completion of this survey should take approximately five to ten minutes of your time. There is no compensation for completing this survey.

Confidentiality:
Your name will not be included on any documents. We do not believe that you can be identified from any of this information.

Right to Withdraw:
Your participation in this study is entirely voluntary. You may choose not to participate without any adverse consequences to you. However, should you choose to participate and later wish to withdraw from the study, there is no way to identify your anonymous document after it has been turned into the investigator.

IRB Approval:
This study has been reviewed and approved by The University of Wisconsin-Stout's Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have questions or concerns regarding this study please contact the Investigator or Advisor. If you have any questions, concerns, or reports regarding your rights as a research subject, please contact the IRB Administrator.

Investigator:
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Sue Foxwell, Director, Research

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Statement of Consent:
"By completing the following survey you agree to participate in the project entitled "Safety/Risk Management in Middle School/High School Technology Education"

Appendix B: Teacher Survey

This research has been approved by the UW-Stout IRB as required by the Code of Federal Regulations Title 45 Part 46.

Please answer all questions if possible. Leave question unanswered if you are not sure of the answer. All questions except question 4 have multiple choice answers. Please give only one answer for multiple choice questions unless question asks for more than one answer. Please answer question 4 as completely as applies to you. Feel free to add any additional comments to any of the questions. Thank you for participating in this survey.

1) Your age
   a) 35 or less
   b) 36-45
   c) 46-55
   d) 55 or more

2) Years teaching
   a) 5 or less
   b) 6-10
   c) 10-15
   d) 16-20
   e) 20 or more

3) Is teaching your first career?
   a) Yes
   b) No

4) If you answered NO to the above question, what other career(s) have you had?

5) How would you classify your school district?
   a) Small
   b) Medium
   c) Large

6) Are you trained in first aid?
   a) No
   b) Yes, a long time ago
   c) Yes, I have a current first aid certificate

7) Does your school offer first aid training for teachers?
   a) No
   b) No, but they will reimburse costs for first aid training

c) Yes

8) Does your school have a set protocol for treating injuries?
   a) No
   b) Yes, but it is not well known or not well followed
   c) Yes it is reviewed with staff regularly and is followed

9) Are you trained in shop safety/risk management? Mark all that apply
   a) No
   b) Yes, informally
   c) Yes, I have had safety training at a previous job
   d) Yes, I have had safety inservices as part of teaching
   e) Yes, I had coursework in safety/risk management

10) Do you think that safety/risk management training is an important part of teacher preparation?
   a) No
   b) Yes, a small part
   c) Yes, it is vitally important

11) Do you teach safety/risk management as part of your regular curriculum? Mark all that apply.
   a) No
   b) Equipment based procedures and hazards
   c) Hazard and risk identification and abatement
   d) Personal protective equipment
   e) Other administrative or engineering control measures

12) Do you teach shop maintenance as part of your regular curriculum?
   a) No
   b) Yes

13) How often do you review safety/risk management with students?
   a) They are trained once.
   b) After an accident or injury
   c) Yearly
   d) As new concepts/machines are introduced
   e) Each semester

14) How do you conduct your training? Mark all that apply
   a) Lecture
   b) Demonstration
   c) Handouts
   d) Quizzes

15) Where did you or your school obtain materials for student safety training?
   a) We don't use any materials
   b) Instructor developed
   c) Machinery manufacturers
   d) Purchased from educational vendor
   e) Purchased from vendor specializing in safety equipment, supplies and training
   f) We have an outside source come in to do the student training
   g) We have an outside source do teacher training and reviews, then teachers train the students
   h) Other, please specify

16) Do you keep records of student safety training and reviews separate from grade records?
   a) No
   b) Yes

17) Are students empowered to perform hazard abatement?
   a) No
   b) They can identify hazards, which they then point out to the instructor
   c) They can identify and correct hazards as they are uncovered.

18) Are hazards and operator stations clearly marked?
   a) No
   b) Hazards are, but not operator stations
   c) Yes, both are clearly marked

19) Who does shop accident investigation at your school? Mark all that apply
   a) The teacher involved
   b) Department head
   c) Principal
   d) Administration (not Principal)
   e) Safety committee

20) Do you have a safety committee at your school?
   a) No
   b) Yes

21) If you answered yes to above, who is on the committee? Mark all that apply
   a) Tech Ed teachers
   b) Department head
   c) Principal
   d) Administration (not principal)
   e) Other teachers
   f) Custodian
   g) School board members
   h) Community members

22) Do you have regular safety inspections? This does not include fire inspections.
   a) No
   b) Yes, conducted in-house. By whom? _____
   c) Yes, conducted by an outside inspector

23) Are the results of the inspection documented? Mark all that apply
   a) No
   b) Yes, they are kept in a file or binder
   c) Yes, they are posted in a common area (teachers lounge, department workroom, etc)
   d) Yes, they are distributed to all affected staff

24) Is there follow-up to the inspection?
   a) No
   b) Yes, but no specific timetable for remediation
   c) Yes, with a timetable for remediation

Appendix C: Industry Survey Cover Letter

November 4, 2005
825 S. Summit St.
Appleton, WI

Safety Officer
Company name
Company address
City, WI zip

Dear Safety Officer,

I am a graduate student in the Industrial/Technology Education program at University of Wisconsin-Stout. I am asking for your help in completing a short survey on the level of safety/risk management training that high school students receive in school and how well it applies to your company's needs.

Enclosed with this letter is a Consent to Participate in University of Wisconsin-Stout Approved Research form, a survey and a return envelope. Please fill out and return the survey only in the enclosed envelope. Do not return the consent form or this letter to keep your response anonymous. If you have any questions, please contact me or Dr. Brian Finder using the information provided on the consent form.

Thank you for participating in this research.

Sincerely,

Erick Jensen

Appendix D: Industry Survey

This research has been approved by the UW-Stout IRB as required by the Code of Federal Regulations Title 45 Part 46.

Please answer all questions if possible. Leave question unanswered if you are not sure of the answer. All questions except question 5 have multiple choice answers. Please give only one answer for multiple choice questions unless question asks for more than one answer. Please answer question 4 as completely as applies to you. Feel free to add any additional comments to any of the questions. Thank you for participating in this survey.

1) Type of business
   a) Construction
   b) Manufacturing
   c) Distribution
   d) Agriculture
   e) Other

2) Size of your company
   a) Under 20
   b) 21-50
   c) 50-100
   d) 100-200
   e) 200 or more

3) Do you provide safety/risk management training to your employees
   a) No
   b) Yes, as new hires
   c) Yes, ongoing

4) If you answered "Yes, ongoing" to the question above, how often is the ongoing training conducted?
   a) As needed
   b) Occasionally
   c) Weekly
   d) Monthly
   e) Quarterly
   f) Yearly
   g) Other, please specify

5) What safety/risk management topics do you regularly provide to your employees?

6) Is first aid a regular part of this training?
   a) No
   b) Yes

7) If no, does your company offer another avenue for first aid training?
   a) No
   b) Reimbursement for training on their own time
   c) Time off for training
   d) Outside trainers come to us for training on company time

8) Do you feel that high school graduate age newly hired employees have adequate safety/ risk management skills and knowledge?
   a) No
   b) They have an adequate foundation on which to build, we add the specifics for their job.
   c) They have good skills and knowledge
   d) They have excellent safety/ risk management skill and knowledge, and put them in practice regularly

9) Who is responsible for safety in your company?
   a) Supervisors
   b) Safety officer
   c) Safety committee
   d) Other, please specify

10) Does your company have a set protocol for treating injuries?
   a) No
   b) Yes, but it is not well known or not well followed
   c) Yes it is reviewed with staff regularly and is followed

11) Do you think that safety/risk management training should be part of employee preparation?
   a) No
   b) Yes, a small part
   c) Yes, it is vitally important

12) How do you conduct your training? Mark all that apply
   a) Lecture
   b) Demonstration
   c) Handouts
   d) Quizzes

13) Where did you or your company obtain materials for employee safety training?
   a) We don't use any materials
   b) Instructor developed
   c) Machinery manufacturers
   d) Purchased from educational vendor
   e) Purchased from vendor specializing in safety equipment, supplies and training
   f) We have an outside source come in to do the training
   g) Other, please specify.

14) Do you keep records of employee safety training and reviews separate from personnel records?
   a) No
   b) Yes

15) Are hazards and operator stations clearly marked?
   a) No
   b) Hazards are, but not operator stations
   c) Yes, both are clearly marked

16) Who does shop accident investigation at your company? Mark all that apply
   a) The employee involved
   b) Involved employee's supervisor
   c) Other supervisor
   d) Safety officer
   e) Safety committee

17) Do you have a safety committee at your company?
   a) No
   b) Yes

18) If you answered yes to above, who is on the committee? Mark all that apply
   a) Employees at large
   b) Supervisors
   c) Safety officer
   d) Human resources
   e) Others

19) Do you have regular safety inspections? This does not include fire inspections.
   a) No
   b) Yes, conducted in-house

c) Yes, conducted by an outside inspector

20) Are employees required to perform these inspections or accompany an outside inspector?
   a) No
   b) Yes

21) Are the results of the inspection documented?
   a) No
   b) Yes, they are posted in a common area
   c) Yes, they are distributed to all affected staff

22) Is there follow-up to the inspection?
   a) No
   b) Yes, but no specific timetable for remediation
   c) Yes, with a timetable for remediation