An Analysis of Strategies and Interventions for Preventing Exposure to Hazards in Young, Entry Level Workers

by

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A Research Paper

Submitted in Partial Fulfillment of the
Requirements for the Education Specialist Degree
in
Career and Technical Education

Approved: 6 Semester Credits

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February, 2009

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Title: ***An Analysis of Strategies and Interventions for Preventing Exposure to Hazards in Young, Entry Level Workers***

Graduate Degree/ Major: Ed.S. Career and Technical Education

Research Adviser: **Howard Lee, Ph.D.**

Month/Year: **January, 2009**

Number of Pages: **254**

Style Manual Used: **American Psychological Association, 5th edition**

ABSTRACT

This paper explored the efficacies of proactive intervention directed at young, entry-level workers, in the ability to produce effective strategies in recognizing hazards and reducing exposure to potential work-related injuries and illnesses. The target audience was students enrolled in a program titled: The 2008 Manufacturing Academy.

Intervention consisted of focused training delivered during the sessions presented June 16 - 27, 2008. Information addressed general safety awareness, an introduction to the Occupational Safety and Health Administration (OSHA) and its relevant standards. The training involved the application of practical knowledge expressed through demonstration of competencies in the cognitive and psychomotor domains.

Student understanding and demonstration of competencies was measured through a series of performance evaluations. Six different instruments were used to collect and evaluate data.

A literature review evaluated the types of accidents most prevalent among young workers. Examples of strategies and targeted programs aimed at preventing young workers from experiencing work-related incidents were discussed. Identifying and evaluating trends and patterns of actual and potential accidents was explored.

The study presented a series of preventive strategies for achieving worker compliance with safe practices and safe procedures, designed to minimize industrial accidents and the subsequent human and operational losses. The effectiveness of OSHA and other related agencies was reviewed toward setting and meeting compliance standards that could provide sound methods for reducing or preventing accidents.

A conclusion was presented to outline a series of steps that could be used to educate young workers to the risks and dangers of hazards, along with methods for identifying and controlling the risks. The objective was to provide young workers basic skills which could be used to build and maintain a safe working environment throughout their careers.

Data received from surveys and other instruments was extrapolated and applied to help reduce accidents and exposure to hazards for workers in other age groups. The goal was to present sound, practical and proactive programs and tactics that could lead to safe working conditions. The results could also help employers achieve regulatory compliance and teach employees to develop both on and off-the-job safe habits.

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Acknowledgements

This field study is dedicated to several individuals who contributed to my growth and education. I would like to especially thank the following individuals for their steadfastness, generosity, and patience with my endeavors.

Dr. Howard Lee, who served as the field study advisor and greatly helped with the project.

Dr. Amy Gillett, who assisted so generously with the statistical analysis.

Dr. Elbert Sorrell, for wisdom and guidance in the field of risk control.

Dr. Juli Taylor, for imparting knowledge and direction in career and technical education.

Kathy Goodman, for help in formatting and editing the paper, and continuing encouragement.

Finally, special recognition and acknowledgement goes to my family, without whose help, this endeavor would not have been possible.

Steven Senor, February 2009

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Chapter I: Introduction

Background of the Study

Are young workers at a greater risk of experiencing work-related injuries or illnesses when first becoming employed? Can an introductory safety and health training program serve as an effective model to help selected young workers learn skills to recognize potential work-related hazards and reduce or prevent workplace accidents during their initial period of employment? Did students participating in a pilot safety training program apply the competencies learned while working at entry-level jobs?

Because of their inexperience, adolescents beginning employment may not possess an understanding or recognition to the dangers of on-the-job hazards. These hazards are often realized in the form of work-related injuries and illnesses. Legislation, standards, and practices have been developed to help educate employers and employees to the nature of the hazards and help reduce losses resulting from exposure to the hazards. On a federal level, the U.S. government established the Occupational Safety and Health Administration (OSHA) in response to the number of workplace fatalities and serious injuries encountered.

The number of work-related deaths has generally declined since the advent of the OSHA in 1971. According to the agency: “Since its inception in 1971, OSHA has helped to cut workplace fatalities by more than 60 percent and occupational injury and illness rates by 40 percent. At the same time, U.S. employment has increased from 56 million employees at 3.5 million worksites to more than 135 million employees at 8.9 million sites” (OSHA, 2007, page 1). Table 1 displays the number of workplace fatalities involving employees from 1996 – 2006.

Table 1

Workplace Facilities per 100,000 Employees, 1996-2006

Year	Number of workplace fatalities*
2006	5,840
2005	5,734
2004	5,764
2003	5,575
2002	5,534
2001	5,900
2000	5,915
1999	6,023
1998	6,026
1997	6,218
1996	6,112

Note. *Annual numbers of unintentional work-related fatalities.

(U.S. Department of Labor [U.S.DOL], Bureau of Labor Statistics [BLS], 2006)

The National Institute for Occupational Safety and Health (NIOSH) estimated that an average of 67 young workers (aged 16 – 17) died annually from work-related incidents (NIOSH, 2003). The results of the data study are presented in Table 2.

Table 2

Fatality Rates Based on Selected Age Groups

	Number of fatalities		Fatality rates based on*	
Age group	Total fatalities	Annual average	Employment	Hours worked
Total, all ages	37,875	6,313	5.0	5.0
16 years	91	15	1.6	3.4
17 years	157	26	1.9	3.7

Note. * Fatality rates are based on 100,000 workers, excluding military and workers under 15 (Windau et al., 1999).

An analysis can also be conducted comparing the causes of occupational fatalities to all workers, with youth under age 17. Table 3 identified the types of events which resulted in occupational fatalities, comparing all workers, to those under age 17. Figures were reported as percentages of the total number of workplace fatalities.

Table 3

*Causes of Occupational Fatalities Comparing All Workers with Youth Under Age 17**

Cause or event	All workers (1)	Youth under age 17 (2)
Transportation incident	43%	52%
Contact with objects and equipment	18%	16%
Falls	14%	8%
Assaults and violent acts	14%	14%
Exposure to harmful substances and environments	8%	8%
Fires and explosions or other causes	3%	2%

Notes:

* The figures for youth under age 17 did not indicate a beginning age. This study evaluated the risk of injury to workers aged 16 – 17. The percentages shown in Table 3 included youth who may have been under the age of 16.

(1) The total number of fatalities reported was 5,703.

(2) The total number of fatalities reported was 304.

(3) The total percentage for both columns was 100.

(U.S. DOL, BLS, 2004).

Along with the other causes listed in Table 3, unintentional deaths, classified as 'assaults and violent acts', (also termed workplace violence), were identified as major risks to young workers. Another category, 'transportation incidents', specifically those occurring on highways, was a leading cause of death in young workers. A subsequent study conducted identified at-risk jobs: "Occupations which appear to be the greatest risk are agricultural work, jobs in the retail trades, construction and those which involve transportation-related functions" (Windau et al., 1999, p.7).

Data presented by the Bureau of Labor Statistics and OSHA outlined the magnitude of the problem affecting young workers:

- From 60 – 70 adolescents died each year in the United States due to work related injuries.
- An estimated 200,000 young workers sought emergency medical treatment for work related injuries.
- Non-fatal occupational injuries for workers under 18 were more frequent than for adults.
- Burns and lacerations were the most commonly reported injuries.
- The overall fatality rate was similar to adults even though national and state laws did not allow adolescents to work in more hazardous occupations.
- The risk of a youth dying while performing construction work was twice the risk to adult workers (U.S. Department of Labor Occupational Safety & Health Administration [US DOL, OSHA] 2004).

In order to help reduce the frequency and severity of workplace hazards, federal, state, and local regulations were enacted to help employees and employers recognize and prevent the hazards from directly impacting young workers. This included restricting the activities allowed to be performed by workers under the age 18. Occupations classified as hazardous included:

- Manufacturing and storing of explosives
- Driving a motor vehicle and being an outside helper on a motor vehicle

- Coal mining
- Logging and sawmilling
- Power-driven woodworking machines*
- Exposure to radioactive substances
- Power-driven hoisting apparatus
- Power-driven metal-forming, punching, and shearing machines*
- Mining, other than coal mining
- Meat packing or processing (including the use of power-driven meat slicing machines)
- Power-driven bakery machines
- Power-driven paper product machines, including scrap paper balers and paper box compactors*
- Manufacturing brick, tile, and related products
- Power-driven circular saws, band saws, and guillotine shears*
- Wrecking, demolition, and ship breaking operations
- Roofing operations and all work on or about a roof*
- Excavation operations*

(U.S. DOL, 2008). (Note: limited apprentice/student-learner exemptions applied to those occupations marked with an asterisk (*).

Entry-level training has been traditionally conducted by employers to instruct new workers, on the basics of job safety. Content for the new employee orientation training generally included relevant company rules and guidelines. At issue, and a primary reason for this study, was a lack of continuity and consistency in the quality of entry-level safety training delivered to new employees to help them recognize hazards and reduce accidents.

There has been precedence established for providing safety information to young workers. One example was the OSHA "Teen Summer Jobs – Safety Pays" program. The program provided awareness on recognizing the risks associated with selected occupations in which younger workers were likely to work, including construction, landscaping, life guarding, restaurants, farm work and driving.

Information presented included recognition of the types of injuries commonly experienced, and methods for preventing exposure to hazardous conditions (OSHA, 2008). Some states have offered general advice on employment relating to safety, including worker rights and responsibilities (University of California Berkeley, 2008).

Emphasis on the need to follow established safe practices has been developed for selected industries. The food service industry was one example studied, which has been a starting point for many young workers. The Texas Department of Insurance reported that among food service companies, an analysis of safe practices and conditions offered both employers and employees a foundation for establishing effective habits (Texas Department of Insurance, 2006).

Data derived from the Bureau of Labor Statistics suggested that laws and employer efforts helped reduce the number of work-related fatalities in workers aged 16– 17. During the period of 1992 – 2006, the highest number of deaths was 46 (in 1999), while the lowest number was 21 (in 2006). Of the 533 deaths reported in the target group during the period, the average per year was 35.53 (U.S. DOL, BLS, 2008).

The need for entry-level workers to recognize safety has been addressed by NIOSH and other organizations, as described by the passage below:

> "Every year, approximately 84,000 youth are injured on the job seriously enough to seek emergency room treatment. In fact, teens are injured at a higher rate than adult workers. As new workers, adolescents are likely to be inexperienced and unfamiliar with many of the tasks required of them" (NIOSH, 2007).

Studies have evaluated the risk to adolescents when they perform job functions normally assigned to adults. Resulting legislation restricted the amount of hours and types of activities allowed by young workers under age 18. While child labor laws, OSHA regulations and community standards have guided employers and young workers, the risk from exposure to potential hazards affecting entry-level employees has continued to occur.

NIOSH recommended a team approach to gain the attention of young workers and reduce their risk to experiencing work-related accidents. This involved receiving input from the workers, their parents or guardians, employers, educators and community resources. Young, entry-level workers historically have been at-risk to exposure from known or recognized hazards. A number of factors identified as contributing to the occurrence of accidents are listed below:

- Unsafe equipment
- Stressful conditions
- Inadequate safety training
- Inadequate supervision
- Dangerous work that is illegal or inappropriate for youth
- Trying to hurry
- Alcohol and drug use (OSHA, 2008, p.1).

In an effort to help young workers recognize their on-the-job injury and illness risks, counter measures have been identified. The Canadian Centre for Occupational Health and Safety provided tips to young workers through a series of questions designed to help them obtain the necessary information from employers relevant to performing their jobs safely. The list included:

- What are the physical demands of the job?
- Will I have to work very late at night or very early in the morning?
- Will I ever work alone?
- What kind of safety gear will I need to wear?
- Will there be noise? Chemicals? Other hazards?
- What safety training will I receive?
- When will I receive this training?
- Where are the first-aid supplies and fire extinguishers kept?
- Do you have a worker safety policy and an emergency plan?
- Can you give an example of how employee health and safety is important to your business? (Canadian Centre for Occupational Safety and Health, 2008).

High schools have typically integrated safety training into existing course content, relating to class or task-specific functions. The State of Wisconsin, Department of Public Instruction, Curriculum/Instruction web site identified 12 curricular areas. The closest link to employee safety was 'Driver and Traffic Safety', listed under the 'Health Education' heading (Wisconsin Department of Public Instruction, Curriculum/Instruction, 2008).

Personal safety has been addressed based on situations or settings. One example is chemistry students being told to wear safety glasses when handling substances in the lab. However, school curricula have not included a dedicated safety component designed to prepare students for work. NIOSH developed a model high school safety curriculum, titled 'Youth @ Work, Talking Safety.' The program provided basic information to help schools address the primary safety issues and risks that young workers face.

Chippewa Valley Technical College (CVTC) is one of 16 technical colleges comprising the Wisconsin Technical College system. In August 2005, the college established a safety and health teaching position. The goal was to build a foundation for presenting occupational safety and health services to be district's students and employers. A key objective recognized the need to provide area employers and their workers with practical safety and health programs designed to help meet compliance regulations from OSHA and other agencies. A mission and vision were also defined.

The CVTC Safety Vision follows:

Build a center for performance excellence:

- Virtual
- Fundamental
- Progressive

Utilize established and on-going consortia and alliances to generate income and intellectual streams to serve customers within and beyond our district's borders (Senor, 2005).

Several partnerships and collaborations were created to enhance and support these efforts. A formal alliance was signed with OSHA in October 2006 to help both CVTC and OSHA jointly promote efforts in safety and health: "Chippewa Valley Technical College Joins OSHA in Alliance Agreement" (OSHA, 2006).

In June 2007, a program titled 'The Manufacturing Academy' was sponsored and funded by the State of Wisconsin, and conducted through participating technical colleges in Wisconsin.

The program introduced concepts from the Manufacturing Skills Standards Council and was intended to introduce young workers to the manufacturing environment. CVTC hosted one of the Manufacturing Academy sessions, and a safety and health component was integrated into one of the four program modules. A total of eight hours was dedicated to presenting safety training topics. The content featured the following competencies:

- Hazard recognition
- Performing safety inspections
- Fire safety
- Emergency preparedness and response
- OSHA standards and regulations
- Off-the-job safety

Eight high school students participated in the four-week training. A subsequent version of the program was conducted at CVTC in June 2008. One portion of the program again focused on preparing students for workplace safety. The June 2008 training was formalized and expanded to 20 hours, with 18 students participating. (The class began with 26 students, and ended with 18 completing the course). The training presented concepts intended to educate students to the risks of workplace injuries, and provided strategies for recognizing, correcting or reporting the hazards in attempts to reduce potential exposure to accidents. Appendix A described the proposed content and subject areas of the study.

Statement of the Problem

Young, entry-level employees may not receive adequate training from their schools, employers, or outside resources to adequately prepare for and identify work-related hazards. Upon entering the workplace, there may also have been a gap in the knowledge supplied by the employer to allow the individual to adopt safe work practices. In the absence of training and experience, these workers may be at a greater risk for experiencing work-related incidents. There has also not been a recognized point of focus for providing sound, fundamental training to entry-level workers.

Because much of the 'safety training' presented by employers is generic to workers of all ages, young workers may not have related to the training, as it may not have accounted for cultural, age-related or individual factors. Therefore, these workers may not have been receptive to the training, or understood the concepts communicated. A NIOSH study addressed these and other issues affecting young workers:

- Young workers may not be trained to perform assigned tasks safely.
- Young workers may be assigned to perform incidental tasks for which they have no training or experience, or they may take it upon themselves to perform these tasks without direct supervision.
- Young workers may not be adequately supervised during the initial hiring phase.
- Young workers lack the experience and maturity needed to recognize and deal with injury hazards. More specifically, they may not yet have a sufficient understanding of work processes to recognize hazardous situations.
- Young workers may not have the training or experience to handle emergencies or injuries.
- Young workers, their employers, and parents may disregard or be unaware of child labor laws that specify the jobs and the hours that young workers may not work (NIOSH, 2003).

Purpose of the Study

The purpose of this study was to analyze whether specific interventions targeted at high school students could reduce at-risk behaviors and be replaced by safe practices and conditions. The training was developed and applied in order to assess the students' level of understanding and competency. The primary area of focus was on hazards: recognition, correction and reporting. Secondary focus was on understanding the purpose and scope of OSHA and other relevant regulations.

A group of selected students received training designed to help them learn how to work safely. Training was delivered to address commonly reported injuries to this age group – muscle strains resulting from overexertion, cuts and lacerations. Specific instruments were applied to measure safety-related performance. The absence of accidents does not indicate the presence of safety. To that end, 'leading indicators' were introduced to evaluate proactive, positive aspects of employee safety, such as competencies demonstrated, employer evaluations, self-ratings, and other methods.

Research Questions

The following research questions were the focus of this field study:

1. What was the level of learning demonstrated by students participating in the June 2008 Manufacturing Academy?
2. To what extent did the safety training strategies transfer to the work environment?
3. What was the level of training effectiveness based on entry level jobs?
4. Was there a difference in comprehension based on selected demographics?
5. Was there a single strategy which achieved success?

One of the objectives of the study was to develop effective tools that could be applied (such as training and practical exercises), as interventions against at-risk behaviors (such as hurrying or horseplay). When left unattended, these unsafe acts or conditions could contribute to the occurrence of hazards and subsequent losses. These 'lagging' or 'trailing' indicators have been expressed in both human terms and financial losses. The dynamics and format of the program were structured to present the concepts in a classroom setting, supplemented with laboratory and outside activities. Field trips to local manufacturing companies and guest speakers provided additional support.

Students successfully completing the training received certificates of completion. The training also incorporated topics from the NIOSH "Youth @ Work, Talking Safety" curriculum. Topics presented in the training included:

1. Hazard recognition
2. Workplace violence prevention
3. Safe driving techniques
4. Identifying on-the-job and off-the-job hazards
5. Methods for reporting hazards
6. Methods for correcting or reducing hazards
7. Primary OSHA regulations applicable to all workers
8. Performing lifting and other ergonomic tasks safely
9. Safe handling knives and other sharp objects
10. Use of hand protection and other applicable personal protective equipment

Importance of the Study

The importance of this field study was based on the following reasons:

1. Produce a reliable curriculum model. The implementation of a relevant safety program model can be demonstrated by participants when they adopt the safe practices learned. The concepts and content learned could be applied by high schools and presented to a larger student audience. Instead of offering the training to a limited number of students during a summer session, the training could be incorporated into core classes conducted during the school year.

2. At-risk behaviors can be reported and assessed, leading to reductions in work-related incidents. The students participating in the June 2008 Manufacturing Academy were taught to recognize at-risk behaviors as being counter-productive and hazardous. One study reviewed indicated that that 88% of all accidents were caused by unsafe acts, 10% were caused by unsafe conditions, and 2% resulted from other causes (Idaho State University, 2008). According to one source, at-risk behaviors can combine or contribute to an increased chance of experiencing an accident, in this case, involving motor vehicles.

> The big concern we have is that they [adolescent drivers] don't have as much exposure and tend to be risk-takers. This age group's inexperience, inattentiveness and higher risk factors contribute to this group also being the most likely to be involved in traffic accidents (Banks, 2008 as cited in Pettis, 2008, September 7, p. 10A).

Applying hazard recognition and safe work practices to reduce accidents both on and off-the-job was a goal of the study. One report described the impact of off-the-job accidents:

> U.S. workers are actually safer on the job than in their homes or communities, according to the NSC's 2008 "Injury Facts" report. Nearly all of workers' unintentional fatalities (10 out of 11) and more than 70 percent of disabling injuries occur off the job. For every two workplace injuries, there are five off-the-job injuries (National Safety Council, 2008).

Limitations

Potential limitations of the study are outlined below:

1. The study was limited to a control group of 18 students. While the program began with 26 students, 18 participated in the safety cohort presented week two of the 2008 Manufacturing Academy. The program was presented through a Wisconsin state funded grant which expired June 30, 2008. Additional, future funding from the State of Wisconsin to pursue a longitudinal study through the use of grant funding was explored.
2. One measure of the training was tracking safe acts and behaviors, prior to the realization of work-related accidents. Because hazards and unsafe acts do not always result in accidents, interpreting the results of employees working safely can be difficult to accurately assess.
3. The extent of the knowledge learned and applied during the June 2008 program was not known until the students began working following the training.
4. Tracking of participants was reported through self-surveys. Objective data, such as the number of workplace accidents, might not be fully reported by all participants in the study.
5. While initial data was collected, long-term effects were not known. Attempts to maintain contact with participants to chart or follow their progress was made. The ability to track progress and performance was limited to maintaining communications, along with the willingness of participants to follow-up with the requested survey information.

6. Student reporting was subjective. The survey was constructed to collect data that was reliable, valid and statistically significant. Verification of the information received was based on participant accuracy in following the survey instructions and reporting results.
7. Employer support for the program was not consistently known. Attempts were made to communicate with employers reported by the participating students. An explanation of the program was provided to employers willing to participate.
8. Available resources were limited in the June 2008 course. Students received a financial stipend for participating in the program. Other funds included transportation provided for field trips to local companies to view manufacturing processes. The class was held at the CVTC Manufacturing Center in Eau Claire, Wisconsin. Internal tours to view program laboratories were conducted.
9. Much of the data discussing injuries and deaths to young workers identified family businesses and agricultural work as leading injury and illness causes. For the purpose of this study, data was applied to entry-level occupations that were not family-oriented, nor related to farming or other agricultural work.
10. The time allotted (20 hours) for the field study was reduced from the original amount planned (28 hours). The reduction of eight contact hours limited the content and face-to-face interaction spent with the students. This in turn impacted on the ability to fully present the proposed curriculum and measure student performance and competency.
11. The population sampled included participants whose first language was not English. The class sessions and materials distributed were presented in English. The level of comprehension and the degree in which the concepts were able to be learned and then

applied may have been affected by the extent of fluency and understanding demonstrated by all participants.

12. The June 2008 Manufacturing Academy was delivered in two weeks, and consisted of 50 student contact hours. The June 2007 Manufacturing Academy was held over the course of four weeks, with 120 hours dedicated to the program. While the content varied from 2007 to 2008, the reduction in hours and interaction with the students may have affected the degree of learning and responses provided.

Assumptions

The following assumptions were made in regards to this study:

1. Young entry level workers accepted the training offered. The concepts presented students with methods for assessing workplace risks and skills for recognizing hazards. The degree to which participants accepted and applied the concepts was recognized through their classroom performance. Transfer of the skills outside of the class, to on-the-job performance was an expected outcome.
2. The control group fit the requirements as being in the category or classification of young, entry level workers. Students participating in the Manufacturing Academy 2008 program were 16 – 17 years old and enrolled in local area (Chippewa Valley, west-central Wisconsin) high schools.
3. Employers integrated the training received from the Manufacturing Academy into new employee orientation training programs. For students employed prior to or during the Manufacturing Academy, communications were made with employers to provide an overview of the instruction and objectives of the study. Agreement by employers to

integrate and support the concepts was to be determined following presentation of the program overview.

4. Certification provided (CVTC safety award of completion) was recognized by employers as providing value and relevance to their own internal safety training. There have been previous efforts to provide high school students with safety training which included participants receiving a course completion card from OSHA. An example of this was the 2007 training conducted by the Georgia Tech Research Institute (Occupational Health and Safety, 2007). The addition of the OSHA 10-hour course completion card hour card was perceived as adding value and credibility to the instruction.
5. The training was relevant to the conditions and situations expected to be experienced by the students. Focus of the program was aimed at entry-level occupations and the types of hazards young workers typically face. Material to guide the instruction was obtained from other sources, such as OSHA and NIOSH. Content also included materials presented in the safety module of the Manufacturing Skills Standards Council training program presented in 2007.
6. Students agreed to participate in the process. By registering for the course, the students implied their consent to participate. The audience represented a cross-section of area communities and schools. Students who completed the program received high school credit, along with a stipend. Student performance expectations included daily attendance for all sessions, and satisfactory completion of all assignments.
7. Students sought employment in entry-level positions following the program.

Participants received employment assistance and support from the State of Wisconsin, Department of Workforce Development (DWD), the agency that sponsored and funded the Manufacturing Academy in both 2007 and 2008. The focus of the program was to provide job-enhancement skills and competencies. The Wisconsin DWD provided follow-up job and career placement for many of the students. Once employed, tracking and evaluation from participating students was conducted in order to receive additional data for the study.

8. Students participating in the study completed surveys, questionnaires and other data-collecting instruments. Communications were made with the students, and as necessary, their parents or guardians and school officials. Full attendance and participation were required to successfully complete the Manufacturing Academy. While participation in the study was voluntary, acceptance and agreement by the students was obtained.
9. The training did not violate any laws, regulations, or otherwise deal with private or confidential matters. There were no intrusive, personal information or private matters asked, reported or revealed. The training was general in nature and structured to allow for the content to be adapted to different groups and individuals.
10. All data gathered was treated confidentially. The results were reported anonymously. Student names and personal information were not disclosed. The information collected and reported was in compliance with University of Wisconsin-Stout regulations.
11. The research study complied with University of Wisconsin-Stout Institutional

Review Board (IRB) Human Subjects procedures. A University of Wisconsin-Stout 'Protection of Human Subjects in Research Form' was completed prior to collecting the research. Fulfillment of the University's Human Subjects Training program was obtained prior to beginning the study.

Scope

While adolescents may start working prior to age 16, for purposes of clarification, this study defined young or entry-level workers as being in the 16 – 17 age range. Emphasis was placed on persons who performed work in entry-level jobs, such as retail, food service, and related areas. This study did not address workers who entered into non-traditional entry-level positions, such as family business and agriculture.

The study group was compared against a profile of state and national workers aged 16 – 17. The goal of the study was to evaluate the effectiveness of safety training delivered to participants and determine if similar skills and education could help reduce at-risk behaviors and other factors which contribute to workplace (as well as non-work related) incidents.

The participants of this study were high school students, aged 16 – 17, living in what is termed the Chippewa Valley of West-central Wisconsin. Table 4 identified the students and their respective school districts.

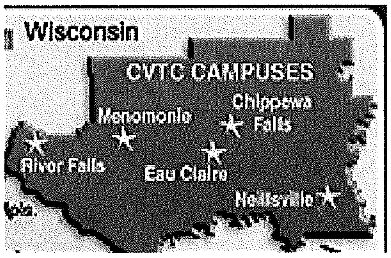
Table 4

Participating Schools and School Districts in the 2008 Manufacturing Academy

School district	County	Number of students
Menomonie Public Schools	Dunn	7
Eau Claire Public Schools	Eau Claire	6
Chippewa Falls Schools	Chippewa Falls	2
Altoona School District	Eau Claire	2
Boyceville School District	Dunn	1

The school districts participating in the 2008 Manufacturing Academy, and representing the Chippewa Valley Technical College is illustrated below.

Area Comprising the Chippewa Valley Technical College, 2008 Manufacturing Academy



Definition of Terms

Below are definitions or terms that were used in the study. Where applicable, a description and examples of the terms are provided.

Accident and incident - For the purposes of this study, the terms were used interchangeably.

Bureau of Labor Statistics (BLS) - In this report, facts and figures provided by the Department of Labor through the BLS expressed statistical indicators based on injury or illness rates. The figures were reported by companies and interpreted for purposes of gauging or comparing performance.

Class and program - Both of these terms applied to the safety training presented during the Manufacturing Academy and were used interchangeably in this study.

Department of Workforce Development: The State of Wisconsin agency that provided funding and support for the Manufacturing Academy sessions.

Employee and worker - For the purposes of this study, the terms were used interchangeably.

Field study and research study - These two terms were used interchangeably, to describe the work performed and presented in this paper.

Hazard - There are several recognized definitions for the word. An accepted version for the purpose of this study was: "An incident without adequate controls applied which has the the potential of producing an accident or loss." (Coastal Training Technologies Corporation, 2004).

Institutional Review Board - The University of Wisconsin-Stout committee that evaluates studies involving human subjects to ensure that applicable protocols and procedures are followed.

Job-related and work-related - For the purpose of this study, both terms were used interchangeably.

Lagging indicators (also referred to as trailing indicators) - These terms have been applied as traditional measurements of safety and health performance, and the statistics have often been displayed in terms of frequency and severity. An example of frequency could be the number or rate of lost-time injuries a company experienced. An example of severity could be the cost or rates of workers' compensation. Many of the BLS statistics and other sources have relied on reporting or interpreting lagging indicators.

Leading indicators - these figures have been referred to as measurements of positive or proactive performance used in evaluating safety and health. Examples include numbers of employees participating in safety training, number of safety audits conducted, and the number of hazards reported or corrected. Leading indicators have demonstrated employee involvement and management commitment to the safety process.

NIOSH - The National Institute for Occupational Safety and Health. Research performed by the Institute has provided OSHA and other organizations with data relating to safety and health topics.

Off-the-job - this has been referred to as activities conducted away from work or when persons are not employed.

On-the-job - this has been referred to assigned work tasks performed by the employee under normal or routine conditions.

OSHA - The Occupational Safety and Health Administration. This agency has been tasked with enforcement, training and other related activities designed to protect employees.

Participant, respondent, and student - for purposes of this study, the terms were applied to this study and were used interchangeably. The term 'student' also applied to respondents described or cited from other in-school studies.

Young workers and entry level workers - For the purposes of this study, the terms were used interchangeably.

Young workers - for the purpose of this study, these individuals were defined as being between 16 – 17 years of age.

Methodology

Evaluation of the process occurred through the following elements:

- Core competencies presented
- Self-assessment survey pre-test
- Post-test following the June 2008 training
- Quarterly participation in reporting on work experience and any incidents

A literature review of previous research and studies was conducted and is presented in Chapter II of the field study.

Chapter II: Literature Review

The purpose of this study was to review school-based safety programs designed to teach students about occupational safety and health. The degree of effectiveness achieved by the programs, in terms of improving on-the-job safety, recognizing hazards, and reducing the incidence of injuries or illnesses was assessed.

Studies evaluated in Chapter II determined the relevance to students in applying the safety and health concepts learned. This included studies aimed at educating young, beginning workers, focusing on the 16 – 17 age group. Information included program evaluations and personal interviews with school officials and safety professionals.

The Impact on Young Entry-Level Workers

The impact of work-related injuries and illnesses experienced by young workers was explored in Chapter I. A summary of the findings presented in Chapter I reinforced the problem:

- An average of 67 workers (aged 16 – 17) died each year from on-the-job injuries or illnesses (NIOSH, 2003).
- An estimated 84,000 young workers sought emergency medical treatment resulting from work-related injuries or illnesses annually (NIOSH, 2007).
- Workers under the age of 18 experienced non-fatal occupational injuries at a higher proportionate rate than for adults (U.S Department of Labor Occupational Safety & Health Administration [U.S. DOL, LOSHA], 2004).
- A combination of inexperience and performing at-risk behaviors contributed to the increased risk of young workers experiencing a work-related incident. Factors included: inadequate safety training, trying to hurry, and lack of supervision (OSHA Teen Workers, 2008).

- Work-related injuries and illnesses accounted for 26.2% of all emergency room visits among 17-year old Massachusetts youth (NIOSH, 1997).
- On average, workers aged 15 – 17 incurred a risk of an occupational fatality work that was about 80% of the corresponding risk for older workers (U.S. DOL, BLS, 2000).
- When measuring injuries resulting in days away from work to all workers aged 18 or younger, youth aged 16 – 17 incurred 97.3% of these incidents (U.S. DOL, BLS, 2000, p. 59).
- Annually, an estimated 200,000 teenage workers experience on-the-job injuries, an average of one injury every six minutes. Common causes for the injuries include: dangerous machinery, heavy lifting, exposure to toxic chemicals, and falls from ladders (University of California Berkeley, 2008).

Is the degree of risk and resulting injury and illness figures accurate? A report by the National Research Council and Institute of Medicine, Committee on Health and Safety, indicated that the number of young workers injured or ill on the job may be understated. Factors leading to the discrepancy included:

1. An underestimation of young workers entering employment. The U.S. Department of Labor estimated that 44% of 16-and 17-year-olds worked entry-level jobs during the year. This is contrasted by surveys conducted with high school students who reported an 80% rate of holding jobs at some point during high school. If the number of 16 – 17 year old workers employed in the workforce is almost twice as high as reported by the U.S. Department of Labor, and if the injury rate of adolescents is higher than for adults, the number of work-related injuries may be underestimated (U.S. DOL, BLS, 2006).

2. Younger workers experienced higher injury rates. The rate of injury per hour worked appeared almost twice as high for adolescents as for adults—about 4.9 injured per 100 full-time-equivalent workers among adolescents, compared with 2.8 per 100 full-time-equivalent for all workers (Committee on Health and Safety Implications of Child Labor, 1998). Another important factor to take into account is that youth employed in family business and small agricultural enterprises were included into the figures compiled by the U.S. Department of Labor.

Individual Considerations

In order to assess the efficacy of school or work-based youth safety programs, non-work related issues need to be considered. This is one key area in which the effectiveness of the safety training delivered may differentiate from younger workers to adults. Behavioral, social and psychological factors may influence the value and acceptance of the safety training initially received by the beginning worker. An instructor involved with the summer 2008 CVTC Manufacturing Academy identified several of the influential factors:

1. Distractions and detractions from learning
2. Identification with the situations or characters displayed during the training
3. Peer and personal interest in the subject matter
4. Teaching styles employed to encourage participation and maintain attention
5. Direct application of the knowledge to personal situations
6. Keeping the learning process entertaining and engaging (T. Vanderloop, personal communication, June 30, 2008).

If the student perceives the training as personally beneficial (both on and off the job), there may be more of an identification and acceptance to follow the concepts and principles presented. This in turn may lead to the person continuing to apply the skills throughout his or her career. Adopting safe work habits early on may help young workers short and long term, helping to reduce or minimize the risk of experiencing accidents and resulting losses later in life. First impressions can create positive reinforcement for the acquired knowledge and skills. Support from management and co-workers to the importance of following safe work practices can be powerful motivational tools to help continue the application of the fundamental skills (T. Vanderloop, personal communication, 2008).

Conditions and Causes of Risks to Young Workers

The Canadian province of Manitoba's Workplace Safety and Health Division conducted research to help identify causes and behaviors which could place young workers at risk. The Division sponsored a 'Young Workers Safety and Health Initiative', producing the 'Safe Work' program using the acronym SAFE (Spot the hazard, Assess the risk, Find a safer way, Everyday). The Division considered personal and behavioral issues which could contribute to an increased risk for experiencing an injury or illness. The study reasoned: "Young workers are at higher risk of being injured on the job. According to research, this is in part because:

1. They tend to think they're invincible (it won't happen to them).
2. They are not always aware of the risks of their jobs or what they need to do to protect themselves.
3. They may be eager to impress an employer and may not ask questions for fear of losing their job or appearing incapable" (Manitoba Labour and Immigration Workplace Safety and Health Division, 2008).

The book "Protecting Youth At Work" evaluated conditions that could lead to young workers increasing their risk of experiencing an occupational injury and illness. Emphasis was applied to 16 – 17 year-old youths entering the workplace. A summary of the findings is presented below:

1. Lack of long-term health effects on young workers exposed to toxins.
2. High-intensity work (usually defined as more than 20 hours per week) associated with unhealthy and problem behaviors, including substance abuse and minor deviance.
3. Insufficient sleep and exercise.
4. Inadequate health and safety training at work.
5. Inadequate supervision and assignment to tasks for which they may be developmentally unprepared.
6. Health and safety hazards that adolescents face in the workplace and the protections to which they are entitled under the law were little known or understood by the children and adolescents themselves, by their parents, and by other adults who were in a position to give them guidance.
7. Inexperience and the need to balance school and work.
8. Young workers were congregated in jobs characterized by the absence of opportunities for significant promotion within the firm, high turnover, little on-the-job training, limited scope for worker discretion or application of skill, heightened job insecurity, wide variation and uncertainty in hours, low pay, and few benefits.
9. Scattered and uncoordinated efforts to provide information and training related to making workplaces safe and healthy environments for young people.
10. Physical mismatches between the size of the adolescent and the task (Committee on the Health and Safety Implications of Child Labor, 1998).

Other causal factors leading to work-related injuries and illness in youth were recognized:

1. Use of unsafe equipment
2. Eagerness to please when asked to do hazardous tasks that may be illegal
3. Lack of awareness or compliance with child labor laws
4. Developmental characteristics that make them more vulnerable to injury
5. Inability to voice concerns about safety (Miara, 2003).

Vicente, in "The Human Factor" pointed out the need to address the human element in considering safety. "In many cases, the problem is that technology hasn't been designed to fit our bodies, even though the knowledge to do so has been available for some time" (Vicente, 2003, p. 135). Other risks to young workers have also been noted. "Work-related injury and illness among young individuals may also be attributable to physical, psychological and cognitive developmental characteristics along with inexperience on the job (West, et al., 2005, p. 298).

The effects on school performance associated with work were also evaluated. One study investigated the relationship comparing work intensity levels and their impact on academic, health and social outcomes in a selected minority population. The findings suggested that: "Working longer hours may have untoward effects on student functioning. Most notably, working longer hours was positively associated with using several illicit substances, psychological distress, dissatisfaction with amount of leisure time, and reduced time with friends. High-intensity work was also associated with slightly lower grades, increased absences and tardies, and greater frequency of sleeping in class" (Weller, et al., 2003, p. 449).

Existing School-Based Safety Curricula

Existing youth safety programs have adopted a host of strategies aimed at preventing accidents in young workers. The NIOSH "Youth @ Work – Talking Safety'" program issued state-specific editions which identified the common accidents occurring to workers in the affected region (NIOSH, 2007). The Wisconsin version of the program consisted of six lessons, which included individual activities, games, exercises, group work, and methods to measure the knowledge learned. Various scenarios presented young workers in potentially hazardous situations. Participants were taught to recognize potential hazards and suggest possible solutions for reducing the risk of accidents. Both on and off-the-job examples were presented. An outline of the lessons follows below.

Lesson 1: Young Worker Injuries (45 minutes)
Lesson 2: Finding Hazards (95 minutes)
Lesson 3: Finding Ways to Make the Job Safer (120 minutes)
Lesson 4: Emergencies at Work (75 minutes)
Lesson 5: Know Your Rights (60 minutes)
Lesson 6: Taking Action (70 minutes)

The time allocated for completing the entire program was seven hours and 45 minutes. A certification from NIOSH was available to students who successfully completed the program.

The University of California – Berkeley created a program analyzing young worker safety. Called ‘Keeping California’s Youth Safe on the Job’, the study was conducted in cooperation with the California Partnership for Young Worker Health and Safety. The program consisted of 33 recommendations for improving worker awareness to hazards, and teaching skills for safely working on the job. Involvement at the school, community and employer levels focused on informing young workers of the regulations, laws and training available to help them prepare to enter the workforce (UC Berkeley Labor Occupational Health Program, 2004).

The California consortium also developed 'Work Safe!', a program designed to teach adolescents skills to safely enter the workforce. The curriculum consisted of four lessons designed to be taught in six hours and 25 minutes. The program is outlined below:

Lesson 1: Teen Work Injuries (65 minutes)

Lesson 2: Finding Hazards (140 minutes)

Lesson 3: Know Your Rights (75 minutes)

Lesson 4: Taking Action (95 minutes) (UC Berkeley – LOHP 2001).

A project sponsored by the UCLA – Labor Occupational Safety and Health Program produced a school-based curriculum titled: "Healthy Communities, Healthy Jobs". Unit III of the five unit program: 'Safe Jobs for Youths' consisted of 10 learner-centered units. The first section described techniques for helping youths identify hazards and solutions (University of California Los Angeles, 2008).

The Massachusetts Department of Health prepared a school-based program promoting safety education for young workers, called 'Safe Health/Safe Workers'. The curriculum consisted of five lessons, four hours in length. The program is outlined below:

Lesson 1: Overview to the Problem of Teen Work Injuries (45 minutes)

Lesson 2: Identifying Hazards on the Job (60 minutes)

Lesson 3: Controlling Hazards: Preventing Teen Work Injuries (45 minutes)

Lesson 4: Job Rights and Resources (45 minutes)

Lesson 5: Speaking Up About Workplace Health and Safety Problems (45 minutes)

(Massachusetts Department of Public Health, 2002).

In addition to the school-based programs, on-line training safety programs have been developed and made available to help teach job-related safety principles to young workers. The on-line courses reviewed consisted of five and ten hour modules. The programs were titled 'Y2Y' (Youth Teaching Youth). The five-hour program included the following modules:

1. Start Safe/Stay Safe
2. Preventing Falls
3. Personal Protective Equipment (PPE)
4. Bloodborne Pathogens
5. Electrical Safety
6. Machine Guarding
7. Hazard Communication
8. Ergonomics
9. Preventing Workplace Violence
10. Emergency Action (Texas Engineering Extension Service, 2003).

The 10-hour on-line safety programs (either general industry or construction-centered) included elements presented in the five-hour module, along with other compliance areas required by OSHA. Students completing the 10-hour program received a course completion card from OSHA. The emphasis of the NIOSH 'Youth @ Work' curriculum was on hazard recognition and understanding the rights of young workers. The CareerSafe program presented more traditional standards and regulatory topics (Texas Engineering Extension Service, 2003).

In-School Safety Training

The importance of instructors in taking lead roles in the communication of safety principles was emphasized by several researchers. One of the first recommendations was to assess the risks posed to young workers: "Reviewing the integration of OSH (occupational safety and health) information into vocational and technical training begins with considering the school-related injury or illness risks that exists for students and teachers" (Schulte, et al., 2005, p. 407).

Emphasis was also applied on the school instructor to model and reinforce safe practices, as described in the following passage:

> TE (Technical Education) instructors must consider several factors when deciding how to develop a comprehensive safety program. First, as the educational leader of the classroom/laboratory, the TE instructor must model effective safety strategies.
> TE students focus on the instructor as a role model and imitate both the positive and negative behaviors they witness. Sometimes it may not seem worth the effort to don a pair of [safety glasses] when drilling just one hole in a piece of metal. Who would know if the safety guard was lifted off a table saw for just one second to make a saw cut? Students see these omissions and see that all the talk about safety is just that – talk. When students take these shortcuts and get injured in the process, the ultimate responsibility falls on the safety instructor (Gunter, 2007, p. 6).

Interviews were conducted with selected school officials to assess the types of safety training offered to students. Staff interviewed described varying degrees of informal training available to students. For example, students enrolled in the Menomonie, Wisconsin High School internship program were required to complete the CareerSafe on-line safety program in order to earn a 10-hour course card from OSHA. The students registered and paid for the training themselves. In the school's Technology program, the instructor Stan Phillips, issued safety guidelines to his students and tested their ability to understand and follow the safety rules (S. Phillips, personal communication, June 13, 2008).

The subject of safety and health training offered to high school students was also discussed, including ‘pathways’ offered for students interested in career exploration. One example is the pathway for Engineering and Technology careers offered by the Menomonie Public School District. In addition to completing the core courses, students were required to complete a one credit ‘Life Skills’ class at some point during their high school experience (grades 9 – 12).

One component of the Life Skills class was Basic First Aid/CPR training (J. Marion, personal communication, June, 2008). The class is in one of the defined career clusters and related pathways provided to Menomonie High School students. The students are encouraged to choose one of the available 16 pathways to learn more about various career options. The manufacturing pathway was the only one of the 16 clusters listing safety as an individual course component.

Discussions with other Menomonie High School staff members revealed that the amount of time spent on teaching students safety depended on the type of program or class in which they were enrolled. For example, students interested in restaurant and hospitality careers were taught how to prevent burns, slips and falls, and how to avoid transmitting disease. Students interested in computer skills received information on ergonomics and reducing the risk of related conditions (S. Halama, personal communication, June 2008), and (C. Husby, personal communication, June, 2008).

A review was conducted of applicable programs from other selected school districts in west-central Wisconsin. Several schools offered training in technology, engineering or health. For example, the Eau Claire Area School District offered 16 core areas required for graduation (similar to, but varying from the Menomonie School District’s core areas). One of the modules was called ‘Work Based Learning’ (ECASD Work Based School Learning Programs, 2008). While occupational safety training may be offered within one or more of the courses, there was no reference made either in the course listing or course descriptions (Eau Claire Area School District, 2008).

A review of the Chippewa Falls School District’s course offerings produced similar results. Safety training may be referenced in selected courses, such as ‘Independent Living’, and technology classes, but there was no dedicated program listed for preparing youth to enter the workplace (Chippewa Falls High School, 2006). Several safety-based in-school training programs and curricula have been developed to teach high school students. The issue is not the content or fundamental concepts offered, but the time allocated or allowed by the districts and their teachers for students to complete the content.

One study recommended a series of elements recognized for designing an effective school-based safety and health program. Elements included conducting formative research, evaluating the results, implementing a pilot program, then applying improvements to revise the final curriculum format and content (Miara, et al., 2005).

One school program’s efforts to emphasize the importance of following safety rules were reviewed. The training involved a slide presentation designed to present an overview of OSHA and the importance for following prescribed safety regulations. The content of the presentation included a series of graphic images showing severe injuries and illnesses resulting from occupational accidents.

The intent of the presentation may have been to show participants the consequences of unsafe conditions or acts. A sampling of the content included: “Safety is as much a part of your job as turning on your machine or strapping on your tool belt. An unsafe act by you could lead to serious injuries or death to you or a co-worker. Although you have seen some horrible things that have happen to workers most workers work their entire working life without being seriously injured" (West High School, Technical Education, n.d.).

A comparison of the school-based programs described in this chapter is presented in Table 5.

Table 5

Comparison of School-Based Safety Programs

Agency	Program title	Lessons	Time	Certification
NIOSH	Youth @ Work – Talking Safety	6	7.75 hours	Yes (1)
UC-Berkeley	Work Safe!	4	6.5 hours	No
UCLA-LOSH	Healthy Communities/Healthy Jobs	37	1 semester	No (2)
MA Dept. Health	Safe Health/Safe Workers	5	4 hours	No
CareerSafe	Youth Teaching Youth	10	5 - 10 hours	Yes (3)
CVTC	Manufacturing Academy 2008	15	12 hours	Yes (4)

Notes:

(1) A NIOSH certificate of completion is presented to participants who successfully complete the program.

(2) The full five unit program is scheduled as a semester-long program. Unit III is dedicated to workplace safety and is titled 'Safe Jobs for Youth'.

(3) A card from OSHA is provided to students who complete the 10 hour on-line training program.

(4) Certifications included: fire extinguisher demonstration (the Cintas Company), Adult CPR/AED for the Workplace (American Red Cross, 2007), Adult First Aid for the Workplace (American Red Cross, 2007), and a Safety in the Workplace Certificate (Chippewa Valley Technical College).

Table 6 compares the primary elements reviewed in the school-based safety programs in Chapter I and Chapter II. Further assessment of the topic areas presented in the CVTC program is discussed in Chapter III.

Table 6

Common Elements Presented in Youth-Based Safety Training Programs

Topic	Youth @ Work	Work Safe	Safe Health/ Safe Workers	Y2Y	CVTC
Hazard identification	Yes	Yes	Yes		Yes
Injuries and illnesses	Yes	Yes	Yes		Yes
How to improve job safety	Yes		Yes	Yes	Yes
Emergency response	Yes			Yes	Yes
Young worker rights	Yes	Yes	Yes		Yes
Worker responsibilities	Yes	Yes	Yes		Yes
Specific safety topics	Yes			Yes	Yes

Note. Core subjects are listed. An affirmative response indicated a highlighted topic. Other programs, though absent of affirmative remarks, may be referenced to the listed topics in lesser detail.

Perspectives from Safety Professionals

Safety professionals were asked for their views on the success or impact of school-based safety programs. One safety manager described a gap in the educational system for school-based safety programs.

> Most teachers lack basic understanding of safety principles. Teaching safety to high schoolers in isolation is helpful. But for it to be effective and sustainable, it has to be based on a foundation of safety provided, practiced, and modeled by the school leadership and teachers. That's why school leaders should be required to attend a semester course in school safety management that focuses on prevention of unintentional injuries as a prerequisite for their administrator certification. Similarly, teachers should be required to attend an undergraduate class in Safety 101 as part of their teacher training and a continuing education class on safety every so many years to maintain their certification (B. Silkowski, personal communication, July 13, 2008.).

Another safety professional spoke to the lack of continuity in the system pertaining to safety and health training at the student level:

> Actually, I've found that this is one of the failures of the entire education community. No education degree program contains a mandatory occupational safety course for educators. This is then coupled with a lack of adequate occupational safety staff in any public school district due to budgetary constraints and priorities. Attention to safety is further reduced by the fact that public schools in states without a state plan are not covered by OSHA and are therefore not forced to concern themselves with OSH regulations and compliance. The closest they get is probably a Risk Manager or workers' compensation person. Mention the term 'safety' to most educators and state and federal

departments of education and they will define it as gun control, bullying and controlled substance prevention and emergency planning. The end result is that high school graduates usually enter the workforce with little or no concept of occupational safety (D. Sharrow, personal communication, July 16, 2008).

Reference was made relative to the role of students and teachers in the attainment of safety education: “Teaching safety to high school students can only be effective and sustainable if it's based on a foundation of safety provided, practiced, and modeled by the school leadership and teachers” (B. Silkowski, personal communication, July 13, 2008).

Improving Employee Safety Performance with Training and Supervision

The value of combining effective supervision with employee training can work in unison to help prepare workers to recognize hazards and prevent accidents. One example of the synergy associated with effective supervision on improved performance is provided by the following statement: “Implementing (aspects of) performance management contributes to improved performance. Supervision and support are particularly crucial to enhance quality services” (Dieleman & Harnmeijer, 2005, p. 24). Another study focused on improving performance by providing active feedback and clear guidelines to improve the impact of training on performance:

1. Ensure that those chosen to participate in training are appropriate for the training.
2. Prior to training, provide briefings to participants on expected post-training application.
3. Design and deliver training according to learner characteristics and performance needs.
4. Provide immediate supervision and support, encouragement, and resources post-training.

5. Provide consistent, specific, corrective and confirming feedback to improve and maintain performance. Offer personally meaningful benefits to incite learners to persist with the new skills and knowledge (Stolovitch, 2001).

A study evaluating the effectiveness of safety performance based on supervision and training identified what were termed as critical training factors:

> Taken as a whole, there is substantial documentation showing how training can meet objectives of knowledge gain, behavior change for improving worker health and safety. Reductions in work injuries and medical costs may also be noted in conjunction with these changes but evidence to show actual linkage or dependency remains to be ascertained (Cohen & Colligan, 1998, p. 33).

Additional support for training and supervision was also offered: "The general finding concerning training was that early indoctrination of new workers in safe job procedures with follow-up instruction to reinforce the learning was most frequently linked with successful safety performance" (Cohen & Colligan, 1998, p. 42). Factors identified as being critical to assessing positive performance included: determining the training needed; identifying training needs; identifying goals and objectives; developing learning activities; conducting the training; evaluating program effectiveness; and improving the program (Cohen & Colligan, 1998, p. 20 - 21).

The value of combining safety training with adequate supervision to reduce accidents and losses was stated:

> Three observations about training derive from these NIOSH and BOM studies. The first is that training differences do exist between workplaces with good and poor safety records, but their overall importance remains to be ascertained. The second is that the

differences seem relative, i.e., greater or more deliberate efforts are made to train, and to commit supervisor time and resources in the workplaces with better safety records. The third and related to the second is that supervisor training in how best to deliver and reinforce safe work practices seems crucial to the overall training effort and the success of the hazard control program (Cohen & Colligan, 1998, p. 42 - 43).

According to the article “Learning Influences Engagement”, survey participants responded to four learning processes designed to support employee engagement. The participants replied to the degree of organizational and management support for employee learning and application. The quality of workforce learning was identified as the leading factor for improving employee performance. According to the author, “Providing supervisors with training on how to coach and engage were recommended as learning processes that should be in place if they are not already implemented” (Paradise, 2008, p. 12).

The value and importance of the teacher’s role in providing supervision to students in technical education was also emphasized: “Proper supervision MUST [capitalized by author] be provided. The instructor cannot leave students unattended. Not being aware of unsafe behavior is not an excuse should an accident occur (Gunter, 2007, p. 7). Relating to employee safety, OSHA applies controls for accident prevention by establishing varying levels of employee competency and training requirements. The agency provides definitions for the terms ‘competent employee’ and ‘qualified employee’. A ‘competent person is capable of identifying existing and predictable hazards in the surroundings or working conditions, which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them. A ‘qualified employee’, “is one by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or the project" (OSHA, 1986). OSHA standards, such as confined space entry and electrical safe practices require that supervisors personally evaluate and authorize that safe conditions and regulatory compliance are in place prior to allowing employees to work on the related activity. The confined space entry regulation is one example requiring supervisory oversight:

> The entry supervisor: (1) evaluates the conditions in and around any permit space that is to be entered; (2) oversees entry operations, as necessary, to determine if the conditions are acceptable for entry; (3) where acceptable entry conditions are present, either authorizes entry to begin or allows entry operations that are already underway to continue; and (4) takes the necessary measures to protect personnel from permit space hazards. Where acceptable entry conditions are not present, the entry supervisor either prohibits entry or, if entry is already underway, orders the authorized entrants out of the permit space and cancels the entry permit (OSHA, 1994).

OSHA also emphasized the importance of combining supervision with employee training to build a positive environment and culture, based on the fact sheet described below:

> One-on-one training is possibly the most effective training method. The supervisor periodically spends some time watching an individual employee work. Then the supervisor meets with the employee to discuss safe work practices, bestow credit for safe work, and provide additional instruction to counteract any observed unsafe practices. One-on-one training is most effective when applied to all employees under supervision and not just those with whom there appears to be a problem. Positive feedback given for safe work practices is a very powerful tool. It helps workers establish new safe behavior

patterns and recognizes and thereby reinforces the desired behavior (OSHA Safety and Health Management Fact Sheets, 2008).

Health Education and Related Areas to Safety

Preparing students to enter the workplace may be referenced in high school curricula through their health education programs. Most schools require students to complete a class in general health or other related areas. The National Center for Chronic Disease Prevention and Health Promotion produced the 'Coordinated School Health Program', or CSHP. Eight component modules were presented in the training:

1. Health education
2. Health services
3. Physical education
4. Nutrition services
5. Counseling, psychological and social services
6. Healthy school environment
7. Health promotion for staff
8. Healthy community involvement (National Center for Chronic Disease Prevention and Health Promotion, 2008).

The State of Wisconsin's Department of Public Instruction offered a curriculum guide for health education. The resource "Health Education: A Guide to Curriculum Planning in Health Education," provided 14 chapters, with one devoted to safety, titled 'Accident Prevention and Safety' (Wisconsin Department of Public Instruction, 2008). Additional searching through the department's publications resulted in reference to driver and traffic safety. While there was evidence of comprehensive safety training available for young, entry-level workers, the information obtained did not show a level of safety training offered or provided by school systems on a consistent basis.

Employer Entry-Level Safety Training

Much of the responsibility for providing young workers safety training traditionally has been taken by the employer. A question raised may be: if school systems do not offer consistent safety training modules for students, where and when is the training delivered? Employers have been required to provide safety training to their workers, yet one study indicated a lack of safety training available to young workers: “Several studies have found that approximately half of young workers receive no safety training on-the-job” (Miara, et al., 2003, p. S-31).

Many employers rely on new employee orientation programs to deliver the initial training. An example of a new employee orientation checklist is illustrated as Appendix I. This three-day comprehensive program was used by ConAgra Foods, Inc., Menomonie, WI, to provide new workers with information relating to safety and health prior to beginning work (ConAgra Foods, 2007). Most orientation programs have provided an overview of training to meet OSHA required topics. A list of the required OSHA compliance topics is listed as Attachment H.

Several models have been used to train workers the aspects of occupational safety and health. However, worker application and demonstration of competency has not always been an expressed outcome. Many of the OSHA standards are ‘performance-based’, requiring an application or demonstration of the skills learned. Under the Occupational Safety Act of 1970, OSHA defines the requirements of employers to provide a safe workplace. Employees are required to follow the safety rules or guidelines as well. The pertinent section from the Act follows below:

> Section 5. Duties (a) Each employer: (1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees; (2) shall comply with occupational safety and health standards promulgated under this Act. (b) Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct (OSHA, 1970).

Supervisors have often been assigned the new employee orientation training and have relied on the use of checklists (San Diego State University, 2006). The problem has not with the content or checklist, nor the amount of time spent with the new employee. Deficiencies emerged in evaluating the degree of knowledge presented, along with the new employee's ability to understand the training and apply the concepts, and handle the pressures and demands of beginning work. The ability for young workers to understand their roles in working safely, along with other factors, such as maturity, culture and communications may contribute to increasing the risk of experiencing a workplace accident. Help has been provided in certain fields, such as restaurants and fast food, industries in which young workers many times begin their working careers. The OSHA Teen Worker Safety website provided specific information to employers and youth under their 'Youth 2 Work' program (OSHA, 2008).

Resources Available to Young Workers

Several avenues and resources were created for educating young workers. Multiple public and private agencies have participated in the development and delivery of training materials. Available resources have included: vocational, technical and career education, career clusters, national skills standards, school-to-work programs, Workforce Investment Act programs, and apprentice programs (Schulte, 2005).

The University of California – Berkeley developed a website to guide young workers. Titled ‘youngworkers.org’, the site offered information to teens about young worker safety and covered several subject areas. Other topics discussed young worker rights, and how to report a safety problem. This included an introduction and description of the program titled: ‘Why is Job Health and Safety Training Important for Teens?’ (UC Berkeley, 2008).

A resource guide produced by the organization provided listings of safety programs and other assistance available for “teens, employers, school personnel, parents, and others concerned about the safety of young workers to schools” (UC Berkeley, 2004). Another organization providing resources for young workers is the Children’s Safety Network. On their ‘Injury Prevention Information’ website, information and data provided assistance to young workers and their families for accessing safety resources (Children’s Safety Network, 2008).

Organizing Efforts to Help Youth Enter the Workplace

NIOSH organized an extensive effort outlining resources for educating youth entering the workforce, titled “Promoting Safe Work for Young Workers.” The report collected data from three organizations and identified steps for coordinating community resources to prepare young workers to enter the workforce with the necessary skill sets and support. The steps included:

1. Forming Partnerships with Schools
2. Developing Teen Peer Education Programs
3. Involving Parents
4. Linking with Job Training Programs
5. Including Health Care Providers

6. Working with Employers

7. Reaching the Broader Community (NIOSH, 2000).

The Royal Society for the Protection of Accidents produced a review of safety education efforts implemented in the United Kingdom. Recommendations for applying safety education were aimed at selected groups and individuals:

1. A whole population (universal)
2. At-risk groups where the incidence of accidents was higher than the population at large (selective)
3. Those identified by a screening process that may be at particular risk e.g. individuals with mobility or mental health problems (Royal Society for the Protection of Accidents, 2008).

Taking into account generational and age variables has also been considered. According to one article:

> Under 30 workers prefer their safety training information delivered to them in a multimedia buffet of handouts, one-on-one attention and video instruction. Some people work better with written [instruction], some do better with video, and some do better with one-on-one. We find the combination of these three has been very successful for the younger worker (Cable, 2005, p. 21 – 22).

Guiding Principles

An additional series of ‘guiding principles’ and recommendations were proposed to help young workers reduce their risk and exposure to workplace hazards. The objectives were to:

1. Help young workers recognize and assess potential risks and to make decisions about them, and;

2. Provide adolescents with specific information about the tasks they are asked to perform, in order to make reasoned decisions about safety (Committee on Health and Safety Implications of Child Labor, 1998).

A summary of the principles follows:

1. Education and development are of primary importance during the formative years of childhood and adolescence. Although work can contribute to these goals, it should never be undertaken in ways that compromise education or development.
2. The vulnerable, formative, and malleable nature of childhood and adolescence requires a higher standard of protection for young workers than that accorded to adult workers.
3. All businesses assume certain social obligations when they hire employees. Businesses that employ young workers assume a higher level of social obligation, which should be reflected in the expectations of society as well as in explicit public policy.
4. Everyone under 18 years of age has the right to be protected from hazardous work, excessive work hours, and unsafe or unhealthy work environments, regardless of the size of the enterprise in which he or she is employed, his or her relationship to the employer, or the sector of the economy in which the enterprise operates (Committee on Health and Safety Implications of Child Labor, 1998).

Mention was also made relative to research-based recommendations:

1. Longitudinal studies of how individuals who have worked in their youth function as adolescents and adults and how various outcomes are associated with the quality of the work experiences.
2. Research to determine whether the developmental characteristics of children and adolescents put them at [an] increased risk from factors in the work environment,

including chemical, physical, ergonomic, and psychosocial conditions (such as stress or type of supervision).

3. Research on efficient and effective strategies to protect working children and adolescents, with emphasis on primary prevention of injury and other negative outcomes (Committee on Health and Safety Implications of Child Labor, 1998).

Building a Foundation for Workplace Safety

Recommendations for building a foundational program for training youth at school have been proposed. A global, comprehensive and joint effort was recognized as helping to guide young workers to learning and applying sound safety principles. This view has been acknowledged: "Safety planning should be a cooperative effort between the [TE] instructor, students, parents, and school administrators" (Gunter, 2007, p. 6).

Another view reinforces the position of integrating multiple levels of support: "Young workers are in need of education related to safety practices and prevention of exposure in the workplace. Adult advocates, such as parents, teachers, employers, and mentors, as well as the young people themselves, should be empowered with the information to ensure safe and healthy work environments (West, et al., 2005, p. 302).

The relevance of offering in-school training to young workers in order to reduce or prevent work-related losses was investigated in a study analyzing educational status and work injuries. The author concluded: "The elevated injury risk of young workers out of school suggests that school-based work safety education programs need to be supplemented with other prevention strategies that improve the fit between these young workers' experience and capabilities and the work environment" (Breslin, 2008, p. 121). Efforts to reduce the risk of potential work-related injuries were also proposed: "Injury prevention principles such as engineering out hazards where possible, education and training, and enforcement of occupational health and safety regulation relevant to youth (Breslin, 2008, p. 124).

A NIOSH directive proposed guidelines for involving stakeholders to help promote young worker safety. A comprehensive list was provided to assist schools with conducting safety audits. Overall recommendations included the following actions:

1. Assure management commitment
2. Assure employee and student involvement
3. Identify and prioritize potential hazards
4. Eliminate hazards
5. Train employees, students, and management (NIOSH Safety Checklist for Schools, 2008).

NIOSH also listed methods for communicating with young workers on occupational safety and health issues. They included:

1. Booklets
2. Book covers
3. Wallet cards, posters, and mouse pads
4. CD-ROMs
5. Presentations
6. Teen focus groups
7. Child labor law calendar
8. Teen peer education and assessment project (NIOSH, 2005).

Measuring Results From School-Based Safety Programs

Educational efforts aimed at improving student perception and knowledge to the importance of workplace safety have been performed. A study of the 'Safe Jobs for Youth' curriculum found that:

> After completing the two week adolescent's workers rights curriculum, ninth grade students showed statistically significant improvement ($p < .001$) in scores on post-tests in which the curriculum was taught. For example, after the class, more students were aware that the Occupational Safety and Health Administration is the agency that regulates worker health and safety (Postma, 2006, p. 145).

A consortium of organizations and agencies gathered in December 2005 to develop a resource compendium identifying available federal and state young worker programs. Titled 'Health and Safety Training for Young Workers, How Do We Really Make This Work', the report evaluated the efforts undertaken by the State of Wisconsin that produced the following results:

1. Worked with local Workforce Development Boards to create a program for at-risk youth.
2. Trained teachers in juvenile justice facilities to implement *Youth@Work*. The students earned a certificates demonstrating that they completed *Youth@Work* and were coached to tell potential employers that the program taught them to work safely.
3. Trained middle school teachers in Cooperative Educational Service Agency districts to use *Youth@Work*.
4. Encouraged the Wisconsin Department of Public Instruction to add worker safety to the training students take to obtain Employability Certificates.

5. Trained technical education teachers and others in schools to use *Youth@Work.*

6. Trained the staff of nonprofit organizations to use *Youth@Work.*

7. Held child labor law clinics for employers.

8. Developed a health and safety curriculum for fast food restaurants, which was distributed to these restaurants.

9. Worked with the Wisconsin Safety Council to disseminate health and safety information and materials to employers (National Young Worker Safety Resource Center, 2005).

Other Organized Efforts

While the above programs were designed for the high school aged audience, other programs have targeted their efforts at younger ages. The Director for the Wisconsin Council of Safety, Bryan Roessler, referred to a safety curriculum the organization prepared for elementary teachers to deliver to 4th grade students. The general response from the schools contacted by Mr. Roessler was that they did not have room or time built into their school year for delivering the safety component. This was in spite of the fact that the Safety Council provided the licensing for the curriculum at no cost (B. Roessler, personal communication September 21, 2008).

Summary

Causes and factors increasing the risk for young workers becoming injured or ill on the job have been explored in this chapter. Based on many of these factors, young workers have faced an increased risk of experiencing a work-related injury or illness. The result of the exposure may be immediate (such as a burn or laceration), long-term (such as back pain), or unknown for years to come (such as exposure to toxic substances).

Training programs have been made available to schools, many times at no cost to help educate students and prepare them to enter the workforce. Schools have evaluated time, staffing, and other resource allocations when deciding on the degree of safety training available. An analysis of a safety training program conducted at CVTC June 2008 is presented in Chapter III.

Additionally, Chapter III described the methods and procedures employed to evaluate data collected from the June 2008 Manufacturing Academy and assess the level of knowledge and skills learned by the participants enrolled in the program.

Chapter III: Methodology

Opening – Method of Study

Chapter II of the field study reviewed previous research describing school-based youth safety programs. The purpose of the literature review was to determine the degree of the existing safety programs, in their actual or perceived effectiveness at reducing work-related injuries and illnesses. The impact on 16 – 17 year-old youth from exposure to hazards and resulting accidents was also analyzed to determine trends and identify methods for mitigating both the frequency and severity of workplace accidents through a safety training intervention.

Six safety programs were reviewed as models for introducing occupational safety and health training to high-school youth. Included in the review was the 2008 CVTC Manufacturing Academy program, delivered as part of the field study. In Chapter II, a comparison of the six programs was identified in Table 5 (p.38), and common program elements discussed in the study were displayed in Table 6 (p.39). A discussion on the methods and procedures applied in the study comprised the content of Chapter III. The results of the data collected were analyzed and reported in Chapter IV.

The scope of the field study was intended to address the research questions proposed in Chapter I. A summary of the research questions included: 1) the ability for participants to actively demonstrate the safety concepts learned; 2) the transfer of safety knowledge from the school to the work environment; 3) the ability of the students to directly apply the skills on-the-job; 4) the extent to which the students were able to comprehend the training presented; and 5) determining if there was a single strategy which could assist the students in reducing their risk of experiencing a work-related injury or illness.

Sample Selection

In June 2007, a course produced by the Manufacturing Skills Standards Council (MSSC) was sponsored by the Wisconsin Department of Workforce Development (DWD). Titled the 'Manufacturing Academy', the program resulted from a grant funded by the State of Wisconsin and offered to high school junior and senior students. The program contained four modules, one which included instruction in occupational safety and health. CVTC hosted two of the Manufacturing Academy sessions. Additional programs were held at other Wisconsin Technical College locations. The program was promoted to high school guidance counselors in the 39 school districts comprising the technical college. The counselors recommended or selected interested students to attend the pilot program. A total of eight students enrolled in the June 2007 training, held at the CVTC campus in Menomonie, Wisconsin. (An additional MSSC course was conducted at the CVTC Neillsville, WI campus but did not include the safety training module).

The school counselors were contacted by the DWD during the spring of 2007 to inquire about potential students interested in exploring careers in manufacturing. Information describing the Manufacturing Academy was forwarded by the counselors to instructional staff responsible for career and technical education to share with their students. Materials included MSSC brochures, and an outline for the upcoming summer academy. The 2008 Manufacturing Academy was promoted in a similar fashion. The format and content however, changed, in that the 2008 program was shortened from the four weeks dedicated to the 2007 version, down to two weeks. The focus was again on opportunities in manufacturing and models for career exploration. The difference in the 2008 program was the removal of the MSSC component. The structure of the safety-related content was also consolidated, to become more interactive and performance-based. The aspect of providing outside certifications (fire safety, first aid/CPR, and safety) was another feature added to the 2008 program.

The grant funding period extended from June 1, 2007 to June 30, 2008, enabling the DWD to sponsor the 2008 Manufacturing Academy following the conclusion of the school year. The program was again promoted to high school guidance counselors within the CVTC district. Students who expressed an interest in learning about manufacturing careers were invited to attend. The number of students enrolled in the 2008 Manufacturing Academy increased from the eight who attended in 2007, to 26 who registered for the 2008 session. The increase in enrollment may have been attributed in part to referrals from 2007 participants. Students who successfully completed the 2007 or 2008 programs earned high school and potential college transfer credits, along with receiving a paid stipend. (One of the students who attended the 2007 Manufacturing Academy also enrolled and successfully completed the 2008 program). Similar to the 2007 Academy, students who participated in the 2008 program were high school juniors and seniors. Table 7 illustrates the composition of the sample population from both the 2007 and 2008 Manufacturing Academy sessions.

Table 7

Chronology of Topics Conducted During Week Two of the
June 2008 Manufacturing Academy

Manufacturing Academy Student and School Representation Comparison, 2007 – 2008

2007 Representation

School district*	Male students	Female students
Menomonie	4	3
Plum City	1	0
Total	5	3

2008 Representation (students who completed the program)

School district*	Male students	Female students
Menomonie	5	2
Altoona	2	0
Eau Claire	6	0
Chippewa Falls	2	0
Boyceville	1	0
Total	16	2

Note:

*Participating districts included students from public and charter schools.

A total of 26 students were initially enrolled in the June 2008 Manufacturing Academy. The students attended classroom and laboratory sessions during the first week (June 16 – June 19, 2008). Topics presented included principles of manufacturing and technology. A portion of the second week was dedicated to learning the concepts of occupational safety and health. At the beginning of the second week (June 23, 2008), 23 students were enrolled in the program; three having dropped the class following the first week. Five additional students were subsequently dismissed on June 24, 2008 for attendance reasons. Of the eight students who either dropped the course or were dismissed, two were from the Menomonie School District, one was from the Eau Claire School District, one was from the Stanley-Boyd School District, and four were from the New Auburn School District. One student was female, and the other seven were male.

Eighteen students completed the program, which concluded on June 27, 2008. The composite demographic representation of the population sampled included two female and 16 male students. In order to ensure individual confidentiality, a specific ethnic representation was not reported in the study.

Relative to the instrumentation employed in the research study, Table 8 included a timeline and description of the activities conducted during week two of the June 2008 Manufacturing Academy, in which the safety and health component was delivered. A list of the instruments applied in the study, along with the implementation dates, was included.

Table 8

Chronology of Topics Conducted During Week Two of the June 2008 Manufacturing Academy

	June 23	June 24	June 25	June 26	June 27
Safety training (1)	X	X	X	X	X
Pre-class questionnaire	X				
Pre-test	X				
Pre-class skills application	X				
Post-test					X
Post-class skills application					X
Post-class survey I					(2)
Post class survey II					(3)

Notes:

(1) Safety training was conducted in full or as part of other program content during the week.

(2) Post-class survey I was sent on 7/31/2008.

(3) Post-class survey II was sent on 9/2/2008 to participants who did not reply to the first post-class survey.

Instrumentation

A series of seven instruments were applied in the study, in order to obtain data which could be statistically analyzed to determine validity and reliability. (Note – there were two similar post-class delivered to students following the completion of the 2008 Manufacturing

Academy. Ten students who were sent the initial post-class survey did not respond to the mailing. A second survey was sent to the participants who did not respond to the first one.)

The objective of disseminating the number and variety of the instruments was to gather and compare relevant data which could be used to evaluate trends, receive feedback from the participants, and evaluate their level of knowledge. The data and results reported, along with an evaluation of the individual instruments used in the field study was described in Chapter IV.

All of the instruments applied in the study were submitted for outside review. The first peer-review was conducted by University of Wisconsin-Stout graduate students enrolled in a class titled 'Instrumentation for Research'. The reviewers were advanced (educational specialist or doctoral) degree candidates. The course professor also provided comments and recommendations. The instruments were next submitted to board members from the Western Wisconsin Safety Council, to gain their professional insights. Comments received helped to qualitatively improve the instruments. A synopsis of the recommendations received from the peer and professional reviews followed below:

1) Regarding the pre-class questionnaire (Appendix C), the feedback received led to grammatical corrections and formatting changes designed to improve clarity and understanding. Construction of the survey followed principles for designing affective measurement instruments (Lee, 2006). For example, initial choices allowed for a single 'yes' and 'no' response. Changes were made to allow participants to make single or multiple choices. The questionnaire was formatted to fit onto a single page, printed front and back.

2) Changes were made to the post-test (Appendix E) to simplify the required information, and followed guidelines for constructing recall – recognition test items (Lee, 2006, slides 7 – 9). This included allowing participants to answer with simple figures (such determining the

minimum height requirement for providing fall protection), or definitions to commonly applied safety-related acronyms. Other recommendations involved re-wording questions to clarify the response necessary to correctly answer the question or statement.

3) Peer-review comments applied to the provided pre/post class skills applications (Appendix G). The skill level required to correctly respond to the items was modified to approximate general employee safety training. An example was demonstrating how to use a fire extinguisher to suppress an incipient fire. When conducted as an employee training exercise (which was done during the class), students discharged the extinguishers onto an actual fire. For purposes of the skills application, students simulated how they would discharge the extinguisher.

4) Peer reviews applied to the first post-class survey (Appendix J) involved wording and formatting. For example, box diagrams were inserted in the survey to allow respondents to check their replies (this was changed from circling or writing in their selections). Changes to the second post-survey (Appendix K) included color-coding 'yes' and 'no' responses, adding pictures, and dividing the survey into sections where students not working would complete only the first three questions.

Content and Subject Distribution

The safety training portion of the class was presented during the second week of the 2008 Manufacturing Academy. Activities conducted the first week consisted of providing orientations to selected CVTC program areas: nanotechnology, machine tool operation, and electromechanical engineering. The students rotated through the programs, and also visited area businesses to observe manufacturing processes. A portion of week two (20 out of 35 hours) was dedicated to presenting safety concepts. (Note – the safety training component was initially planned to encompass 28 hours. Due to other commitments, the available time was condensed to

20 hours.) Additional program content included in week two consisted of general manufacturing and engineering concepts.

Table 9 described the approximate time and percent given to program content in the 2007 and 2008 Manufacturing Academy sessions.

Table 9

*Program Content and Delivery, Comparing the Manufacturing Academy Sessions, 2007 and 2008, Expressed in Hours and Percentages**

Topic	2007 Academy (1)	2008 Academy (2)
Introduction to manufacturing	20 (17%)	30 (44%)
Production and processes	20 (17%)	4 (6%)
Quality assurance	15 (12%)	0 (0%)
Occupational safety and health	20 (17%)	20 (29%)
Outside field trips	20 (17%)	8 (12%)
Independent study and research	10 (8%)	4 (6%)
Student presentations	5 (4%)	2 (3%)
Guest speakers	10 (8%)	0 (0%)
Totals	120 (100%)	68 (100%)

Notes:

Percentages are displayed parenthetically

* Figures were approximated.

(1) The 2007 Manufacturing Academy consisted of four weeks, five days a week, eight hours per day.

(2) The 2008 Manufacturing Academy consisted of two weeks, four days per week, eight hour per day, plus one additional day for four hours.

On June 23, 2008, at the onset of the safety portion of the class, the students were informed that a field study was being conducted which would involve their participation. They were asked for their voluntary participation in the study, which would be conducted independently of the Manufacturing Academy. Anyone who chose not to participate in the study would not be hindered or adversely affected. All 18 students agreed to participate.

A consent form was distributed to each person (Appendix F). The forms were returned on June 24, 2008. A copy of the consent form used in the field study is included. (Note – approval for conducting the research study was obtained from the DWD and CVTC prior to the start of the class. Research protocols were also followed per the guidelines of the Institutional Review Board, and the University of Wisconsin-Stout.) An overview of the field study was presented, including its purpose and scope. The students received instructions explaining their expected role for participating in the study and its additional components (the questionnaire, surveys, tests and skills applications). Directions for completing the pre-class questionnaire were provided and included assigning each participant a dedicated number which would be used for the duration of the class and serve be their identifier for the study.

The instructors sought to build rapport and continuity with the students, as this was the first opportunity for them to gather together in one setting. Because many of the students were unfamiliar with each other, introductory activities were conducted to enable team building activities, such as describing personal interests, backgrounds and additional information they were willing to share with others. A class outline was distributed, which listed the topics to be discussed during week two. An explanation and description of the instruments applied in the study is described in the following sections.

Procedures Followed

1. Pre-class questionnaire: Titled 'Safety Research Study', this instrument consisted of seven questions designed to collect baseline information about the participants and their level of school or work-related safety training. Prior to the Manufacturing Academy, little was known about the students beside their names and school affiliations. The intent of the survey was to assist the instructors in preparing the content to assess perceptions, attitudes, and a willingness to participate following the completion of the class.

This instrument was distributed in an effort to gather baseline data regarding safety training, work experience and an interest in safety and health. The questionnaire was presented as part of the orientation to the safety training on the first day of week two of the Manufacturing Academy. There were no time limits for completing the questionnaire. All participants completed and returned the questionnaires in their entirety. Results obtained from the instrument were used to help structure the course and adjust the content to the training.

The first survey question asked respondents to indicate any job experiences. The second survey question followed in the same context as Question #1, asking if the participants had received any on-the-job safety training (regardless if they were currently or previously employed). The third and fourth questions asked participants if they had received any safety training in school, and if so, the nature or description of the subject matter. Question #5 asked participants to list any safety-related training received outside of school and work, such as through clubs or organizations. The purpose of the first five questions was to determine the past level of training the students may have received. This data would serve to gauge the depth and scope of content to be applied over the remainder of the course.

Questions #6 and #7 were written to measure perceived opinions regarding the importance of workplace safety. Recognizing that many of the students may have entered the program with little or no prior knowledge of workplace safety, Question #6 was designed to rate their interest to learn about safety and health concepts. Question #7, which concluded the survey, asked participants if they would cooperate to complete a post-class survey.

Participants were informed that their replies on the questionnaire as well as the other instruments used in the field study would be treated confidentially. They were asked to reply with honest answers and informed that the scores would not influence their ability to receive a safety certification at the conclusion of the class. A copy of the questionnaire is included in the field study as Attachment C. Data gathered from the questionnaire was evaluated in Chapter IV of the field study.

2. Pre-test: Following completion and return of the pre-class survey, the students were given the pre-test. The pre-test is included in the field study as Attachment D. The pre-test was designed to measure cognitive knowledge, and consisted of common safety concepts typically presented by employers to employees. The content of the pre-test consisted of safety principles related to several areas of OSHA compliance. Most of the questions could be correctly answered with a number or a definition. Many of the questions consisted of information referenced from OSHA standards and regulations. Table 10 displayed the subjects addressed in the pre-test.

Table 10

Subjects Addressed in the Pre-Test Instrument

Topic	Number of questions
Fire safety (1)	3
Fall protection (2)	3
Electrical safety	3
OSHA compliance	3
Confined space entry	2
Hazard Recognition	1
Bloodborne pathogens	1
Hazard communications (chemical safety)	1
Personal protective equipment	1
Hearing conservation	1
Operating industrial vehicles	1
Total	20

Notes:

(1) Fire safety included the use of fire extinguishers.

(2) Fall protection included ladder safety.

The students were informed of the pre-test prior to the instrument being distributed and were instructed to answer as many of the questions as possible. Partial answers or guesses were acceptable and allowed. There was no time limit for completing the pre-test. Students were asked to answer the questions on their pre-tests individually, without assistance from others. Clarification was provided by the instructor. The choice to leave a question blank was accepted if the participant did not know the answer. The students were reassured that their scores would not reflect negatively upon them and that unless they had received prior safety training, it was not expected that they would be able to supply the correct answers.

The students were informed that answers to many of the questions would be provided during the week, and that a post-test of the same questions would be given on the last day of the training. Scoring for the pre-test was based on awarding five points for each correct response. Partial credit (1 – 4 points) was applied if a portion of the question was answered correctly. If a question was left blank or answered incorrectly, no credit was earned. All 18 students completed and turned in their pre-tests. The purpose for distributing the pre-test following the pre-class survey was to compare the answers and scores from the pre-test with the information obtained from the pre-class surveys. The correlation between the level of pre-existing knowledge expressed could be matched against the scores received from the pre-test.

3. Pre-class skills application: The third instrument used in the field study was presented upon the conclusion of the pre-test. A copy of the pre-class skills application is included in the field study as Attachment G. While the pre-test was created to measure cognitive knowledge, the purpose of the pre-class skills application was to measure the practical demonstration of basic safety concepts. The instrument incorporated components of the instructional design system (PBID). Items were constructed to conform with the following criteria:

1. An integrated system for developing and evaluating instruction.

2. Aimed at ensuring performance capability.

3. Organized into components that parallel the decision-making of the instructional designer (Taylor, 2006, slide number 10).

The skills application consisted of 20 items, each one dedicated to a specific activity. The skills represented routine situations which employees were likely to face. There were no time limits for completing the instrument. Scoring for the skills application was based on the student earning five points for correctly describing or completing the item. Partial credit (1 – 4 points) was awarded if the student completed a portion of the activity correctly. If the student did not provide an answer, no credit was earned.

Similar to the pre-test, students were informed of the intent of the skills application, which was to collect data and assess their pre-class knowledge. Reassurance was made prior to and following completion of the assessment tool, indicating that many of the skills would be addressed during the course of the week, and that a lack of knowledge on the pre-class performance evaluation was expected. The students were informed that the skills application would be repeated, and that their scores would be compared to see if improvements were made. All 18 students completed and turned in the instrument.

The questions chosen for the pre-class skills assessment were designed to concentrate on the concepts expected to be presented in the Manufacturing Academy. The areas of focus on the assessment were in some cases similar to those listed on the pre-test. Other subjects were also highlighted. An analysis of the subject areas addressed in the instrument was described in Table 11. In preparing the pre-test and pre-class skills assessment, attention was given to address student knowledge in the areas that have historically produced severe occupational injuries and fatalities. Examples included falls, strains and sprains, lacerations, and vehicular accidents. Information obtained from the student scores (coupled with the survey results) could help provide direction for focusing on knowledge gaps or content deficiencies.

Table 11

Subjects Addressed in the Pre-Class Skills Assessment

Topic	Number of skill assessments
Emergency response	3
Fall protection/ladder safety	3
First aid/CPR	2
Bloodborne pathogens	2
Hazard recognition	2
General employee safety	1
Fire safety	1
Hearing protection	1
Personal protective equipment	1
Operating industrial vehicles	1
Use of tools – hand safety	1
Ergonomics – safe lifting	1
Occupational health – respiratory protection	1
Total	20

4. Post-test: Students received a post-test on the last day of the Manufacturing Academy (June 27, 2008). The post-test was a repeat of the pre-test given on June 23, 2008. Many of the topics and questions on the pre/post-tests were presented during the safety portion of the Manufacturing Academy. Further elaboration of the results collected from the post-test was reported in Chapter IV. The post-test is included in the field study as Appendix E (the pre-test and post-tests consisted of the same questions and format).

Like the pre-test, focus in expected outcomes for the post-test were set in a similar fashion, and designed to follow a systems approach, as described by Ramsay and Sorrell:

> When engaged in the problem-based learning process, students are presented with a real-life scenario. They attempt to solve multi-faceted and complex problems with information they already know. They then determine what else needs to be learned; that is, they determine what they do not know or know how to do. Once they have determined what they need to learn, they engage in self-directed study, researching information needed to effectively address the problem and offer alternative solutions. After they complete the work on the identified problem, they assess themselves and each other to develop self-assessment and constructive assessment of peers (4). As a consequence, PBL [performance-based learning] integrates and develops all three domains of learning as described by Bloom, including the cognitive (mental and intellectual skills), affective (feelings and attitudes) and the psychomotor (skills) (Ramsay & Sorrell, 2006).

The purpose of the post-test was to assess learning gaps from both the concepts presented, and the ability to correctly respond to the questions asked. One of the objectives of the field study was to present basic safety information which could be applied both on and off-the-job. If students could learn basic safety concepts, this could lead to establishing good safety practices and the ability to recognize hazards before an incident occurred. The benefit would be a greater awareness and responsibility for taking ownership for one's personal safety. The post-test was also designed to measure the concepts actually discussed during the safety training, as some items were not addressed in the class due to time constraints.

There was no time limit for completing the post-test. Both the pre-test and post-tests were conducted similarly, asking students for their responses to the questions posed. Clarification was provided by the instructor. Scoring for the post-test was conducted similarly to the pre-test. Each correct answer was worth five points. Partially correct answers received from 1 – 4 points. Incorrect responses or questions left blank earned no credit. All 18 students completed and turned in the post-tests. Table 12 displayed the topic areas on both the pre and post-tests, and whether the topic was discussed during the safety portion of the Manufacturing Academy.

Table 12

Content Delivery Addressed in the 2008 Manufacturing Academy

Topic area	Number of questions	Content addressed
Fire safety	3	All 3 questions were addressed
Fall protection	3	All 3 questions were addressed
Electrical safety	3	2 of 3 questions were addressed
OSHA compliance	3	All 3 questions were addressed
Confined space entry	2	Neither question was addressed
Hazard recognition	1	The question was addressed
Bloodborne pathogens	1	The question was addressed
Hazard communications	1	The question was addressed
Personal protective equipment	1	The question was addressed
Hearing conservation	1	The question was not addressed
Operating industrial vehicles	1	The question was addressed
Total	20	16 of 20 questions were addressed

5. Post-class skills application: This instrument was designed to measure the practical knowledge and application of the skills presented during the safety portion of the Manufacturing Academy. The instrument is included in the field study as Appendix G (the pre and post-class performance evaluations were in the same format and consisted of the same skills assessments). The post-class skills application was constructed similarly to the pre-skills application.

The same 20 items included on the pre-class skills application were repeated on the post-class skills application. There was no time limit for completing the stations. Students were asked to describe how to complete the activity without consulting with other members of the class. Clarification was provided by the instructor. Scoring for the post-class skills application consisted of awarding five points for correctly describing how to complete the task. Partial credit (1 – 4 points) was earned for performing a portion of the required task correctly. If the student was unable to describe how to correctly perform the activity, no credit was received. All 18 students completed the post-class skills applications in their entirety. Table 13 displayed the topic areas listed on the post-class skills assessment addressed during the class.

Table 13

Topic Areas Addressed During the Manufacturing Academy

Topic area	Skills addressed during the manufacturing academy
Emergency response	2 of 3 skills were addressed
Fall protection	None of the skills were addressed
First aid/CPR	Both skills were addressed
Bloodborne pathogens	Both skills were addressed
Hazard recognition	Both skills were addressed
General employee safety	The skill was addressed
Fire safety	The skill was addressed
Hearing protection	The skill was not addressed
Personal protective equipment	The skill was addressed
Operating industrial vehicles	The skill was not addressed
Use of tools – hand safety	The skill was not addressed
Ergonomics – safe lifting	The skill was not addressed
Occupational health – respiratory protection	The skill was not addressed
Total	11 of 20 skills were addressed

6. Post-class survey I: A survey to assess the knowledge learned and applied by the students was distributed following the completion of the Manufacturing Academy. The surveys were sent by postal mail to the students on July 31, 2008 (several students did not provide an

electronic mail address). A return date of August 11, 2008 was requested. Of the 18 surveys distributed, eight were returned. Information requested on the survey included assessing the degree of safety knowledge learned or applied, and determining if there was any additional on-the-job safety training received by students who were currently working. A copy of the post-class survey I is included in the field study as Appendix J.

The survey consisted of nine questions, printed on a single page, front and back. Several symbols were applied to increase attention and solicit interest in completing and returning the instrument. Students who were not working were asked to complete questions 1 – 3 (the front side of the survey), and return the instrument in the self-addressed stamped envelope (SASE). Questions 1 – 3 were answered by circling either a 'yes' or 'no' reply.

Students who were employed, either prior to or following the Manufacturing Academy, were asked to also complete questions 4 – 9, which were displayed on the back side of the survey. Question #4 requested the name of the employer, and Question #5 asked if the employer provided any safety training. Question #6 asked students to indicate if the employer's safety training assisted them in recognizing workplace hazards. The students were asked to select from a list of safety topics. Question #8 asked the students to indicate if the safety certificates earned during the class were perceived as being beneficial. The survey closed with Question #9, asking the students to indicate if the safety training or certificates had helped them gain employment.

The focus of the post-class survey was to incorporate safety training into required job skills or tasks. This approach coordinated with the task analysis model described by Dr. Juli Taylor and consisted of the following elements:

1. The job or occupation is broken down into duty or function areas.
2. Duties are broken down into tasks.

3. Tasks are detailed into sequential steps: knowledge, skills and attitudes.

4. Analysis is validated by industry experts (Taylor, 2006, slide number 7).

The purpose of the survey was to evaluate the content and skills presented during the 2008 Manufacturing Academy, and assess the relevance to the students in applying the skills to recognize hazards and prevent accidents. Information was also requested to compare safety knowledge presented by the employer with the content delivered during the class.

7. Post-class survey II: Due to the limited number of replies from the first post-class survey (10 of 18 were not returned), a follow-up survey was sent to students who did not respond to the first one. The second post-class survey was mailed on September 2, 2008. A copy of the post-class survey II is included in the field study as Appendix K. The post-class survey II consisted of the same questions listed on the first post-class survey. The format and style was changed in an attempt to help encourage its completion and return. The surveys were again sent by postal mail to the home addresses supplied by the students. A reply date of September 15, 2008 was requested. Of the 10 surveys distributed, seven were returned.

Method of Analysis

The plan for analyzing the instruments consisted of evaluating the individual questions or items separately. For the pre-class questionnaire, an analysis of each question was evaluated. For the pre-test and pre-class skills instruments, the number and percentages of correct responses were calculated, and the data was analyzed to determine statistical relevance. The data obtained from the post-test and post-class skills applications was designed to compare the differences from the initial responses given by the students on the first day of the safety training, to competencies learned and demonstrated the last day of the class.

The post-class surveys (both I and II) were developed to measure several variables, including on-the-job training for students who were working, and the application of any skills learned in the Manufacturing Academy. An analysis of individual student performance was also provided, comparing scores derived from the first day of the training (pre-test and pre-class skills application), to measure improvements or changes in scores from the last day's results (post-test and post-class skills application).

Data was measured from replies to questions asked on the post-class surveys (I and II, as the same question were asked on both). The purpose was to measure if the safety concepts presented during the training were applied. In addition to evaluating quantitative data, responses received from the post-class surveys were compared with the replies collected from pre-class questionnaire to evaluate attitudinal and qualitative variables.

Measures of Validity and Reliability

The validity and reliability of the instruments were statistically evaluated. The objective was to produce an assessment of the safety training presented during the Manufacturing Academy, and the degree of knowledge learned and applied. Other measures involved assessing participants' attitudes regarding the perceived short and long-term value of the training received, in terms of applying the skills. Data collected from the instruments was evaluated and reported using the Statistical Package for Social Sciences (SPSS) program. Methods considered for evaluation included:

- Descriptive statistics: frequencies and descriptive ratio statistics
- Bivariate statistics: means, t-test, ANOVA, correlations (nonparametric tests)
- Predictive numerical outcomes: linear regression

- Prediction for identifying groups: factor analysis, cluster analysis, discriminate (SPSS, 2008). The results of the data analysis were reported in Chapter IV of the field study.

Conclusion

The objective of the methods and procedures employed in the field study was to collect data through applying a series of instruments designed to measure student perceptions about safety, and the extent of knowledge gained during the class. The pre-class survey was intended to identify baseline data, including previous in-school safety training, job experience, and the acceptance to learning new skills that could assist the person following the class. Similarly, the pre-test and pre-class skills applications were designed to obtain the students' existing knowledge of what would be considered basic occupational safety concepts. The same questions on the instruments applied prior to the class were repeated on the post-test and post-class skills application given on the last day of the program.

The difference in the answers and responses (scores) from the information gathered prior to the safety training was evaluated and the results calculated. Post-class surveys sent following the class were developed to assess the extent to which the participants were able to apply the knowledge and skills presented during the class. The results obtained from the surveys, as well as the other instruments used in the study were analyzed and reported in Chapter IV.

Chapter IV: Results

Various methods were used to collect and evaluate data used in the field study. Respondents were informed of the voluntary nature for participating in the study, and reassurance was provided relative to the data gathered, indicating that it would be expressed confidentially and was intended to be evaluated independently of the requirements for attending and participating in the Manufacturing Academy. Information received from the students was obtained through qualitative and quantitative methods and included the following instruments:

1. Pre-class questionnaire
2. Pre-test
3. Pre-class skills application
4. Post-test
5. Post-class skills application
6. Post-class surveys (I and II)

The data collected focused on addressing the five research questions posed in the study:

6. What was the level of learning demonstrated by students participating in the June 2008 Manufacturing Academy?
7. To what extent did the safety training strategies transfer to the work environment?
8. What was the level of training effectiveness based on entry level jobs?
9. Was there a difference in comprehension based on selected demographics?
10. Was there a single strategy that achieved success?

Demographic Data

A total of 26 students initially registered for the CVTC 2008 Manufacturing Academy. The academy was conducted over the course of two weeks. During the transition from manufacturing topics to subjects concentrating on safety and health, eight participants either withdrew or were disqualified from the program. The safety and health portion of the academy was completed by 18 students. This represented a completion rate of 69.2% of the starting population. As described in Chapter III of the field study, 16 of students who completed the academy were male, and two students were female. The students represented five separate Wisconsin public school districts.

Data was collected from the students on the instruments applied in the study. All 18 respondents (100%) completed the pre-class questionnaire, pre and post-tests, and the pre and post-class skills applications. The post-class survey was completed and returned by 83.33% (15 out of 18) of the students. Table 14 lists the instruments used in the study and the number of questions or statements posed for each one.

Table 14

Description of Field Study Instruments and Number of Questions or Statements Posed

Instrument	Number of questions or statements
Pre-class questionnaire	7
Pre-test	20
Pre-class skills application	20
Post-test	20
Post-class skills application	20
Post-class survey (I and II)	9

Notes.

(1) Post-class surveys I and II contained the same nine questions. The format was slightly changed on post-class survey II in order to achieve a higher return rate from students who did not return post-class survey I.

The rate at completing the six instruments varied by respondent. The 18 students completed all seven questions on their pre-class questionnaires. This was not the case with the other instruments used in survey. Varying by student, selected questions on the pre and post-tests, and stations of the pre and post-class skills applications were left either unanswered or not attempted.

The sequence in which the instruments were delivered may have influenced the response rates. The first three instruments: the pre-class questionnaire, the pre-test, and the pre-class skills application, were each conducted on June 23, 2008, day one of the safety training, prior to initiating the safety content of the course. The pre-class questionnaire was first distributed. After students returned the survey, they were given the pre-test. Upon completion and collection of all pre-tests, the pre-class skills application was distributed, conducted, and collected.

The post-test and post-class skills applications were conducted on June 27, 2008, at the conclusion of the program. The post-class surveys were sent to the students' homes following the end of the program. Table 15 displays the number of items on each instrument, the varying response rates, and the dates when they were conducted.

Table 15

Number of Questions or Statements Answered by Manufacturing Academy Respondents

Instrument	Number of items	Number of items answered by respondents	When conducted
1. Pre-class questionnaire	7	7	June 23, 2008, day one
2. Pre-test	20	Varied	June 23, 2008, day one
3. Pre-class skills application	20	Varied	June 23, 2008, day one
4. Post-test	20	Varied	June 27, 2008, day five
5. Post-class skills application	20	Varied	June 27, 2008, day five
6. Post-class survey (I and II)	9	9	After class ended (1) and (2)

Notes.

(1) Post-class survey I was mailed to respondents July 31, 2008.

(2) Post-class survey II was mailed to respondents August 28, 2008, who did not reply to the post-class survey I.

Though not timed, students completed and returned their pre-class questionnaires in about 15 minutes. Following an explanation of the class and the collection of data for the field study, the pre-test was delivered. Conducted on an item-by-item basis, the instrument was completed in approximately 30 minutes. A break was then provided to the students. When they returned, the pre-class skills application was performed. This instrument was conducted as class, group, and individual activities. Similar to the pre-test, activities (called stations) were not timed. The 20 stations were completed in approximately 90 minutes. Students completed the stations at varying rates, and were allowed to review their answers before turning in their results.

The post-test was not timed and was conducted as a class activity. It was performed similarly to the pre-test. The activity was completed by the students in approximately 20 minutes. Following receipt of the pre-tests, the post-class skills application was conducted. This instrument was conducted differently than the pre-class skills application on the first day of class. The class members were asked to provide consensus answers or responses to the 20 individual stations. Once agreement was obtained, the answer was recorded. The activity was completed in approximately 30 minutes.

The post-class survey was designed to be completed in 10 minutes or less. Depending on whether or not the students were working, the instrument may have been completed in less time. Students not working were asked to complete the first three questions. Students employed were asked to complete all nine items on the survey.

An overall demographic analysis was calculated, comparing participants with the instruments and their scores or level of response. Table 16 identifies the instruments applied in the study, and displays the completion, scores and number of responses provided by each of the 18 participants.

Table 16

Overall Summary of Instruments Used in the Study

ID No.	Gender	PCQ	Pre-test	Pre-SA	Post-test	Post-SA	Survey I	Survey II
1	F	Yes	8	10	54	55	No	No
2	F	Yes	13	10	51	55	Yes	n/a
3	M	Yes	10	10	43	55	No	Yes
4	M	Yes	10	10	42	55	Yes	n/a
5	M	Yes	20	10	38	55	No	Yes
6	M	Yes	0	0	48	55	No	No
7	M	Yes	25	10	73	55	No	Yes
8	M	Yes	31	10	71	55	No	Yes
9	M	Yes	13	10	41	55	No	Yes
10	M	Yes	16	10	55	55	Yes	n/a
11	M	Yes	5	15	62	55	No	Yes
12	M	Yes	13	10	30	55	No	Yes
13	M	Yes	0	0	19	55	No	No
14	M	Yes	0	0	19	55	Yes	n/a
15	M	Yes	15	10	63	55	Yes	n/a
16	M	Yes	5	10	21	55	Yes	n/a
17	M	Yes	7	10	43	55	Yes	n/a
18	M	Yes	0	15	55	55	Yes	n/a
Percent/ Average	89% male, 11% female	100%	10.61	8.89	43.58	55	44%	70%

Notes:

(1) ID No. = Individually assigned numbers were given to each respondent to ensure confidentiality.

(2) PCQ = Pre-class questionnaire.

(3) Pre-SA = Pre-class skills assessment.

(4) Post-SA= Post-class skills assessment.

(5) All participants completed the pre-class questionnaires.

(6) The post-quiz and post-class skills assessments were conducted as a class exercise with all members participating together to answer the questions.

(7) There were 18 post-class surveys mailed (post-class survey I), with eight returned.

(8) The 10 students who did not respond to the post-class survey I were mailed the post-class survey II. Seven of the surveys were returned. A total of 15 students returned the post-class surveys (I and II combined). An 'n/a' was applied to students who completed the first post-class survey and therefore, were not required to complete the second version.

(9) The post skills class assessment was conducted as a class activity, with all members participating in deriving a consensus response. The other instruments were applied as either individual or partnered activities.

(10) The word 'average' was applied in the table to indicate different terms. For the pre-class survey, this indicated the total percentage or surveys returned. For the pre and post-tests, and the pre and post-class skills assessments, the term indicated the mean score. On the post-class surveys, the term applied to the percentage of surveys answered and returned. As such, the figure was displayed as either a score or percentage under the column.

Evaluation of Instruments

Six unique instruments were applied in the field study in attempts to gather background and baseline data from the students, determine their pre and post class knowledge, and assess the degree to which competencies learned during the class were applied on-the-job. The first instrument presented to the students consisted of a pre-class questionnaire. The purpose of the questionnaire was to assess the students' willingness to participate in the study, and to gain baseline employment information relating to their safety training experience.

Instrument 1: Pre-Class Questionnaire

The 18 students replied to all questions on the instrument. The number of replies ('N') may have exceeded 18 in cases where multiple responses were allowed or encouraged. An item-by-item analysis was conducted of the seven questions, to help determine interest and experience. The first item asked referred to the types of jobs or employment students reported having prior to the start of the class. Table 17 indicated the number of replies received, and the associated percentage.

Table 17

Pre-Class Questionnaire Item 1: Types of Jobs or Employment

Choices	Number of replies	Percent
None	8	44.44
Worked in a family business (other than farming)	1	5.56
Farm or agricultural work	1	5.56
Other jobs	8	44.44

Employers listed included: Dooley's Best Buy, McDonald's, Sweetwater's Restaurant, Taco John's, Burger King, and Kmart. The focus of the Manufacturing Academy was to introduce students to different types of careers available and emphasize the importance of following safe practices and safe procedures to reduce exposure to workplace hazards. The listing of employers indicated entry-level jobs.

For the second item, students were asked to report if a safety orientation had been provided by their employer. Responses from this item are displayed in Table 18.

Table 18

Pre-Class Questionnaire Item 2: Safety Orientations Received From Employers

Choices	Number of replies	Percent
Yes	5	27.78
No	10	55.56
I don't remember	3	16.67

The degree of on-the-job safety training was not assessed. The questions was designed to determine if the employer addressed any level of training through a safety orientation. The students who replied with a 'no' or 'I don't remember' response either were not employed, or if so, could not remember if any training had been provided by their employers.

Table 19 indicated if safety training had been received by the students from their respective home high schools, prior to attending the 2008 Manufacturing Academy.

Table 19

Pre-Class Questionnaire Item 3: Prior High School Safety Training Received

Choices	Number of replies	Percent
Yes	16	88.88
No	1	5.56
I don't remember	1	5.56

For this item, the level or depth of school-based safety training was not evaluated. The term 'safety training' was also not defined. As such, students were free to apply their perception of safety-related training and acknowledge if the subject, however defined, had been addressed in any of their classes.

The fourth item on the pre-class questionnaire asked students to describe the types of safety training they may have received in high school, and if any of the training was occupationally-related. Information collected from the students is displayed on Table 20.

Table 20

Pre-Class Questionnaire Item 4: Types of High School Safety Training Subjects

Choices	Number of replies	Percent
I have not had any safety training	2	11.11
Safety was mentioned during class, such as in a science lab	3	16.67
First aid/CPR training, such as a babysitting or lifesaving course	9	50
Workplace safety was discussed as part of a health or other class	4	22.22

First aid training was the most commonly reported safety-related training reported. Other subjects were not specifically identified. The context of the safety training may have been presented as part of an existing class, or conducted as a separate entity.

The fifth item on the survey asked students to report on any safety training received outside of school. The results are displayed in Table 21.

Table 21

Pre-Class Questionnaire Item 5: Safety Training Received Outside of School

Choices	Number of replies	Percent
No	9	50
Yes – as part of a sports team or athletics	1	5.56
Yes – as part of another after-school activity	1	5.56
Yes – as part of scouting or other non-school activity	3	16.67
Yes – at home, church or with an outside organization	4	22.22

Note: the N = 19, as multiple responses were allowed and received for this question.

Nine of the students (50%) reported receiving some type of training outside of school. This compared with the 16 (88.9%) who reported receiving safety training in one or more of their classes. The source of the safety training was provided, but the subject matter was not.

The sixth question posed on the instrument queried students for their opinions about workplace safety. There may have been different interpretations regarding the concept 'workplace safety'. Students employed may have been able to provide a point of context for the term and associate a value based on their experience. For others, they may have drawn upon the opinions or experiences of others to form an association. The results compiled from the question are shown in Table 22.

Table 22

Pre-Class Questionnaire Item 6: Opinions on Learning About Workplace Safety

Choices	Number of replies	Percent
I don't care	0	0
I want to wait until after the course is over to see if it was helpful	1	5.56
It doesn't apply to me	0	0
It is important only for people working full-time	1	5.56
It may have some value to me now or later in life	5	27.78
I may be able to use the information from the course on or off the job	12	66.67

The majority of the respondents (94.4%) indicated that they might at some point be able to apply the training, either on-the-job or away from work. One person replied wanting to wait until after the safety training was completed to determine the value of safety skills learned.

The final question on the survey queried students on their willingness to participate in the study following conclusion of the class. An explanation had been given at the start of the class, expressing the voluntary nature of the students' participation in the study. This included reassurances for confidentiality, and indications that scores or results on the study would not be detrimental to their success in the Manufacturing Academy. The results collected from the students are displayed in Table 23.

Table 23

Pre-Class Questionnaire Item 7: Willingness to Participate in the Study Following Completion of the 2008 Manufacturing Academy

Choices	Number of replies	Percent
Yes	9	50
No	3	16.66
I want to wait until after the Manufacturing Academy is over before deciding	6	33.33

Note:

(1) Applying the SPSS program, a confidence level of 0.15898 was determined based on the data collected.

The replies reported may have influenced the collection of results from other instruments later used in the study. Nine of the students (50%) indicated an agreement to participate in the field study, while the other 50% either elected not to participate, or to wait until the conclusion of the training to decide.

<u>Instrument 2: Pre-Test</u>

The pre-test was delivered to the students on the first day of the safety portion of the Manufacturing Academy. Following introductions of the students and instructors, the students were informed of the content of the class, which would include collection of data for use in the field study. Consent forms were distributed to the students, for review and approval from their parents or guardians. Signed consent forms were returned to the instructors the next day.

A copy of the consent form used in the study is included as Appendix F. The pre-class questionnaire was next distributed and completed by the students. The data received from the first instrument was evaluated. Copies of the pre-test were distributed to the students, who were instructed to answer as many of the questions as possible, based on information they may have learned in school, on-the-job, or from other sources.

The students were informed that they would not be graded on their replies, and that the purpose of the pre-test was to determine baseline knowledge from the class, which would help the instructors prepare and present the materials during the remainder of the program. The students were told that they could guess on any or all questions, or leave the item blank. Depending on the question, incomplete answers or replies could receive partial credit.

The pre-test was designed to measure comprehension of basic principles taught to employees relating to workplace safety and health. The objective of the pre-test was not to determine a lack of skill or knowledge, but to gain a degree of knowledge about common safety information. The safety training to be conducted over the course of the program was constructed to address the topics on the pre-test. The goal was to gauge individual and group application of the content and seek improvement in scores from the post-tests, which would be presented on the last day of the class. The same 20 questions were asked on both the pre-test and post-test.

Each of the 20 questions on the pre-test were worth five (5) points. The scores received from the students ranged from a low score of 0, to a high score of 31. All students completed and returned an individual pre-test. An item-by-item analysis of the questions posed and replies received was conducted.

The first question on the pre-test asked students to identify the two primary diseases that could be spread by blood. This information may have been presented in a high school health or safety class. The results obtained are reported in Table 24.

Table 24

Pre-Test Item 1: The Two Primary Bloodborne Diseases Transmitted in the Workplace

Response	Number of replies	Percent
Both correct replies	2	22.22
One correct reply	8	44.44
Incorrect or missing response	8	44.44

The correct reply was HIV/AIDS, and Hepatitis B (and/or Hepatitis C) (NIOSH, 2008). Credit was earned a basis of 0, 3, or 5 points. No credit was earned if the question was left blank, or if incorrect answers were provided. Partial credit (three points) was awarded for listing either one of the diseases. Full credit was awarded for listing both diseases. No incorrect answers were given. The eight students who earned zero credit did not choose to answer the question. The eight students who provided one correct reply did not report any additional or incorrect replies.

The second pre-test question focused on fire safety. Later in the course, students would receive practical training on the use of fire extinguishers to suppress a controlled fire. This question was raised to assess their understanding to the risk of an insipient fire becoming out of control. Table 25 presents the data collected from this question.

Table 25

Pre-Test Item 2: Amount of Time Once a Fire Occurs Before Becoming Out of Control

Response	Number of replies	Percent
Correct response	8	44.44
Incorrect or missing response	10	55.56

The correct reply was 30 seconds (WCBS, 1988). Credit was earned on a basis of 0 or 5 points. Full credit (five points) was awarded for the correct answer. No credit was awarded for other replies. The eight students who earned five points provided the correct answer. The 10 students who earned zero credit did not answer the question.

Item 3 on the pre-test also pertained to fire safety, asking the students to identify a common acronym applied to home and workplace fire safety. Table 26 displays the results reported.

Table 26

Pre-Test Item 3: The Acronym 'RACE' as Applied to Fire Safety

Response	Number of replies	Percent
All four words correctly identified	0	0
One, two or three words identified	2	22.22
Incorrect or missing responses	16	88.88

The correct response was rescue and (or) relocate, alert (or alarm), confine, and evacuate (or extinguish) (Acronym Finder, 2008) (University of Rochester, 2008). Credit was earned on a basis of 0, 3 or 5 points. Full credit was earned for correctly identifying all four words. Partial credit (three points) was earned for correctly identifying one or more of the words. No credit was earned for incorrect replies or missing information. Students who did not earn points did not choose to answer the question.

The next question, item #4, also was a commonly applied acronym used by safety representatives to communicate instructions for operating a fire extinguisher to suppress an insipient fire. Similar to question #3, the students were asked to spell out the four words. The results from this item are reported in Table 27.

Table 27.

Pre-Test Item 4: The Acronym 'PASS' Applied to Using a Fire Extinguisher

Response	Number of replies	Percent
All four words correctly identified	1	5.56
One, two or three words identified	0	0
Incorrect or missing responses	17	94.44

The correct response was pull, aim, squeeze, and sweep (University of Rochester, 2008). Credit was earned a basis of 0, 3 or 5 points. Full credit was earned for correctly identifying all four of the words. Partial credit (three points) was earned for correctly identifying one or more of the words. No credit was earned for incorrect replies or missing information. Students who did not earn points chose not to answer the question.

Item #5 on the pre-test asked students to identify the minimum height where fall protection is required for general industry. The focus of the Manufacturing Academy was on general industry occupations. Many post-high school entry-level positions are found in general industry. Injuries and losses from falls have been a leading cause of injuries and deaths, both on-the-job and away from work (National Safety Council, 2006). The subject of preventing falls was one of the primary topics planned for the safety training. The replies received from the students are shown on Table 28.

Table 28

Pre-Test Item 5: Minimum Height Requirements for General Industry

Response	Number of replies	Percent
The correct response was given	1	5.56
An incorrect or no response was given	17	94.44

The correct answer was four feet (OSHA, 1974). Credit was earned on a basis of five points for the correct answer. Incorrect or missing answers did not earn any points. One student listed an incorrect height (10 feet). The other 16 students did not answer the question.

Item #7 on the pre-test also dealt with minimum requirements for fall protection, in this case, addressing the construction industry. The importance of preventing injuries and deaths from falls is evident from an analysis performed, following a death to a young construction worker resulting from a fall.

> Young workers generally lack experience in the tasks they are requested to perform and are less able to recognize workplace hazards. Young people generally do not receive

> adequate health and safety training. As they have little experience in the workforce in general, they also do not recognize how much training may be necessary. Young workers may be asked to do more dangerous jobs and they may not understand their rights as workers. They are often unwilling to ask questions (Workers' Compensation Board of British Columbia, 2007).

The replies received from the students to this question are shown on Table 29.

Table 29

Pre-Test Item 6: Minimum Height Requirements for Construction

Response	Number of replies	Percent
The correct response was given	0	0
An incorrect or no response was given	18	100

The correct answer was six feet (OSHA, 1995). Two students provided answers which were incorrect (4 feet and 20 feet). The other 16 students did not provide any answers to the question.

Question #7 on the pre-test asked students to identify the responsible party for providing a workplace free of recognized hazards. While several choices were available, the intent was to identify the employer as being principally responsible for providing a workplace free of recognized hazards. This is the cornerstone of the OSH Act, which led to the formation of OSHA. The students' replies to this question are shown on Table 30.

Table 30

Pre-Test Item 7: Responsibility for Providing a Workplace Free of Recognized Hazards

Response	Number of replies	Percent
The correct response was given	4	22.22
An incorrect or no response was given	14	77.78

The correct answer was 'the employer' (OSHA, 2008). Five points or full credit was earned for the correct answer, with no points earned for incorrect or partial answers. Two of the 14 students who answered the question incorrectly replied: 'everyone'. The other 12 students who did not earn any points for the question left it blank.

The next question, #8, was similar to the previous one, in this case though, students were asked to identify who was responsible for following safety rules or regulations. The responses received are displayed in Table 31.

Table 31

Pre-Test Item 8: Responsibility for Following Safety Rules and Regulations

Response	Number of replies	Percent
The correct response was given	5	27.78
An incorrect or no response was given	13	72.22

The correct answer was ‘employees’ (or workers) (OSHA, 2008). Five points or full credit was earned for the correct answer, with no points earned for incorrect or partial answers. One student who answered incorrectly replied: ‘everybody’. The other 12 students who did not earn any points for the question left it blank.

There is not a defined regulation for every safety deficiency or hazard. Question #9 addressed the application of compliance and enforcement for occasions in which specific standards had not been promulgated. The student replies to this question are listed on Table 32.

Table 32

Pre-Test Item 9: Application of OSHA Compliance for Situations Without Identified Regulations

Response	Number of replies	Percent
The correct response was given	0	0
An incorrect or no response was given	18	100

The correct answer was ‘The General Duty Clause’ (OSHA, 2008). Five points or full credit was earned for the correct answer, with no points earned for incorrect or partial answers. None of the students answered the question correctly or listed a response.

Question #10 addressed the subject of chemical safety. Called ‘hazard communications’, topics involve preparing workers to understand the hazards associated with chemicals and other substances, and methods or procedures for using them safely. One of the core components of a hazard communications program is access to Material Safety Data Sheets (MSDS’s). Students were asked to spell out the four words. Their results are shown in Table 33.

Table 33

Pre-Test Item 10: The Term 'MSDS'

Response	Number of replies	Percent
All four words correctly identified	1	5.56
One, two or three words identified	0	0
Incorrect or missing responses	17	94.44

The correct answer was 'Material Safety Data Sheet' (OSHA, 1986). Credit was earned on a basis of 0, 3 or 5 points. Full credit was earned for correctly identifying all four of the words. Partial credit (three points) was earned for correctly identifying one or more of the words. No credit was earned for incorrect replies or missing information. One student correctly identified all four words. The other 17 students did not list any response for the question.

Question #11 on the pre-test asked students to identify the noise level in which hearing loss can occur. Since hearing loss can happen without pain, knowledge of hearing protection and reducing unwanted noise can be an important component in conserving the person's hearing. The responses to this question are shown on Table 34.

Table 34

Pre-Test Item 11: The Noise Level in Which Hearing Loss Can Occur

Response	Number of replies	Percent
The correct response was given	0	0
An incorrect or no response was given	18	100

The correct answer was 85 decibels (dBA) (Berg, 2008). Five points or full credit was earned for the correct answer, with no points earned for incorrect or partial answers. None of the students answered the question correctly.

Whether working in construction or general industry, the use of ladders is a common occurrence. Injuries associated with falls from ladders can be costly. One of the principle concepts to ladder safety was asked in question #12. Table 35 contains the answers submitted by the students on this question.

Table 35

Pre-Test Item 12: Explaining the 4 to 1 Rule in Ladder Safety

Response	Number of replies	Percent
The correct response was given	0	0
An incorrect or no response was given	18	100

The correct response was to place the ladder out and away from the wall or surface to be climbed one foot for every four feet to be climbed (OSHA, 1978). Five points or full credit was earned for the correct answer, with no points earned for incorrect or partial answers. None of the students answered the question correctly. The students would be asked to demonstrate the 4 to 1 rule as one of the stations on the pre-class skills assessment.

Question #13 focused on general safe practices and asked the students to identify the types of activities that could lead to injuries or illnesses. The results are shown in Table 36.

Table 36

Pre-Test Item 13: Activities Which Can Result in Severe Injuries and Deaths

Response	Number of replies	Percent
The correct response was given	0	0
An incorrect or no response was given	18	100

There are several responses which could have been judged correct. Examples included: ‘unusual and non-routine’, ‘performance mistake’, or ‘management error’ (Ezell, n.d.). Five points or full credit was earned for the correct answer, with no points earned for incorrect or partial answers. None of the students answered the question correctly.

Question #14 asked the students to list locations in which a ground fault circuit interrupter (GFCI) is required in the workplace. These devices can help reduce the chance of an electrocution or accidental electrical discharge. The answers supplied by the students to this question are listed on Table 37.

Table 37

Pre-Test Item 14: Identified Workplace Areas for GFCI Installation

Response	Number of replies	Percent
The correct response was given	0	0
An incorrect or no response was given	18	100

The correct answer was: anywhere there could be a wet environment (OSHA, 1981). Five points or full credit was earned for the correct answer, with no points earned for incorrect or partial answers. None of the students attempted to answer the question, therefore no points were earned.

The next question, item #15, asked the students to describe the necessary personal protective equipment (PPE) to be worn by workers on a standard construction site. Multiple examples were available, and the list provided by the students is shown on Table 38.

Table 38

Pre-Test Item 15: PPE Required When Entering a Construction Site

Response	Number of replies	Percent
Five examples were provided	1	5.56
Two examples were provided	1	5.56
One example was provided	2	11.11
No responses listed	14	77.78

There were several correct responses to the question. First, students needed to understand the abbreviation 'PPE' (personal protective equipment). One point was earned for each correct piece of equipment the student listed (up to a maximum of five). Correct responses could have included: safety glasses or eye protection, foot protection, gloves or hand protection, face protection, fall protection, head protection, and hearing protection (OSHA Office of Training and Education, 2008). Four students provided answers to the question, earning from one to five points.

Question #16 was presented as a true or false item. Students were asked to indicate if holding a valid driver's license or permit would allow them to operate a forklift in the workplace, or if specific powered industrial vehicle training was needed. The responses to the question are shown on Table 39.

Table 39

Pre-Test Item 16: If Holding a Driver's License or Permit Authorizes Workers to Operate a Forklift without Further Training Being Required

Response	Number of replies	Percent
The correct response was given	8	44.44
An incorrect or no response was given	10	55.56

As a true/false question, full credit (five points) was awarded for the correct answer (false), with zero points given for an incorrect answer (OSHA, 1975). Two of the students answered the question with a yes (incorrect) response, and eight of the students left the question unanswered.

For question #17, students were asked to identify the criteria for defining what is considered as a 'confined space'. Confined space fatalities occur both on-the-job, and also in agricultural settings. The ability to recognize confined spaces would be the first step in enacting controls to allow safe entry and prevent injuries or illnesses due to accidental exposure. The replies to this question are listed in Table 40.

Table 40

Pre-Test Item 17: Identifying the Three Criteria for Defining a Confined Space

Response	Number of replies	Percent
The correct response was given	0	0
An incorrect or no response was given	18	100

The correct answer was: limited access, the ability to be entered, and not meant for continuous occupancy (OSHA, 1973). Credit was awarded on the basis of five points for identifying all three criteria, three points for listing 1 – 2 criteria, and no points if the question was left blank or incorrect replies were made. Since none of the students chose to answer the question, no points were earned on this item.

In question #18, students were asked to identify what would be considered a safe distance from possible exposure to an arc flash or arc blast, if such an event occurred when electrical components were being worked on by other individuals in a typical industrial setting. The answers supplied by the students are shown in Table 41.

Table 41

Pre-Test Item 18: Minimum Distances for Unqualified Workers to Remain from Electrical Components When Qualified Employees are Performing Work

Response	Number of replies	Percent
The correct response was given	2	11.11
An incorrect or no response was given	16	88.89

The correct answer was four feet (National Fire Protection Association, [NFPA] 2004). Five points were earned for the correct answer. There was no partial credit awarded. Two of the students supplied the correct answer of a minimum of four feet distance. The other students did not answer the question.

Question #19 was similar in nature to the previous question, with the difference being maintaining minimum distances for achieving clearance from obstacles, and to allow ready access to electrical panels. Results from the student replies are shown on Table 42.

Table 42

Pre-Test Item 19: Minimum Distance for Clearance to Electrical Panels

Response	Number of replies	Percent
The correct response was given	1	5.6
An incorrect or no response was given	17	94.44

The correct answer was: three feet (OSHA, 1981). Five points were earned for the correct answer. There was no partial credit awarded. One student supplied the correct answer. The other students did not reply to the question.

The final question on the pre-test concerned confined space, and asked students to name the three designated roles for initiating entry into an identified confined space. The results are presented in Table 43.

Table 43

Pre-Test Item 20: Identifying the Three Primary Roles or Confined Space Entry

Response	Number of Replies	Percent
The correct response was given	0	0
An incorrect or no response was given	18	100

The correct answer was: entrant, attendant, and entry supervisor (OSHA, 1973). Five points were earned for identifying all three roles, three points were given for listing 1 – 2 of the roles, and no points were earned if the question was incorrectly answered or left blank. No points were earned on this item.

Each of the questions from the pre-test were evaluated individually in the study in order to draw a comparison later with responses given by students on their post-tests. Table 44 presented data collected and evaluated based on composite scores from all 20 of the questions. Figures were calculated using the SPSS program, version 15. The analysis measured four variables.

Table 44

Composite Scores from Instrument #2, Pre-Test

Score	Frequency	Percent	Cumulative percent
0	4	22.2	22.2
5	2	11.11	33.3
8	2	11.11	44.4
10	2	11.11	55.6
13	3	16.7	72.2
15	1	5.6	77.8
16	1	5.6	83.3
20	1	5.6	88.9
29	1	5.6	94.4
34	1	5.6	100
Total	18	100	

Instrument 3: Pre-Class Skills Assessment

The pre-class skills assessment was the third instrument applied in the field study. Similar to the first two tools, this one was distributed to students prior to the formal start of the class. During the first day's activities, students were informed of the purpose and scope of the research study. This included assessing their level of knowledge to the principles of occupational safety, based on any information they may have received either in school or on the job.

Where the pre-test was designed to measure cognitive knowledge, the pre-class skills assessment was structured as a performance-based instrument. As with the pre-test, there were 20 items, or 'stations', worth from 0 – 5 points each, consisting of defined activities or skills. Some of the activities were conducted as a class or group (partner) exercise. The other stations were conducted and evaluated individually. The objective of conducting a pre-class skills assessment was to measure baseline knowledge. The instructors could then focus on the topics or subjects in which the student demonstrated the least competencies over the course of the class.

As with the pre-test, the students were instructed to apply their knowledge and skills to the best of their abilities. They were informed that there would be no grades given for the assignment, and that a lack of knowledge would not hinder their ability to complete the program. The scoring system was explained, allowing for guesses or multiple attempts. In most cases, there were no time limits for completing the activity, and the plan was to present as many of these skills as possible over the course of the week of safety training. The students were informed that the assessment would be repeated at the end of the program and that they would have opportunities to practice and learn the skills.

The post-class skills assessment, consisting of the same 20 stations would be conducted at the conclusion of the class, and the results would be compared from the students' first attempts at the stations, to their performance of the exercise on the post-class skills assessment. This approach would follow the concept of the pre-test and post-test, and would be presented in the same fashion. That is, the pre-test and pre-class skills assessments were introduced at the start of the class. The post-test (instrument #4) and post-class skills assessment (instrument #5) were conducted on the last day of the safety training, at the conclusion of the program.

Results obtained from the students would be compared along pre and post-class parameters. That is, individual student scores would be evaluated for each instrument, and a composite data analysis would be performed measuring the pre and post-tests, and the pre and post-class skills assessments. The overall scope and purpose was to provide a series and cross-section of information and skills that were identified as being core or relevant to beginning workers.

Implementation Planning for the Pre-Class Skills Assessment

As mentioned, the skills assessment consisted of a series of 20 stations. Each station was conducted as a separate activity. In some cases, the station was set up in the primary classroom and performed as a class activity (for example, stations #1 and #2). Other stations were conducted in separate classrooms or other areas in the CVTC campus in which the training occurred. The purpose of separating out the activities was to evaluate individual performance capabilities. A skills checklist was applied to determine competency and award points for full or partial completion. Tools, equipment, or supplies were included with the stations, and either verbal or written instructions accompanied and preceded the performance evaluation.

The first item on the assessment asked students to identify and select hazards. This activity was conducted as a class exercise. Students were given a 'Find the Hazards' answer sheet (Appendix L), which consisted of two vertical columns, one side for listing home hazards, and the other side for listing work-related hazards. The students paired into teams, and instructions were relayed for completing the activity, which included indentifying as many possible hazards as possible in the picture in a two minute timed trial.

A handout with a drawing of a typical home kitchen was next distributed to each person (Appendix M). Over 20 hazards were illustrated, and all students received the same picture. The students began the exercise at the same time. When informed to stop, they were directed to complete the item they were writing, then review their findings with their partner. One point was awarded for each hazard identified. The exercise was conducted as a game. The results collected from the teams are displayed on Table 45.

Table 45

Pre-Class Skills Assessment Station 1: Identifying and Listing Home Hazards.

Response	Number of replies	Percent
Five hazards identified	15	83.33
1 – 4 hazards identified	0	0
No hazards indicated	3	16.67

Within the pair, each person would compare his or her hazards with the other person. If both in the pair identified the same hazard, they would each cross out the item. The goal was to see if they found any items that their partner did not locate. The exercise was later reviewed and presented on screen, with the instructor seeking group consensus of the hazards found. While all 18 students participated in the exercise, three did not list any hazards on their answer sheets.

On the reverse side of the first set of home hazards were several work-based scenes, depicting people engaging in unsafe acts or behaviors. This activity was conducted similarly to the first station. The same partners who were paired for the first exercise participated in station #2. In this case, the drawing consisted of a typical manufacturing environment, involving over 30 pictured hazards (Appendix N). Results obtained from the students in this exercise are shown on Table 46.

Table 46

Pre-Class Skills Assessment Station 2: Identifying and Listing Work-Related Hazards

Response	Number of replies	Percent
Five hazards identified	15	83.33
1 – 4 hazards identified	0	0
No hazards indicated	3	16.67

Because of the number of potential hazards, the students were given three minutes to conduct the activity. Similar to station #1, the students completed the worksheet and compared their responses with their partner. One point was again awarded for each hazard identified, regardless if the partner recognized the same item or not. All 18 students participated in the exercise, with 15 identifying and earning the full five points. This exercise was also reviewed with the whole class, to see if additional hazards could be identified that they did not locate.

The third station involved a hands-on (literally!) exercise in which the students were asked to correctly demonstrate how to wear disposable gloves. This exercise was conducted individually, and related to a question presented on the pre and post-tests. Each participant was given a pair of vinyl disposable gloves and instructed to put on (don) and remove (doff) the gloves safely, with the purpose of avoiding disease transmission or contamination.

Different glove sizes were provided, to accommodate varying hand sizes. Once the students donned their gloves, the instructor squirted a mound of shaving cream into their hands, to simulate body fluids. In this manner, the absence or presence of shaving cream left on their hands or body would determine the degree of success in removing the gloves without exposure. Table 47 displays the results from the exercise.

Table 47

Pre-Class Skills Assessment Station 3: Demonstrating Donning and Doffing Disposable Gloves

Response	Number of replies	Percent
Met five of the guidelines	0	0
Met 1 – 3 of the guidelines	1	5.6
Did not meet any of the guidelines	17	94.44

Performance was evaluated based on established guidelines (University of Kentucky Environmental Health Safety Department, 2005). Points were awarded for matching skills according to the guidelines. Points were earned for following the 15 donning guidelines, or 10 doffing guidelines. Either of the two doffing methods described in the guidelines was considered as acceptable. The students were informed that this skill would be presented during the CPR/first aid training to be conducted later in the class. A variety of techniques were employed to demonstrate the donning and doffing of disposable gloves. One of the students correctly demonstrated three of the accepted guidelines. The other 17 students performed the exercise, but not to the established criteria.

Station #4 also consisted of a donning and doffing exercise, in this case, demonstrating the use of a fall protection harness. Results from the exercise are shown in Table 48.

Table 48

Pre-Class Skills Assessment Station 4: Fall Protection Harness Donning and Doffing Exercise

Response	Number of replies	Percent
Met five of the guidelines	0	0
Met 1 – 3 of the guidelines	0	0
Did not meet any of the guidelines	18	100

This activity was conducted individually, in a separate classroom. Students were provided with a fall protection harness and asked to don the equipment. Guidelines for successfully donning the harness consisted of a list of 13 items prepared by the instructor (Appendix O) (Senor, 2006), and compared with a list of five guidelines identified by a fall protection equipment manufacturer (ChicagoJack, 2008). Points were awarded for following the guidelines provided. All of the students attempted to don the fall protection harness. None demonstrated the correct application, so no points were earned at this station.

As respirators, dust masks can be considered as personal protective equipment, similar to using a harness for fall protection. For station #5, students were asked to correctly don a dust mask, based on prepared instructions. Table 49 shows the results from the exercise.

Table 49

Pre-Class Skills Assessment Station 5: Dust Mask Donning Demonstration

Response	Number of replies	Percent
Met five of the guidelines	0	0
Met 1 – 3 of the guidelines	0	0
Did not meet any of the guidelines	18	100

Each student was given a North brand, double-strap N95 particulate dust mask and instructed to don the mask. Points were earned for successfully donning the mask according to the 13 identified guidelines (Appendix P) (Senor, 2008). Similar to the previous station, the students attempted the exercise, but did not perform any of the recommended steps. Therefore, none of the students earned points in this station. The inability for the students to complete the exercise is not unexpected, accordingly to a recent study (Science Blogs LLC, 2007).

In the pre-test, there were three questions pertaining to fire safety, including one asking the students to define the acronym 'PASS'. For the skills assessment, the students were asked to demonstrate the 'PASS' method. This exercise was conducted individually. A Sentry 10-pound dry chemical fire extinguisher was placed on a table in a separate classroom for this exercise. A trash can was positioned 10 feet away from the table. Students were instructed to pick up the extinguisher and demonstrate how to suppress a simulated fire in the trash can. Table 50 describes the students' performance in the exercise.

Table 50

Pre-Class Skills Assessment Station 6: Demonstrating the 'PASS' Method

Response	Number of replies	Percent
Performed the 'PASS' method	1	5.56
Performed one or more of the methods	3	16.67
Unable to perform any of the 'PASS' steps	15	77.77

Note. The acronym 'PASS' stands for 'pull, aim, squeeze, and shoot'.

Five points were awarded for performing the activity by successfully demonstrating the 'PASS' method, as described in the guidelines (University of Rochester, 2008). Three points were earned if the student performed one or more of the steps in the method. If the student was unable to use the extinguisher accordingly to the 'PASS' method, no points were earned.

Several different methods were attempted by the students to suppress the simulated fire. One individual demonstrated all four of the 'PASS' steps correctly. Three students performed from one to three of the steps correctly. The attempts by the other 15 students did not match up with any of the 'PASS' methods.

The next activity, station #7 involved the ability for students to don hearing protection. There are various styles of hearing protection available to workers, including ear muffs, ear bands, and ear plugs. There are also several types and styles of ear plugs, and different methods for securing a proper fit. For the purpose of this exercise, students were provided with one brand and style of foam-fitted ear plugs. The students' performance is shown in Table 51.

Table 51

Pre-Class Skills Assessment Station 7: Demonstrating How to Properly Insert Ear Plugs

Response	Number of Replies	Percent
Followed all four steps in order	0	0
Followed 1or more of the steps	0	0
Did not perform any of the steps in order	18	100

The process for inserting the ear plugs involved four steps which the students were required to perform in sequence to earn partial or full credit (University of South Carolina, 2008). None of the students followed the steps in the order prescribed.

For station 8, students were asked to illustrate and outline emergency routes leading from the building. This exercise was conducted throughout the CVTC campus in which the class was held. Each student was provided an outline which included instructions for locating and identifying emergency routes and equipment, according to a list of symbols and icons (Appendix Q) (Senor, 2007). Results collected from the students along with their scores for the exercise are listed in Table 52.

Table 52

Pre-Class Skills Assessment Station 8: Drawing an Emergency Map, Indicating Primary and Secondary Evacuation Routes and Emergency Equipment

Response	Number of replies	Percent
Listed all items on the map	3	16.67
Listed selected items on the map	6	33.33
Did not identify any of the items	9	50

Full credit (five points) was awarded for listing all of the items on the sheet. Partial credit (three points) was earned for listing some but not all of the items. The students worked on teams for this exercise, and could share information. Three sheets were turned in listing all of the required elements, earning five points for those students. Six of the students partially completed their worksheets, listing selected items or routes. Nine of the students submitted their maps with no information presented.

The issue of fall protection and ladder safety was addressed in the pre-test. In this instrument, there were two exercises designed to assess student abilities at demonstrating safe ladder practices, station #9 and station #15. For station #9, the students were asked to complete a ladder inspection. The results of their performance are shown on Table 53.

Table 53

Pre-Class Skills Assessment Station 9: Conducting a Ladder Inspection

Response	Number of replies	Percent
Completed the entire checklist	0	0
Completed portions of the checklist	0	0
Did not complete any of the items	18	100

This exercise was conducted individually, in the shipping area of the CVTC campus hosting the training. A checklist was provided to each student (Appendix R) (Senor, 2006), describing items to be inspected on a ladder set up in the area. Full credit (five points) was awarded if the form was completed with all items inspected. Partial credit (three points) was earned for completing portions of the inspection. None of the inspections were completed using the supplied checklists, so no points were earned by any of the students for this activity.

In station #8, students charted locations of emergency routes and equipment. For station #10, they were asked to conduct an inspection of various pieces of emergency equipment in the building. The results of the exercise are shown in Table 54.

Table 54

Pre-Class Skills Assessment Station 10: Completing an Emergency Equipment Inspection

Response	Number of replies	Percent
Completed the entire checklist	1	5.56
Completed portions of the checklist	4	22.22
Did not complete any of the items	13	72.22

The assignment involved conducting an inspection of the emergency devices in the building, including fire extinguishers, fire alarms, and other warning devices. The exercise involved recording the inspection from a checklist provided (Appendix S) (Senor, 2007). Full credit (five points) was awarded for completing the checklist with all items inspected. Partial credit (three points) was earned for filling out portion of the inspection. One student turned in the checklist with all items evaluated properly. Four students partially completed their inspections. The other 13 students turned in their inspections without completing any of the listed items.

Station 11 consisted of conducting another inspection, this time on a forklift parked in the shipping area of the CVTC campus. Students were given a checklist of items and asked to perform a vehicle inspection. Results from the inspection are shown on Table 55.

Table 55

Pre-Class Skills Assessment Station 11: Conducting a Forklift Inspection.

Response	Number of replies	Percent
Completed the entire checklist	0	0
Completed portions of the checklist	0	0
Did not complete any of the items	18	100

Full credit (five points) was earned for correctly performing the full inspection and completely filling out all items on the form (Appendix T) (Senor, 2007 November). Partial credit (three points) was awarded for completing portions of the inspection. None of the 18 inspections submitted were completed, so no points were earned by any of the students on this activity.

For station 12, the students were escorted individually to one of several emergency eye wash stations in the building. A scenario was proposed, simulating an emergency, in which a person who had been working with chemicals had experienced an incident in which the chemical splashed into the eyes. The students were asked to demonstrate how to position the injured person under the unit and activate it to flush out the person's eyes. The performance results are displayed on Table 56.

Table 56

Pre-Class Skills Assessment Station 12: Demonstrating an Emergency Eye Wash Station

Response	Number of replies	Percent
Demonstrated all steps	0	0
Demonstrated one or more of the steps	0	0
Did not demonstrate any of the steps	18	100

Full credit (five points) was awarded if the student demonstrated all of the defined steps for using an eye wash station according to the instructions provided (Appendix U) (University of South Carolina, 2008). Partial credit (3 points) was earned for demonstrating selected steps. None of the students were able to perform the activity according to the steps outlined. Therefore, no credit was earned or applied.

Following station #12, the students proceeded to the next station, #13, which involved ergonomics and back safety. The activity consisted of preparing for and lifting a box, with a simulated weight of 50 pounds. An empty box was used, in order to reduce the risk of an actual injury. Student performance was based against a list of 12 steps (Canadian Centre for Occupational Safety and Health, 2007). Table 57 displays the results from this effort.

Table 57

Pre-Class Skills Assessment Station 13: Lifting and Carrying a Box

Response	Number of replies	Percent
Demonstrated all steps	0	0
Demonstrated one or more of the steps	0	0
Did not demonstrate any of the steps	18	100

Five points were earned for completing the exercise by following all of the prescribed steps. Partial credit (three points) was awarded for performing at least three of the steps correctly. While all of the students attempted to perform the activity, none were able to demonstrate the steps in the proper sequence. Therefore, no points were earned by any of the students in this station.

For the next station, #14, students were taken to a classroom and instructed to open a taped cardboard box using a supplied utility knife. Their efforts are outlined in Table 58. Performance was based on a list of steps (Appendix V) (Senor, 2006), and credit was earned for successfully following the steps in the order listed.

Table 58

Pre-Class Skills Assessment Station 14: Using a Utility Box to Cut and Open a Taped Box

Response	Number of replies	Percent
Demonstrated all steps	0	0
Demonstrated one or more of the steps	1	5.56
Did not demonstrate any of the steps	17	94.44

Full credit (five points) was earned for completing all of the steps in the order listed, and partial credit awarded for performing one or more of the steps. One student performed a portion of the activity correctly based on the defined criteria and earned three points. The other students did not successfully demonstrate the steps for opening the box using a utility knife and did not earn any points for the station.

Like station #9, station #15 asked the students to demonstrate a skill based on ladder safety. While station #9 involved conducting an inspection, this activity required students to demonstrate three separate skills for setting up and climbing a ladder.

A ladder was set up in the shipping area and students were instructed to perform each of the three activities described (setting up a ladder in a 4 to 1 ratio (one foot out horizontally for every four feet vertically), climbing the ladder, maintaining three points of contact for balance and stability (two hands and one foot, or two feet and one hand), and demonstrating the 'belt buckle rule' (keeping one's middle ('belt buckle') within the frame of the ladder when climbing. The students' responses are shown in Table 59.

Table 59

Pre-Class Skills Assessment Station 15: Demonstrating Ladder Safety Skills

Response	Number of replies	Percent
Demonstrated all steps	0	0
Demonstrated one or more of the steps	0	0
Did not demonstrate any of the steps	18	100

The basis for awarding points was a series of instructions described from a PowerPoint slide presentation (Senor, 2008). Five points were given for performing all instructed activities. Partial credit (three points) were given for successfully performing one or two of the steps. None of the students were able to correctly demonstrate the three activities for this station, thus no points were earned.

Many of the previous 15 stations in the pre-class skills assessment consisted of applying motor skills to assigned tasks (such as inspections or demonstrating safe aspects of performing a job task). Station #16 was held in the classroom and was more cognitively-based.

This exercise was conducted with a partner and performed in the main classroom. A sample scenario was prepared, describing an unsafe activity (a person observed operating a chain saw while not wearing any eye or face protection). The students were instructed to provide positive or corrective feedback to their partner for the act observed. Table 60 displays the results of the exercise.

Table 60

Pre-Class Skills Assessment Station 16: Communicating Positive Feedback

Response	Number of replies	Percent
Provided feedback based on the models	0	0
Did not provide feedback from the models	18	100

Scoring for the activity was based on following one of the two models which would be later discussed in the class (Senor, 2007). Five points were given for following either of the models. No points were awarded to any of the students, based on conformance with either of the two feedback models serving as guidelines.

For station #17, the students moved to one of the manufacturing labs on the CVTC campus to perform another inspection. This exercise was conducted individually, using a worksheet given to each student. The students were directed to one of the manufacturing labs and asked to evaluate the need for personal protective equipment based on a checklist provided (Appendix W). The checklist was prepared from guidelines established by OSHA (OSHA 1994). The results of the inspections are shown on Table #61.

Table 61

Pre-Class Skills Assessment Station 17: Assessing Personnel Protective Equipment Needs

Response	Number of replies	Percent
Completed the checklist completely	0	0
Did not complete the checklist	18	100

Five points were earned for completing all sections on the form. While all students participated in the exercise, none were able to earn any points, as the worksheets were either filled out incorrectly, or turned in with several sections missing information.

The students returned to the main classroom to conduct the next station, which involved assessing whether an assigned partner was pretending to be unconsciousness and needing assistance. This was one of the core skills to be presented during the safety training and was included to determine the students' baseline first aid skills. The students were paired up, with one first posing as an unconscious victim, positioned on his or her back. The other partner was then instructed to approach the 'victim' and determine if he or she was responsive. Once the activity was completed, the partners switched places and roles. The actions for performing an initial assessment were based on steps recommended by the American Red Cross from the course: Safety in the Workplace (American Red Cross, 2007). Table 62 illustrates the results from this exercise.

Table 62

Pre-Class Skills Assessment Station 18: Demonstrating Emergency Actions for to a Person Discovered to be Unconscious

Response	Number of replies	Percent
Performed all listed steps	0	0
Performed 3 or more of the steps	6	33.33
Did not perform any of the steps	12	66.67

Full credit (five points) was awarded for successfully performing all of the recommended steps. Partial credit (three points) was given for demonstrating three or more of the steps. Three of the students demonstrated a number of the recommended steps and earned three points each. The other 12 students did not perform the response steps according to the established guidelines.

Station #19 also related to first aid, and also to one of the activities performed earlier in the assessment. Similar to the previous station, students conducted this activity with a partner. Each team was given an 'EZ Cleans Plus' bloodborne pathogens spill control kit. The instructor then poured simulated blood onto the table top to approximate a bloodborne pathogens release. The students were asked to clean up their spill safely, according to the directions on the kit (Safetec of America, 2008). Table 63 displays the results obtained from the exercise.

Table 63

Pre-Class Skills Assessment Station 19: Bloodborne Pathogens Spill Clean-up

Response	Number of replies	Percent
Performed all steps correctly	0	0
Performed selected steps correctly	12	66.66
Did not perform the steps correctly	6	33.34

Full credit was awarded to each pair (five points for each person) if all of the instructions were followed. Partial credit (three points) was earned by the team for completing portions of the clean-up correctly. Six of the teams (12 students) performed selected steps correctly. Three teams (six individuals) did not complete any of the steps according to the directions.

The last station conducted in the pre-class skills assessment related to providing assistance to someone who may be experiencing heat stress. This exercise was also conducted with partners, similar to station #18. One person was instructed to sit or lie down and pretend to experience heat stress (heat exhaustion). The other person performed the role of the rescuer and was asked to provide immediate treatment. The students then switched roles. The skills assessed were compared against a checklist (National Oceanic and Atmospheric Administration, n.d.). A chart of the responses is indicated on Table 64.

Table 64

Pre-Class Skills Assessment Station 20: First Aid Treatment for Heat Stress

Response	Number of Replies	Percent
Performed all steps correctly	1	5.56
Performed selected steps correctly	9	50
Did not perform the steps correctly	8	44.44

Credit was awarded individually, on a basis of five points for performing all of the listed steps and three points for demonstrating one or more of the steps. One of the students conducted all treatment steps successfully and earned five points. Nine students demonstrated selected treatment steps and earned three points each. Eight students were unable to conduct any of the steps according to the established guidelines.

Overall performance by students on the 20 stations in the pre-class skills assessment was mixed. The stations involved practical application and were performance-based. Points were awarded for completing or even attempting the activities without penalty. The students were also informed that the stations would be repeated at the conclusion of the class to determine if they were able to apply the concepts and knowledge learned during the class.

Statistical Analysis of the Pre class Skills Assessment

A composite score was calculated on all 18 students' total scores. This represented scores based on the 20 questions, adding up to 100 points. The data is presented in Table 65.

Table 65

Composite Scores from Instrument #3, Pre-Class Skills Assessment

Score	Frequency	Percent	Cumulative percent
0	3	16.7	16.7
10	1	5.6	22.2
13	1	5.6	27.8
15	1	5.6	33.3
16	2	11.11	44.4
18	1	5.6	50
19	3	16.7	66.7
21	1	5.6	72.2
22	1	5.6	77.8
25	1	5.6	83.3
29	1	5.6	88.9
31	1	5.6	94.4
33	1	5.6	100
Total	18	100	

Three students did not earn points on any of the stations. This occurred despite opportunities for working together in teams or with a partner. A high score of 33 was obtained by one student. The students were informed that they would perform the activities at the end of the program, and that improvements in their scores would likely be achieved, as they would learn and practice many of the skills later in the class. the low mean score (8.89) may have been based on the students' lack of previous knowledge or application of the skills presented in the stations.

Instrument 4: Post-Test

The fourth instrument applied in the safety training for collecting statistical data was the post-test. The same 20 questions used for the pre-test were repeated on the post-test. While the pre-test was delivered on the first day of class, the post-test was presented on day five, the last day of the class. The purpose of repeating the test was to determine if the content and skills presented over the duration of the program resulted in improved scores. The post-test was conducted similarly to the pre-test.

The students received copies of the post-tests and were asked to answer the questions to the best of their abilities. The original structure of the class was to address all subject areas listed on the pre-test and assess competency and knowledge on the post-tests. Due to time and other constraints, however, not all of the topics were addressed. This factor was discussed in Chapter V of the study. Table 66 illustrates the post-test scores obtained by the participants.

Table 66

Composite Scores from Instrument #4, Post-Test

Score	Frequency	Percent	Cumulative percent
19	2	11.1	11.1
21	1	5.6	16.7
30	1	5.6	22.2
38	1	5.6	27.8
41	1	5.6	33.3
42	1	5.6	38.9
43	2	11.1	50
48	1	5.6	55.6
51	1	5.6	61.1
54	1	5.6	66.7
55	2	11.1	77.8
62	1	5.6	83.3
63	1	5.6	88.9
71	1	5.6	94.4
73	1	5.6	100
Total	18	100	

An analysis of the scores and findings from the post-test is discussed in this chapter following presentation of the data from Table 66. A comparison of scores from the pre-test and post-test was performed. This was conducted in a paired samples test. The results of the analysis are presented in Table 67.

Table 67

Paired Samples Test, Measuring Pre-Test and Post-Test Results

Statistical indicator	Result
Mean	34.94
Standard deviation	13.35
Standard error mean	3.15
95% confidence interval of the difference	
Lower	28.31
Upper	41.59
t-score	11.11
df	17
2-tailed significance (p)	.0001

The results displayed in Table 66 note a p-value and a confidence level of 99%, with a margin of error of < 1%. The results reported suggest a rejection of a null hypothesis. The reported significance of < .0001 can be termed as statistically significant. The t-score of 11.11, when compared with the p-score, indicates statistical significance as well. The limited sample size of 18 respondents may have influenced the degree of significance and reliability of the data collected. One source of interpretation was applied to the results:

> If the P value is small (usually defined to mean less than 0.05), then it is unlikely that the discrepancy you observed between sample mean and hypothetical mean is due to a coincidence arising from random sampling. You can reject the idea that the difference is a coincidence, and conclude instead that the population has a mean different than the hypothetical value you entered. The difference is statistically significant. But is the difference scientifically significant? The confidence interval helps you decide (Motulsky, 1999, p. 31).

Attempts were made to seek a correlation between the variables in the study. The results reported on the pre-test questions were compared with scores on the post-tests. Likewise, results from responses on the pre-class skills assessment were compared with those received on the post-skills skills assessment. The concept of interval variables was applied in the study, as the pre and post-test responses were compared and ranked according to the scores received and results reported.

Instrument 5: Post-class Skills Assessment

The post-class skills assessment consisted of the same 20 stations presented on the pre-class skills assessment delivered on the first day of class. The intent of the activity was to measure competency and knowledge learned during the safety training, and to seek improvement on one or more of the skills. The pre-class skills assessment was conducted individually or in pairs. Points for full or partial credit were earned based on the accuracy and completion of the activities. When initially constructed, the post-class skills assessment was designed to be conducted along the same constructs as the pre-class skills assessment.

However, due to time constraints, the post-skills assessment was performed as a class activity. The stations were conducted with input from all students. Points were awarded based on consensus answers provided. As such, each student received the same composite score of 55. The difference in approach and delivery in presenting two instruments is discussed in Chapter V. Table 68 displays the primary variables from the post-class skills assessment.

Table 68

Composite Scores from Instrument #5, Post-Class Skills Assessment

Score	Frequency	Percent
55	18	100

Note: N = 18

The post-test consisted of the same 20 questions listed on the pre-test. The original design of the class involved presenting all of the competencies comprising the content of the tests and skills assessments. Due to time constraints and other logistical issues, a number of the intended competencies were not addressed during the class. (The plan called for 28 hours of safety instruction, but only 20 hours were actually delivered).

The decrease in hours allotted for the safety training was due to a number of factors. The matrix of activities and hours conducted dedicated to safety training is shown on Attachment A. In comparison, Table 69 presents a comparison of the proposed hours planned verses the actual hours allowed to present the safety training.

Table 69

Proposed Verses Actual Safety Hours Presented During the Manufacturing Academy

Date	Proposed hours	Actual hours	Comment
6/16/2008	2	0	Manufacturing tours
6/23/2008	4	4	Hours conducted as planned
6/24/2008	8	8	Hours conducted as planned
6/25/2008	8	5	Field trip reduced available time
6/26/2008	4	2	Field trip reduced available time
6/27/2008	2	1	Student presentations – preparation
Totals	28	20	

The original plan was to present a safety orientation to the students on the first day of week one, then proceed with the remainder of the safety training during week two. In lieu of a general opening session, the students rotated among three manufacturing labs and general introductions to the programs were conducted in that manner. Another factor reducing the proposed safety training time was scheduling of field trips to local companies. Time planned for safety training on June 25th and June 26th was instead reassigned to send the students off-site to view manufacturing facilities.

The decision to schedule the field trips to replace the safety training was made independently by outside personnel. Finally, the proposed safety training for June 27th was reduced to allow additional time for the students to work on projects to be presented in an award ceremony. Preparation time built in for June 26th was redirected to the field trips, and instead, moved to the final day of the class, June 27th.

The post-test was presented and conducted similarly to the delivery of the pre-test. Students provided answers to the questions posed, using knowledge learned from the class and other sources.

None of the questions involved calculations or use of formulae or equations. The lowest score obtained on the post-test was 19 out of 100, and the highest score received was 73. The mean score was 43.58. When comparing pre-test and post-test mean scores (10.61 compared with 43.58), there was a mean increase score of 32.97. All students showed improvements from their pre-test to their post-test scores, though the increase in score or percentage varied by individual.

The post-class skills assessment consisted of the same 20 stations presented in the pre-class version. The delivery method applied however in both cases, was different. While performed either individually or in pairs in the pre-class skills assessment, the post-class method consisted of presenting the situations to the entire class. Responses were solicited from the group, and a consensus answer was accepted and applied.

Because of the delivery style, all students received the same final score of 55 out of 100 points. When comparing the mean score of 8.89 on the pre-class skills assessment to the mean post-class skills assessment of 55, the mean increase is 46.11. Because of the varying methodology applied, individual improvements or scores were not derived.

A comparison of scores from the pre-class and post-class skills assessments was also performed. This was conducted in a paired samples test. The results of the analysis are presented in Table 70. The analysis was conducted using the SPSS program, version 15.

Table 70

Paired Samples Test, Measuring Pre-Class and Post-Class Skills Assessments

Statistical indicator	Result
Mean	38.00
Standard deviation	9.86
Standard error mean	2.32
95% confidence interval of the difference	
Lower	33.10
Upper	42.90
t-score	16.36
df	17
2-tailed significance (p)	.0001

The statistical indicators collected from analyzing the pre and post-class skills assessments were shown to be different when compared with the results analyzing the pre and post-tests. A p-score of < .0001 was obtained on measurements of the pre and post-class skills assessments, similar to the results collected from the pre and post-test analyses. This indicates statistical significance when comparing results from both sets of instruments. The mean score derived from the skills assessment instruments was shown to be higher than the mean score achieved from comparing the pre and post-tests.

The standard deviation and standard error mean were both lower when comparing the skills assessments to the pre and post-tests. The confidence interval of the difference to the upper and lower levels was higher when comparing the skills assessment values to the pre and post-test statistical results. A higher t-score was obtained from the skills assessments when comparing the score to the results from the pre and post-test analysis.

Instrument 6: Post-class Survey

Following completion of the safety training delivered at the 2008 Manufacturing Academy, participants were sent post-class surveys. The purpose of the surveys was to obtain data relevant to the information and knowledge the students may have gained, and applied either on or off-the-job. The first post-class survey was sent on July 31, 2008. Due to the limited number of responses, a second post-class survey was sent to participants who did not return the first survey. Both versions of the post-class survey asked the same questions.

The format of the second survey was changed to encourage non-respondents to complete and return the instrument. A total of 15 out of 18 of the surveys were returned. The post-class survey consisted of nine questions. Questions 1 – 3 asked students whether any of the skills learned during the safety training were of value or had been applied. Questions 4 – 9 applied to students who were currently employed (at the time). These individuals were requested to answer all nine questions. Students who were not employed were asked to answer questions 1 – 3, then return the survey. For purposes of evaluation, each of the nine questions are presented. This is to measure responses and application of the training. The questions and resulting responses are presented in the tables which follow, starting with Table 71.

Table 71

Post-Class Survey Item 1: Application of Skills Learned During the Manufacturing Academy

Reply	Frequency	Percent	Cumulative percent
No	10	55.6	66.7
Yes	5	27.8	100
Missing	3	16.7	
Total response	15	83.3	
Total class	18	100	

The first question asked students to describe if any of the skills they learned during the Manufacturing Academy had been applied since its conclusion. Two students identified providing first aid since the completion of their training. The three other students who reported using safety skills did not identify the specific skills or situations in which they may have been applied. Following completion of the training, five of the students reported using one or more of the skills learned during the Manufacturing Academy.

The second question of the post-class survey asked the students to indicate if they felt better prepared to work safely following the conclusion of the class. Table 72 shows the responses collected.

Table 72

Post-Class Survey Item Question 2: Degree of Preparedness for Working Safely On-the-job

Reply	Frequency	Percent	Cumulative percent
Yes	15	83.3	100
Missing	3	16.7	
Total response	15	83.3	
Total class	18	100	

The level of preparedness was not rated or evaluated, rather, the students reported on if they felt any more capable of working safely, based on receiving the safety training during the Manufacturing Academy. All 15 of the students who replied reported feeling better prepared to work safely, though the results were described in qualitative terms.

The third question asked on the post-class survey asked students to indicate if they were working. Students were asked only to report if they were currently employed. Determinations regarding the nature of the job, hours worked, or length of employment were not asked in this question. Table 73 indicated the results received.

Table 73

Post-Class Survey Item 3: Employment Status

Reply	Frequency	Percent	Cumulative percent
No	8	44.4	53.3
Yes	7	38.9	100
Missing	3	16.7	
Total response	15	83.3	
Total class	18	100	

Note: one student indicated working part-time in the response.

Seven of the students reported holding jobs. In the pre-class questionnaire, eight out of 18 students (44.4%) reported working in some capacity during their life. For the post-class survey, seven of the 15 students (46.7%) replying indicated being employed. An analysis comparing individual student employment prior to or after the training was not conducted.

Students who did not report current employment were informed that they had completed the survey and were instructed to skip questions 4 – 9, as these items pertained only to students who were working. Students who reported being employed were asked to complete questions 4 – 9, which appeared on the back side of the survey. Question #4 on the post-class survey asked students to list the name of their current employer. The results are displayed on Table 74.

Table 74

Post-Class Survey Item 4: Name of Current Employer

Reply	Frequency	Percent	Cumulative percent
Not working	9	50	64.3
Working	5	27.8	100
Missing	4	22.2	
Total response	14	77.8	
Total class	18	100	

The workplaces reported by the students included the following: UW-Stout, K-Mart, Taco Johns, home, Copps Food Store, and the El Roy Miner. In question #3, seven students reported holding jobs. When asked to name their employer, it appears that two of the students did not disclose the requested information.

The next post-class survey question asked students to indicate if their employer had provided on-the-job safety training. The type or level of training was not asked. Students were asked to indicate if any amount of training had been provided from their employer. The results from the replies are shown on Table 75.

Table 75

Post-Class Survey, Question 5: Safety Training Provided by the Student's Employer

Reply	Frequency	Percent	Cumulative percent
No	11	61.1	73.3
Yes, just the basics	2	11.1	86.7
Yes, safety orientation	2	11.1	100
Missing	3	16.7	
Total response	15	83.3	
Total class	18	100	

Even though seven of the students reported being employed at the time of the survey, there were 11 replies of 'no' to the question of whether on-the-job training had been provided. The increase in replies to this question may have resulted from students who responded thinking that it pertained to any current or previous employment. Based on the findings, four of the seven students reported receiving some level of on-the-job training.

Question #6 on the post-class survey asked students to assess their level of preparedness and confidence for working safely, based on any training they may have received from their employer. The results of the findings are shown on Table 76.

Table 76

Post-Class Survey Item 6: On-the-Job Training and Preparedness to Recognize Potential Safety Hazards

Reply	Frequency	Percent	Cumulative percent
Don't know yet	1	5.6	7.1
No	8	44.4	64.3
Yes	5	27.8	100
Missing	4	22.2	
Total response	14	77.8	
Total class	18	100	

Five of the students indicated that they were better prepared to recognize potential safety hazards because of the safety training received while working. Of the other nine students who replied to the question, one did not report a definitive answer, and eight reported that they did not feel that the safety training received on-the-job had improved their ability to recognize potential safety hazards.

Question #7 on the post-class survey asked students to report the safety subjects discussed by their employers. The results reported are displayed on Table 77.

Table 77

Post-Class Survey Item 7: Names of Safety Topics Presented by Employers

Reply	Frequency	Percent	Cumulative percent
Left blank	8	44.4	53.3
Marked	7	38.9	100
Missing	3	16.7	
Total response	15	83.3	
Total class	18	100	

For this question, 12 topics were listed. Multiple replies were allowed. Students also had the opportunity to add other subjects in which they received training from their employer. Table 78 lists the responses received from the students relating to the specific topics their employers presented on-the-job. Students were offered the opportunity to list multiple responses.

Table 78

Safety Topics Discussed by Employers to Manufacturing Academy Students Following Completion of the Safety Training (Refers to Question 7 on the Post-Class Survey)

Area or topic	Number of replies	Percent from received
Reporting injuries or illnesses	5	83.3
Slips, trips and falls	4	66.7
Cuts	3	50
Workplace violence prevention	2	33.3
Reporting hazards	2	33.3
Burns	4	66.7
Lifting	3	50
Using chemicals	2	33.3
Preventing accidents	3	50
Using equipment	1	16.7
Safe driving	1	16.7
PPE (personal protective equipment)	2	33.3
Other areas (included CPR)	1	16.7
Total replies	33	

Note: N = 6

Question #8 on the post-class survey asked the students to evaluate the perceived value of the safety-related certificates earned during the Manufacturing Academy. They were asked to indicate which if any of the certificates were helpful. Table 79 displays the replies received.

Table 79

Post-Class Survey Item 8: Which of the Certificates You Earned Have Been Helpful to You?

Reply	Frequency	Percent	Cumulative percent
Left blank	11	61.1	73.3
Marked	4	22.2	100
Missing	3	16.7	
Total response	15	83.3	
Total class	18	100	

For this question, students were offered five choices. Multiple replies were allowed. Table 80 presents the choices and the student responses.

Table 80

Indication of Safety Certificates Considered Helpful to Participants

Certificate	Considered as being helpful	Percent from received
Red Cross first aid card	3	42.9
Red Cross CPR card	2	28.6
Fire extinguisher card	2	28.6
CVTC safety certificate	4	57.1
None yet	2	28.6
Total replies	13	

Note: N = 7

The last question on the post-class survey, #9, asked students to indicate if the safety certificates received during the Manufacturing had helped them keep their existing job, or locate a new position. Table 81 displays the information received.

Table 81

Post-Class Survey Item 9: Value of the Safety Certificates in Keeping or Gaining Employment

Reply	Frequency	Percent	Cumulative percent
None	5	27.8	35.7
Yes, one or more	9	50	100
Missing	4	22.2	
Total response	14	77.8	
Total class	18	100	

A list of the certificates awarded to students from their participation in the Manufacturing Academy were provided to help them select from for use on question #9. Multiple responses could be given. Table 82 shows the replies.

Table 82

Perceived Value of the Safety Certificates From Participants Replying to the Post-Class Survey

Certificate	Considered as being helpful	Percent from received
Red Cross first aid card	1	14.2
Red Cross CPR card	1	14.2
Fire extinguisher card	1	14.2
CVTC safety certificate	3	42.9
None	2	28.6

Note: N = 7

In order to summarize the post-class survey, a composite score was prepared for the instrument. The data is displayed below in Table 83.

Table 83

Composite Score for Instrument #6, Post-Class Survey I and II (combined)

Score	Frequency	Percent	Cumulative percent
4	1	5.6	7.7
5	2	11.1	23.1
6	4	22.2	53.8
7	1	5.6	61.5
9	1	5.6	69.2
10	1	5.6	76.9
13	1	5.6	84.6
15	1	5.6	92.3
17	1	5.6	100
Total received	13	72.2	
Total	18	100	

The post-class survey (versions I and II) followed the conclusion of the class in June 2008. The original intent was to send surveys at one and two month intervals (once in July and once in August 2008). The first set of surveys was mailed on July 31, 2008. Because only eight of the 18 surveys were not returned (44.4%), a second mailing of surveys was sent on August 28, 2008, to the ten students who did not respond to the first mailing. The return response rate on the second post-class survey was 70%, with seven of the 10 surveys returned. The total number of surveys received was 15 out of 18, for a rate of 83.3%. In some cases, selected questions were left unanswered or unmarked. This influenced the analysis and calculations of responses.

Summary

Data collected from the respondents was based on two primary categories. The first data set was collected on the first day of the safety training, prior to beginning the class content. This consisted of a survey to ascertain interest and skills, followed by a cognitive pre-test, and a performance-based skills assessment. All 18 students completed the pre-class survey and answered each of the seven questions or statements. The next set of data consisted of the post-test, post-class skills assessment, and post-class survey. These instruments were designed to measure performance improvement made during the duration of the safety training.

The six instruments used in the field study were applied to gather and assess data obtained from respondents participating in the 2008 Manufacturing Academy. Instructions provided at the start of the class included explaining the purpose of the study, and that participation in the study would be voluntary. The students were required to attend the Manufacturing Academy in order to earn their stipend and receive high school credit, but their participation in the study and completing the instruments was voluntary.

Class content was designed to present practical and fundamental skills that could be used to improve safety on-the-job as well as away from work. The degree of participation and application to the instruments used in the study varied from student to student, as was reflected in the scores. An analysis of the results will be evaluated and discussed in Chapter V.

V: Discussion

The purpose for this field study was to determine if instruction in basic concepts of occupational safety and health could improve performance and reduce the occurrence of on-the-job accidents affecting young, entry-level workers. Chapter 5 is divided into a summary of the study, methods and procedures, conclusions and major findings, and recommendations, both relating to this study and for further research.

Summary

A series of six instruments coincided with the safety training, and was designed to measure the degree of knowledge and competencies learned and demonstrated in a selected group of students aged 16 – 17 years old, representing school districts in the Chippewa Valley of west-central Wisconsin. A pool of 26 students initially registered for the two-week program, conducted in June 2008 titled 'The Manufacturing Academy', with 18 students completing the program.

A portion of the training (20 hours delivered during the second week of the program) was dedicated to presenting the safety concepts. A series of instruments evaluated student attitudes and performance relative to their interest and knowledge about occupational safety concepts. The first instrument used in the study consisted of a pre-class questionnaire, distributed prior to the start of the class. The intention of the survey was to determine the students' experience and attitudes toward workplace safety.

Two successive instruments were next presented, consisting of a pre-test, and a pre-class skills application. Both instruments were presented prior to the beginning of the class, and were designed to measure the students' cognitive and practical knowledge relative to safety and health. The same two instruments were repeated and delivered again at the conclusion of the training, as a post-test and a post-class skills application, to assess changes or improvements in the level of understanding and competencies displayed. One month following the conclusion of the training, follow-up surveys were mailed out to the participants, with the goal of determining whether the concepts learned during the class had been applied (for students not employed), or reinforced (by employers for students who were working).

Methods and Procedures

The methods used in the research study consisted of evaluating selected concepts relating to basic occupational safety principles. The concepts presented could pertain to entry-level jobs, such as in the food service or retail industries. The concepts could also apply to other occupations, such as manufacturing or construction. Since the Manufacturing Academy's purpose was to introduce production and operational processes, much of the content of the safety training revolved around issues and practices referring to occupational safety.

As such, much information presented to the students referenced OSHA regulations and standards. The concepts presented could apply to all workers, not just those employed in entry-level occupations, and could be directed to on-the-job and off-work situations. The concepts were designed to provide functional knowledge, and may have been reinforced through prior training received either in high school classes, or from employers, for students who were working.

The methods applied in the research study were designed to measure knowledge and the direct application of competencies and skills. The pre-class questionnaire gained information about the students' prior safety training or employment, along with their willingness to voluntarily participate in the study. Participants were asked to answer 20 questions, worth five points each, consisting of a spectrum of subjects relating to safety and health. Many of the questions could be answered with a phrase or number. In most cases, there was one correct answer to the question. Where the item consisted of multiple answers, partial credit (1 – 4 points) could be awarded. There was no penalty assessed for incorrect or incomplete responses.

The next instrument presented was a pre-class skills application, which consisted of 20 stations, designed to evaluate the ability of the students to perform skills pertaining to such areas as first aid, general safety, and employee health. Many of the same subjects listed on the pre-test were repeated on the pre-class skills application. Examples included ladder safety, first aid, and fire safety. The students were asked to perform the requested tasks, based on written or verbal instructions.

Some of the stations were conducted individually, and some with a partner. Similar to the pre-test, credit was awarded fully or partially for performing the tasks. Five points were earned per station, up to a maximum of 100 points. Students attempting the tasks could earn from 1 – 5 points for fulfilling from part to all of the portions of the individual station. There was no penalty assessed for incorrect or incomplete responses.

The pre-test and pre-class skills applications were conducted on the first day of the safety training, in advance of the class. Over the next four days (20 hours of instruction), the subjects from the pre-test and pre-skills assessment were presented in the class. Students received information, which was reinforced through practical application of the skills. The design of the class was to present all 20 of the concepts from the pre-test, and have the students learn and demonstrate all 20 of the tasks listed on the pre-class skills assessment. However, unexpected time constraints reduced the time available for content and delivery.

Of the 28 hours initially proposed for the safety training, only 20 hours were actually delivered. This reduced the presentation and practice time, and several of the exercises planned for discussion were eliminated from the class. The reduction of allowable time for instruction and demonstration may have influenced the ability of the students to correctly answer some of the post-test questions and successfully perform the post-class skills assessment stations.

On the last day of the safety training, at the conclusion of the program, the same 20 questions asked on the pre-test were again presented to the students, this time as a post-test. Responses were collected and scored in a fashion similar to the pre-test. After collecting the individual post-tests, a post-class skills assessment was conducted. The intention was to present this instrument in the same manner as was conducted on the pre-class skills assessment.

The same 20 stations were selected on each of the skills assessments. However, instead of following the format of delivery used on the pre-class skills assessment, the post-class version was presented as a class effort. That is, the questions or situations were posed, and a consensus answer was charted. Based on the replies, an agreed upon response was indicated and recorded. The reason for the change in process was again, time. The decision to conduct the post-class skills assessment was made realizing that this would result in a difference of statistical analysis.

In terms of methodology, the safety training was presented primarily in a classroom setting. Content delivery was achieved through a combination of techniques, including exercises, PowerPoint slides, demonstrations, small group activities, individual presentations, and other interactive methods. A fire safety professional presented fire safety concepts, and a representative from the American Red Cross assisted in the CPR and first aid training. Field trips employed in the Manufacturing Academy (which may have detracted from the time scheduled for the safety training) involved studying manufacturing processes. Any references to safety on the field trips were made tangentially as a means of avoiding accidental contact with machinery or vehicles during the tours.

Conclusions

A number of conclusions and major findings can be suggested based on the collection and analysis of data. Each of the five research questions were addressed, in terms of providing answers to the questions. Data analysis was collected and consisted of evaluating the responses from the six instruments used, to determine the degree in which the skills and knowledge presented during the class could be applied.

The results received from the respondents were designed to address the five research questions which framed the scope and purpose of the field study. The questions, first proposed in Chapter I, are listed and answered individually in this section. Other major findings are then explored, and recommendations are proposed relating to this study, and for possible future or further research.

Research Question #1:

What was the level of learning demonstrated by students participating in the June 2008 Manufacturing Academy?

As previously noted, improvements were shown individually, as well as from a class composite, based on results obtained from the pre-test to the post-test scores, along with results received from the pre-class to the post-class skills assessments. In cases where the subject or content was presented during the class, improved individual scores were shown. For questions not discussed during the class, the same score was achieved on the pre and post-tests. This pattern was observed from the stations presented on the skills assessments. If the skill was presented during the class, improved results were obtained. For those skills not reviewed, the scores remained flat from the pre to the post-class models.

At times, there appeared to be reluctance from some of the participants to fully answer all questions on their pre-test and pre-class skills assessments. Despite being reassured that the answers and scores would have no bearing on their ability to receive the paid stipend or earn credit for attending the Manufacturing Academy, several of the students chose not to answer questions on their pre-tests, or participate in selected stations on their pre-class skills assessments. Reasons for the intermittent or sporadic responses are discussed later on in this chapter.

Knowledge was displayed in other means in addition to the scoring from the instruments utilized in the study. For example, when asked on the post-class survey if they had used any of the skills learned during the safety training following the class (question #1), five out of 15 of the students (33.3%) replied that they had used one or more of the skills. When asked if they felt better prepared to work safely since taking the safety training (question #2 on the post-class survey), all 15 students who replied did so in with the affirmative (100%), indicating that they felt more ready to work safely based on the training they received in the class.

Research Question #2:

To what extent did the safety training strategies transfer to the work environment?

This question may have been answered through replies received from the post-class surveys. The rate of employment appeared to be relatively static, when comparing students working prior to and following the class. Eight out of the 18 students (44.4%) reported being employed at the start of the class, compared with seven out of 15 (46.7%) who reported being employed following the conclusion of the class (three students did not return either of the post-class surveys).

Item #9 on the post-class survey related to the transfer of skills from the class to the work environment. Nine out of the 14 students (64.3%) who replied to the question indicated that they felt earning one or more of the safety certificates awarded in the class helped them find or keep a job. The short time span (1 – 2 months) from start of the class to the post-class survey may not have yielded a sufficient length of time for receiving relevant information to answer this research question.

One of the objectives of the class was to provide 'immersion training', awarding independent certificates that could be recognized by employers as adding value for their employees. As examples, students who completed the course earned a safety certificate from the college. A card acknowledging successful demonstration for using a fire extinguisher to suppress a live (controlled) fire was given out by the Cintas Company, who arranged the fire safety training. Certificates in Standard First Aid and CPR from the American Red Cross were also awarded to the students for completing that portion of the class.

One additional card had been planned on being presented following the course, but due to time restrictions, was not consummated. Part of the program had been designed around earning a 10-hour course completion card from OSHA for general industry safety training. Several but not all of the required sections for earning the cards were addressed during the Manufacturing Academy, so the cards were not distributed. If sufficient time had allowed for all of the planned safety components, earning the OSHA completion cards may have increased the transfer of skills learned from the class to the work environment.

The transference of skills learned in the Manufacturing Academy by the students did not appear to be sufficiently applied in the work setting based on the data analyzed in this study. Perhaps a longer-term study to evaluate safety performance, including feedback received from both students and employers, could produce the necessary data to better answer research question #2. Surveying employers and receiving feedback from them on identifying skills that could enhance workplace safety training could also assist with the deployment of skills and competencies presented, either in the school setting, or offered through such avenues as the Manufacturing Academy.

Research Question #3:

What was the level of training effectiveness based on entry level jobs?

Improvements were reported from all 18 students from scores received on the pre-test, to the cumulative post-test scores. During the safety program, answers to the questions on the pre-test were provided, including explanations and rationale. The students had several opportunities to relate the concepts learned, in terms of working safely on and off-the-job. The timing of the pre and post-tests (within five days of each other) may have contributed to the improvement received and the retention and reporting of the correct answers for the post-tests.

Improvements were reported from all 18 students from the pre-class skills assessments, to the cumulative post-class skills assessment scores. In realizing the increase, it is important to consider the difference in delivery methods applied in these two instruments. While similar in content (the same 20 stations were repeated on both models), the instrument was conducted largely in individual or small groups and this may have affected the pre-class response rate. This contrasts to the implementation of the post-class skills assessment, which was conducted as a class exercise.

Questions asked on the post-class survey sought to clarify the value of the skills learned during the class when transferred to the work environment. The objective of the question was to determine if training interventions produced in the class could influence or improve a student's ability to work safely on the job. A corollary goal was to seek synergy with any safety training provided by the student's employer, to reinforce or support the concepts taught in the Manufacturing Academy.

The degree to which an individual's safety performance can be measured may be based on interpretation. Many employers used frequency rates (the 'how many') to measure safety performance. This is often reported in the numbers or rates of work-related incidents, compared with overall hours. The OSHA recordable rate is a primary statistical indicator used by employers to measure safety performance.

The figure is derived by multiplying the number of defined incidents during a period of time, called 'recordable injuries or illnesses' times 200,000, over the same period of time (usually a month or year). The numerator is then divided by the total number of hours worked over the same period. Frequency rates are compared by industry type, and are compiled by the Department of Labor, Bureau of Labor Statistics and reported annually (OSHA, 2008).

(Note – the 200,000 figure is used as a constant standard applied across all organizations. It represents an average sized company employing 100 people, working 40 hours a week, 50 weeks a year.)

Another method for measuring safety is evaluating the severity of injuries (the 'how much'). Various indicators can be applied to study severity. Measures include the number and cost of workers' compensation claims, as well as the associated insurance premium rates that are assessed to predict costs and losses.

Proactive indicators can also be applied to measure the degree of safety performance. These 'leading indicators' can be calculated statistically to show rates or improvements in individual as well as organizational performance. Examples include the number or percent of employees receiving safety training, the application of safe practices and safe procedures, and observations made on employee's actions and behaviors compared with expected practices or procedures.

The alignment of the skills presented during the Manufacturing Academy was paced to follow employer-based training for entry-level or beginning workers. The 12 topics listed on question #7 of the post-class survey were based on a selection of subjects planned for review in the class. Some of the topics were discussed (such as reporting hazards and preventing accidents), while other subjects were planned but not addressed (such as lifting and safe driving).

The limited amount of time and content from the original plan may have reduced the perceived or actual effectiveness of the training reported. The extent in which training effectiveness could translate to the job setting would be better observed in a longitudinal study, in which frequency, severity, and proactive indicators could be measured over a fixed period of time, and compared with the performance observed or reported from other employees who did not participate in a high school safety program.

Research Question 4:

Was there a difference in comprehension based on selected demographics?

The initial plan of the study attempted to determine if individual performance could be evaluated and compared against a variety of demographical indicators, in this case, by school district. By design, demographical differences were not calculated. This aspect was not evaluated due to the following reasons:

1. Protecting the confidentially of the respondents. Table 7 showed a breakdown of the participants based on their school district. One student attended the Boyceville School District, and two each represented the Chippewa Falls and Altoona school districts. The other students

attended either the Menomonie or Eau Claire schools. In order to ensure privacy and confidentially, the aspect of analyzing the individual responses was not reported.

2. Program methodology. The content of the class was delivered through a variety of techniques, with the intent of seeking involvement and participation from the students. Many of the activities were conducted as group or team exercises, and students rotated through the teams in order to gain familiarity with students from the other schools. This teaching style was also conducted to help the students build relationships and reduce the established peer-groups or 'cliques' in which some may have been associated.

When the answers were reported by partners or teams, they were applied to all in the group. As such, individual demographics were not reported. This aspect was especially evident in the collection of data from the post-class skills assessment, where a class consensus was applied to all of the 20 stations on the instrument. If another study chose to evaluate demographic data, a larger pool of participants could increase the ability to conduct a successful outcome. The ability to conduct pre and post class functions similarly would also provide a greater degree of statistical relevance.

3. Relative proximity. The students who attended the 2008 Manufacturing Academy represented schools from the Chippewa Valley in west-central Wisconsin. The school districts adjoined each other in a radius of about 30 miles. A study representing a larger pool of school districts and students could improve the ability to receive reliable and valid data to evaluate school districts and school safety programs.

4. Other demographic indicators. The students chosen for the study represented varying ethnicities and cultures. In order to preserve their confidentially and privacy (please refer to point 1 in this section), itemization by gender or other factors was not considered.

Research Question 5

Was there a single strategy which achieved success?

The strategy employed in the Manufacturing Academy was to provide practical, hands-on skills and knowledge that could be readily applied on-the-job, with the purpose of working safely and reducing the chance of work-related injuries or illnesses. The projected outcome could produce possible short-term results (described earlier in the measurement of frequency, severity and leading indicators), but longer-term results could better evaluate the conditions and behaviors displayed by the students, and whether they were influenced positively or adversely by the training received. Reports by students to the post-class survey indicated a positive impression, in terms of interpreting the perceived value of the training or certificates earned.

Two of the students commented on their post-class surveys that they used the first aid skills learned in the period following the conclusion of the program. One student reported assisting a co-worker, and another stopped at the scene of an accident to provide first aid. The achievement of a single strategy employed in the class could be summarized, at least in the short-term, as the practical efforts and application of 'life skills', such as hazard recognition, fire safety and first aid, knowledge that could be used in situations to benefit the students and others in their work and personal lives.

Other Conclusions or Observations

Overall, the students appeared willing to participate in the study, especially as the training progressed. Improvements in scores and participation increased from the first day to the last. Reasons for the increased participation may have included gaining familiarity with the other students and the instructors, encouragement and reinforcement for participation, and interest in the skills presented. Many of the concepts were conducted in an open, positive setting, offering the students opportunities to provide their input.

Working together on class activities may have led to a greater willingness to participate without worrying about perceived peer-pressure or negative consequences. Additionally, while some students left test or skills assessment questions unanswered, all 18 completed the pre-class survey, and participated in the various class activities held during the week.

There was also willingness from the students to participate in the field study following conclusion of the class. The post-class survey was sent out at one and two month intervals, in attempts to obtain feedback from as many of the 18 students who completed the course as possible. A total of 15 out of the 18 students responded to one of the surveys.

Other conclusions or observations can be suggested based on the information received from the students from the instruments applied and the data analyzed. Several points are listed, and descriptions of the reasons or explanations follow each item.

1. Lower than expected pre-test and pre-class skills assessment scores received. The pre-test and pre-class skills assessments were presented on the first day of the safety training. Instructions were given verbally to the students, describing the instruments and the emphasis on the collection of data for the research study. Participants were encouraged to attempt all questions and stations, despite not necessarily having the experience or knowledge. Even with these instructions, several of the students replied with either missing or incomplete answers. Four of the students received scores of zero on their pre-tests, and three did not earn any credit on their pre-class skills assessments. The reasons may have consisted of the following:

2. Language or reading difficulties. A number of the students possessed English as a second language skill. Their levels of reading or comprehension were not known or assessed

prior to beginning the class. While general instructions for completing the instruments were given verbally, directions for completing the individual questions or stations were provided in writing. Perceived or actual deficiencies in understanding the instructions may have posed obstacles for certain students, and resulted in reduced scores or efforts.

3. Peer-based or individual attitudes. The students enrolled in the Manufacturing Academy were either self-selected, or chosen by their respective guidance counselors to attend the training. There were no implicit expectations for performance, other than attending the sessions. Grades were not given, and the same pay rate was given to all participants, regardless of performance.

Knowing these aspects may have resulted in certain students adopting a passive rather than active effort in the class. The original intent of the lead safety instructor was to conduct a safety orientation on the first day of the academy, but this was cancelled. Providing an overview of the class along with explaining the content and expected outcomes may have produced a greater individual and class effort, at least in completing the pre-tests and pre-class skills assessments.

4. Other related factors. Some students may have experienced test anxiety, even though reassurance was given that test scores would not influence their success in the class. Lack of effort on group or team work may also have been influenced by some of the participants due to a possible reluctance in working with others on the assigned activities. One other factor to consider was the interest level of students to the content area. The instructors attempted to generate motivation and interest in the course through the class activities, exercises and content delivery. However, the limited interaction spent with the students reduced the building of relationships and gaining familiarity and interest in the subjects.

5. Time constraints. As mentioned, the 28 hours planned for the safety training varied from the actual delivery time of 20 hours. Appendix A illustrates the proposed hours that were initially prepared to accommodate the time required for presenting the concepts and allowing the students to demonstrate the competencies learned.

The actual content and hours dedicated to the safety training are displayed in Appendix A. The reduction of time from the plan impacted upon both the content of the class and level of comprehension to the topics presented. Two outside field trips not previously scheduled at the start of the activity overrode the safety training on day four (June 26, 2008), reducing the time available by six hours. The other two 'missing' hours were from the safety orientation planned for the first day of the Manufacturing Academy, June 16, 2008.

While several of the subjects were addressed during the class, the elimination of eight hours from the program caused an abbreviation and constriction of the course material. Tables 12 and 13, presented in Chapter III, showed the impact of the reduced time on the overall course. Table 69 also referenced the reduced time by hours and dates.

The inability to provide for the full allocation of time and effort may have resulted in lower scores on the tests and skills assessments. For example, there were eight questions on the pre-test in which no credit was earned by anyone. Five of the same questions remained incorrect or unanswered on the post-test. The results of the scores are displayed on Table 84.

Table 84

Comparing Unanswered or Incorrect Pre-Test and Post-Test Questions

Item number	Subject area	Pre-test	Post-test
6	Fall protection	No	Yes
9	OSHA compliance	No	Yes
11	Hearing protection	No	No
12	Ladder safety	No	Yes
13	General safety	No	No
14	Electrical safety	No	No
17	Confined space entry	No	No
20	Confined space entry	No	No

Of the 20 questions, five, or 25% were not answered correctly by any of the students on either the pre or post-tests. The areas planned but not addressed included hearing protection, electrical safety and confined space entry. A similar analysis can be made comparing the results of the pre and post-class skills assessments, to determine areas in which the students did not earn credit. Table 85 draws comparisons across the two instruments, in which no credit was earned by any student on either one or both assessment.

Table 85

Comparing Unanswered or Incorrect Responses on Pre and Post-Skills Assessments

Item number	Subject area	Pre-class assessment	Post-class assessment
4	Fall protection	No	No
5	Respiratory protection	No	No
7	Hearing protection	No	No
9	Ladder safety	No	No
11	Forklift safety	No	No
12	Emergency eye wash	No	No
13	Safe lifting	No	No
15	Ladder safety	No	No
16	Providing feedback	No	Yes
17	PPE	No	Yes

Of the 20 stations presented, eight, or 40% were incorrectly answered or not responded to on either the pre or the post-class skills assessments. Similar to the pre and post-tests, the topics of hearing protection and ladder safety were not addressed by the participants. Other subjects, such as safe lifting and fall protection, were initially planned for review, but eliminated due to the time restrictions.

Interpreter error was considered by the instructor when scoring the instruments, in cases where no credit was earned. The inclusion of independent criteria for scoring and evaluating performance tended to reduce this error potential. The decision to present topics in which the students could earn independent certification (the Red Cross First Aid/CPR training, and fire safety) promoted those topics. If time permitted, the topics skipped due to time constraints would have allowed the students to earn the OSHA 10-hour course completion card.

The content of the program was modified, based on adjustments made that reduced the available time for presenting the safety topics that were discussed. One example was eliminating a series of exercises planned for day four (June 26, 2008), which would have allowed the students to practice and demonstrate a number of the items on the skills assessments. Team exercises were planned based around performing job safety analyses to demonstrate correct application of the subject areas. Examples of topics removed due to the time limitations included defensive driving, safe lifting, and the correct use of hand tools.

6. Depth of the subject and content area. Perhaps the decision to approach the course as a broad-based overview of safety and health was too ambitious. Whether individual or group performance could have been improved with the addition of the eight hours that was left out of the class may be addressed in a future study. The intent of the program was to present a cross-section of topics considered pertinent or applicable to the students for entry-level employment.

As such, much of the content discussed revolved around the types of situations and conditions in which injuries occurred to entry-level, young workers. The objective was also to present subjects that would likely be reinforced by employers though safety orientations or other on-the-job training. Adjusting the depth and scope of the training and focusing on selected topics, for example, fall protection, may have improved recognition and retention of the core subjects presented.

Recommendations Related to This Study

Several recommendations could be made to improve the statistical relevance for this field study. The application of these proposed efforts may have improved the reliability and validity of the results received, and increased the benefit to the students participating in the course. The recommendations are listed and discussed individually.

1. Better communications and instructions from the instructors for completing the instruments used in the field study.

This aspect has been addressed in the study in terms of inconclusive answers or replies received on the test and assessment instruments. Explicit written and verbal communications given to the students in advance of the instruments may have increased the readiness and willingness for giving responses, especially if delivered prior to their attending the class. This was one of the objectives going into the program, where an orientation to the course would have been presented on the first day of the Manufacturing Academy, when students were assembled in an auditorium, awaiting assignment to one of the manufacturing labs in the campus.

Note for clarification: The 2008 Manufacturing Academy was held from June 16th to June 27th, 2008. During the first week, (June 16 – 19th), students rotated through three manufacturing programs, and participated in a variety of classroom and outside activities. The safety training was conducted during the second week of the program, (June 23 – 27th). Sharing time along with the safety training were non-safety related field trips and other classroom instruction. The orientation for day one, June 16th, was never held, as instead of a welcoming introduction, students were assigned to one of the manufacturing labs, and the program introductions were conducted separately. This change in planning precluded the safety orientation that was scheduled for that initial day.

Another option may have been to provide an instruction or orientation sheet to prospective students at their home schools, describing the program and field study. The information could also have been sent to parents or guardians, to elicit support for the program or answer questions. In this manner, a greater understanding of the process and project may have occurred, leading to increased participation on the tests and assessments.

One other aspect may be presented for discussion. Difficulties in reading or understanding written or verbal instructions may have prevented full comprehension from selected students, particularly those whose primary language was other than English. Providing bi-lingual instructions may have encouraged a greater understanding of the program, and in turn, an improved degree of participation.

2. Coordinate the allocation of time dedicated to the topics and content area to allow proper practice, repetition and retention of skills.

All instruments were delivered with open time frames. The instruments were collected when all students were completed with the activities. With the exception of the post-class survey, there were no parameters given for approximating the time estimated or required to complete the instruments. Defining or allocating time per each item or instrument may have better framed the expectations from the students for completing the activities. It was not evaluated whether peer-pressure contributed to some students hurrying through selected questions on the tests or assessments, avoiding possible perceived embarrassment at not knowing the correct answers. Providing coaching or assisting students with completing the questions on these instruments may have better facilitated collecting relevant data for the study.

One other issue relating to the time allocation for the field study involved the presentation of the instruments themselves. With the exception of the post-class survey, the other five instruments were integrated into the safety training during class time. The length of time required to introduce the items, discuss how they would be implemented, and collect the data, may have detracted from the actual instructional time. For example, if the pre-class survey could have been distributed prior to the start of the class, the time could have instead been redirected to teaching course content. The ability of the students to complete the survey outside of the class, on their own, may also have improved the quality of the results. Furthermore, an explanation sheet or outline of the class may have increased interest from school officials, students, and parents and worked to improve the overall effectiveness of the program.

3. Provide assistance in coordinating the assigned stations on the pre and post-class skills assessments.

During the pre-class skills assessment, students were assigned to the stations and asked to complete them one at a time. They revolved through the various stations, conducting the tasks alone or with a partner. Written directions were provided for each station, asking for completion of the task or activity described. However, the students were largely left on their own to figure out and complete the tasks.

The instructor rotated among the stations, providing clarification and assistance, but with 20 stations and 18 students, there was not ample time to address individual concerns or provide adequate assistance. The ability to allocate additional resources to assist the students, or restructuring the format of the assessment, may have improved the scores and level of completion on the stations.

4. Conduct the post-skills assessment similarly to the pre-class skills assessment.

When comparing results obtained from the post-class skills assessment to scores received in the pre-class instrument, differences in administering the process may have led to unbalanced results and data. The post-class skills assessment was conducted as a class activity due to time limitations. The plan had been to conduct both assessments similarly, seeking improved scores and competencies from the post-class version. However, this was not consummated.

The decision was made to conduct a post-class assessment, rather than skip the activity, in order to at least seek some semblance of competency or improvement, even if it was measured as a group rather than an individual activity. For future studies, the goal would be to have both the pre and post-class skills assessments conducted in the same manner, with the same individuals or teams assigned to each of the stations.

5. Recruit students with the aptitude and interest for participating in the class.

Students attended the 2008 Manufacturing Academy based either on individual interests, advice from school guidance counselors, or from talking with students who attended the 2007 session (one student attended both the 2007 and 2008 programs). Though not specifically asked, most of the students entered the program without any expectations or interest in either manufacturing or safety. The inducement of earning a stipend and receiving high school credit provided the motivation for most to attend. The study may have benefited from screening or interviewing students at their respective high schools, selecting those who showed an interest or ambition in learning about safety and/or manufacturing.

6. Improve communications with area schools for selecting students for the program.

This point aligns with the previous recommendation. School counselors learned about the Manufacturing Academy either from mailings from the state sponsoring agency, or from the technical college. As noted, some of the students attended the 2008 program based on feedback received from 2007 participants. On-site meetings with school staff, explaining the merits and benefits of the program, may have encouraged greater communication to prospective and interested students.

7. Construct instruments to allow for full completion of all items.

This recommendation aligns with the second point, which described the importance of providing adequate time for completing the activities. Rather than focusing on the time elements, construction of the activities to allow for greater understanding and completion rates may have improved the overall outcome.

8. Conduct additional post-class surveys to gain longer-term data.

The initial plan for the study was to collect post-class surveys at intervals of one, two, and three months following conclusion of the program. The program ended June 27, 2008, and the plan called for post-class surveys to be sent out in July, August and September 2008. After reviewing the logistical and statistical coordination of the study, the plan was adjusted down to two post-class surveys, one to be sent in July and one in August.

The first post-class survey was sent out in July, but with a limited return, so a second, similar survey was mailed in August. One recommendation to expedite the process would be to send surveys electronically, verses through postal mail. This was indeed considered, but standard mail was chosen because not all students had access to email accounts. (Note – in addition to receiving replies returned by mail, other methods included visiting student employers and asking some members of the class to contact others to remind them to complete and return their surveys).

Besides using electronic mail, the surveys may have been distributed on-line or via other computerized or virtual methods. One other means for improving the survey return rates may have been working with the home high schools or parents for communications and support.

Receiving two sets of data post-class may also have increased the ability to report on the skills learned and address more fully, the research questions posed in the study.

9. Ask for input from school officials and students for addressing topics during the class.

The students entered the Manufacturing Academy with little information pertaining to the course content. An outline was prepared prior to the class, with specific objectives and competencies planned (regardless of the context to the field study). Communicating the information explaining the content and objectives of the program to school staff and students may have allowed for adjustments to be made in the course and delivery methods.

The subjects taught in the course were identified, correlating to the leading causes of injuries and illnesses to young workers. Other concepts were chosen based on primary or core principles of occupational safety and health. This doesn't mean that the topics were necessarily of interest or perceived relevance to the students attending the program. Seeking input or ideas from the participants may have contributed to greater personal involvement or perhaps an increased enrollment in the program.

10. Seek partnerships and participation in the class from local employers who can provide entry-level employment to students once the course concludes.

The students earned credit, wages, and certificates for attending the program. Some were also employed prior to attending the class. One recommendation for improving attendance or participation in the program would be to forge partnerships with local employers, explaining the benefits of the program to the prospective companies, and soliciting possible employment opportunities for individuals who successfully completed the program.

This could act in a similar fashion to a career and technical education program, where student progress is monitored by faculty and employers to guide the students in learning sound work principles and ethics. While employment could not necessarily be awarded to all participants, discussions with local employers outlining the skills and concepts presented during the program could generate interest and perhaps gainful employment opportunities.

The above 10 points served as recommendations which may have led to improvements in the facilitation of the class and field study. Observations on recommendations for further study and evaluation appear below.

Recommendations for Further Study

A number of recommendations relating to improving data and relevance may be suggested for further study. A list of items and recommendations are provided in the following section.

1. Construct a curriculum addressing the primary injuries and illnesses affecting young workers.

The intent of the field study was to present instruction on identifying the primary causes of work-related injuries and deaths affecting young workers. Much of the instruction addressed these issues and provided information for recognizing potential hazards and preventing the resulting incidents from occurring. However, there were a number of areas not presented, with the leading example being safe driving principles.

A number of the curricula reviewed in Chapter II concentrated on presenting skills relating to common regulatory and compliance areas in safety and health. The intent of this field study was not to present an all-inclusive safety program. Instead, a primary objective was to deliver practical information that could be applied by participants to develop safe work habits.

Future studies could explore both a greater depth and breadth of topics relating to the risks and hazards affecting young workers. Data collected could also evaluate the effectiveness of certain strategies and techniques towards developing safe work attitudes and practices. A longitudinal study could also assess if habits adopted early on in a person's career could carry over into adulthood and continue to be applied. Research could evaluate the results obtained based on frequency, severity or other performance indicators.

2. Address obstacles to learning and motivation, such as risk-taking behaviors.

One area in which greater research could be evaluated would be the prevalence of risk-taking behavior and the degree at which this type of behavior leads to injuries and illnesses. This involves a psychological component and may include other methods of observing and evaluating behaviors.

A number of safety-related concepts were presented during the 2008 Manufacturing Academy. Practical application of the skills and knowledge was assessed. Because of the compacted time period, repetition and retention of the skills was not often performed. Future studies could measure the effects of independent variables on risk-taking behaviors, such as decisions, consequences, and rewards. Interventions or interactions that recognize the risks and consequences (injuries and losses) associated with choosing these behaviors may lead to considering or adopting safer alternatives.

3. Offer incentives to students for registering and enrolling in the course. One example may be reductions in car insurance premiums for successful completion.

In addition to the incentives received by the students, other benefits could be provided to encourage participation in a safety training course. One possibility would be rewarding participants who successfully completed the program with a reduction in their vehicle insurance rates. In this case, the content would need to focus on the core areas identified (such as safe driving practices). If results proved successful, similar programs could be offered to adults or through companies.

4. Offer incentives to school districts for offering a safety and health module to their students.

This could be conducted a stand-alone class, or supported through a grant or other reimbursed expense. In order to gain greater support and contribution from the participating school districts, incentives could be provided in the form of financial reimbursements. A grant that supported school districts and paid the fees for students to attend the program could help gain increased recognition and publicity, leading possibly to additional programs.

5. Promote and offer high-school safety training to teachers at participating districts.

The training modules could be conducted on-line, or through train-the-trainer courses. This increase in the number of classes could better prepare students for entry-level employment. Model school safety programs are available to school districts and faculty members. Similar to the previous recommendation, providing a subsidy to the schools to allow training for their faculty could gain recognition for conducting a dedicated safety training class or module.

6. Offer educational incentives such as high school and college credit to students who complete a safety and health course.

Students from both the 2007 and 2008 Manufacturing Academies earned high school credit for successfully completing the program. Possible college credit could also be earned and applied to interested students who successfully met established criteria.

7. Offer employers incentives for student workers who they hire.

Benefits could include reimbursement to offset costs for hiring or preparing workers to begin employment, or other cost reductions. A job fair or other event could be held to promote openings to applicants and also demonstrate the benefits to employers of hiring students who completed the course. The benefits could include improved work habits, less introductory training required, and less risk to employees of experiencing a workplace incident.

8. Conduct a longitudinal study measuring a larger pool and population of participants.

Goals could include determining if baseline training and concepts learned could be applied on-the-job over a period of time and possibly, across a range of employment. The goal would be establish positive and safe work habits which would benefit participants on and off-the-job. Other aspects that could be evaluated include measuring the impact of high school safety classes on employee performance, the interaction of high school and extra-curricular training (such as the Manufacturing Academy), and comparing the relationship between students receiving high school and on-the-job training and their resulting safety performance.

9. Involve parents and community members of participants in the class.

This would apply especially to students under age 18, as selected for this study. Future studies could collect information from parents as to what topics they were interested in seeing their children learn, and evaluate off-work aspects of performance and safety as well as employment-based or occupational content and skills. Likewise, seeking input and feedback from the community could assist in identifying issues relevant to its members.

10. Address age-related or generational factors which could negatively impact upon the safety and health of participants.

One aspect to study would be the issue of risk-taking behaviors (in adolescents), and the degree at which the behavior is manifested through exposure to hazards and accidents. Other issues could include studying differences in variables between current young workers, comparing data and results from past studies conducted on young workers from other periods.

11. Determine the level or degree at which safety training intervention at the high school level builds positive or safe work habits, and reduces the frequency and severity of work-related losses.

Information presented in Chapter II evaluated a number of school-based safety programs, content areas and skills presented. Future studies could interpret the results from school-based programs on performance and behavior, measuring variables such as accident or injury rates from participants compared with the general population. The degree at which participants are prepared to work safely could be construed and applied to promote general safe work habits.

12. Evaluate the ability for safety training to improve general, non-safety-related work habits, such as reducing turnover, absences, and increasing personal and organizational effectiveness.

A larger research study could evaluate the effectiveness of developing fundamental safe work practices and the role at promoting these principles. Teaching young workers skills to recognize hazards and reduce their risk of exposure and subsequent loss can translate to adopting other positive habits, such as punctuality and leadership capabilities. Assessing how safety principles can contribute to personal and organizational effectiveness may lead to the safety concepts receiving greater support in the partnering of decision-making and resource sharing.

The goal of this field study was to present and evaluate the effectiveness of skills and competencies applied in a condensed program, and the degree to which the application of these skills could transfer to the job setting. Attempts were made to answer the research questions posed. Future studies may pursue these questions, as well as identify other areas in which individual safety and health can be assessed and assured through promotion and employment of lifelong fundamental practices in safety and health.

References

American Red Cross. (2007). *Safety in the workplace, participant workbook.* Washington, D.C.

Banks, E. (2008, September 7). *A turn for the worst: Questions arise amid rash of teen driving deaths.* Leader Telegram, p. 1A, 10A.

Berg, S. (n.d.). *Sound Advice–protect your ears in noisy work environm*ents. Retrieved November 23, 2008, from http://www.cdc.gov/niosh/topics/noise/abouthlp/soundadvice.html

Breslin, F. C. (2008, March-April). Educational status and injury among young people: Refining the targeting of prevention resources. *Canadian Journal of Public Health,* 99(2), 121-124.

Cable, J. (2005, November). Generational Y safety – the challenge of reaching the under 30 worker. *Occupational Hazards,* 67(11), 21-22.

Canadian Centre for Occupational Health and Safety and Health. (2007, March 7). *OSH answers: Back injury prevention.* Retrieved November 28, 2008, from http://www.ccohs.ca/oshanswers/ergonomics/inj_prev.html

Canadian Centre for Occupational Safety and Health. (2008, May). Protecting our young. *The Health and Safety Report.* 6 (5). Retrieved May 25, 2008, from www.ccohs.ca/newsletters/hsreport/issues/2008/05/ezine.html

ChicagoJack. (2008). *Donning instructions for putting on a FallTech full body harness.* Retrieved November 27, 2008, from http://www.chicagojack.com/harness.pdf

Children's Safety Network. (2008). *Injury prevention information.* Retrieved July 5, 2008, from www.childrenssafetynetwork.org/injury_prevention/default.asp

Chippewa Falls Senior High School. (2006, September). *Course planning guide 2006 – 2007.* Retrieved July 5, 2008, from http://64.233.167.104/search?q=cache:_LQmCsClITEJ:chihi.chipfalls.k12.wi.us/ StudentServices/pdf/2006-2007.pdf+safety+courses&hl=en&ct=clnk&cd=2&gl=us

Chippewa Valley Technical College. (2008). *Illustration 1 map source.* Retrieved July 5, 2008, from www.cvtc.edu/pages/1.asp

Coastal Training Technologies Corporation. (Producer). (2004). Food for thought [video recording]. Virginia Beach, VA.

Cohen, A. & Colligan, M. (June 1998*). Assessing occupational safety and health training – a literature review.* Retrieved October 20, 2008, from http://www.cdc.gov/niosh/pdfs/98-145.pdf

Committee on the Health and Safety Implications of Child Labor. (1998). *Protecting youth at work: Health, safety, and development of working children and adolescents in the United States*. Retrieved July 22, 2008, from www.nap.edu/catalog.php?record_id=6019

ConAgra Foods, Inc. (2007, August). *New employee orientation program model.* Company safety manual developed by Steven Senor for the Menomonie, Wisconsin facility

Dieleman, M. & Harnmeijer, J. (2006, September). *Improving health worker performance: In search of promising practices*. Retrieved September 14, 2008, from http://www.who.int/entity/hrh/resources/improving_hw_performance.pdf.

Eau Claire Area School District. (2008, July). *Course offerings for middle and high schools.* Retrieved July 4, 2008, from www.ecasd.k12.wi.us/departments/ci/IS_ webpage/Secondary_ Resources/Course Offerings/index.htm

Eau Claire Area School District. (2008, July). *Work-based learning programs.* Retrieved July 4, 2008, from www.ecasd.k12.wi.us/departments/ci/IS_ webpage/Secondary_Resources/Course_Offerings/High_School/Work%20 Based%20Learning%20Sequence.pdf

Ezell, C. (n.d.). *A paradigm shift towards progress at NSMS.* The National Safety Management Society. Retrieved November 23, 2008, from http://www.nsms.us/pages/paradigm.html

Gunter, R.E. (2007, March). Checking safety in technology education. *The Technology Teacher.* 66(6), 6-7.

Idaho State University. (2008). *Fundamentals of accident reduction.* Part 5.3. Retrieved July 26, 2008, from www.isu.edu/departments/pubsafe/manuals/safety/5prevent.html

Lee, H. (2006, September). *Affective measurement.* PowerPoint slide presentation (Slide #5). Presented at University of Wisconsin-Stout. Instructional Evaluation for Career and Technical Education.

Lee, H. (2006, September). *Competency based instruction.* PowerPoint slide presentation (Slides # 1, 3). Presented at University of Wisconsin-Stout. Instructional Evaluation for Career and Technical Education.

Lee, H. (2006, October). *Recall–recognition test items.* PowerPoint slide presentation (Slide # 2). Presented at University of Wisconsin-Stout. Instructional Evaluation for Career and Technical Education.

Manitoba Labour and Immigration Workplace Safety and Health Division. (2008, July). *Young worker safety & education initiative.* Retrieved July 5, 2008, from http://www.gov.mb.ca/labour/safety/youth/index.html

Manufacturing Skills Standards Council. (2006, June). *Course overview and introduction to the manufacturing skills standards council training program*. Retrieved July 18, 2008, from www.msscusa.org/downloads/training2.pdf

Maryland Department of Labor, Licensing & Regulation. (2008, June). *Employment of minors (work permits).* Retrieved April 30, 2008, from www.dllr.state.md.us/labor/empm.html

Massachusetts Department of Public Health and Children's Safety Network Education Development Center, Inc. (2002). *Safe work/safe workers*. Retrieved July 6, 2008, from www.youngworkers.org/downloads/pdf/sworktoc.pdf

McWhirter, J. (2008, January). *A review of safety education: Principles for effective practice*. Retrieved November 19, 2008, from www.rospa.com/index.htm www.pshe-association.org.uk/PDF/A%20review%20of%20safety%20education-report.pdf

Miara, C., Gallagher, S., Bush, D., Dewey, D. (2003, September-October). Developing an effective tool for teaching teens about workplace safety. *American Journal of Health Education*, 34(5), Slides 30-32.

Motulsky, H. (1999). *Analyzing data with GraphPad Prism*. Retrieved December 14, 2008, from www.graphpad.com/articles/AnalyzingData.pdf

National Center for Chronic Disease Prevention and Health Promotion. (2008, September 24). *Healthy youth! Coordinated school health programs*. Retrieved July 4, 2008, from www.cdc.gov/healthyyouth/cshp/

National Fire Protection Association. (2004, February 11). *Standard for electrical safety in the workplace, #70E*. Retrieved November 25, 2008, from http://www.nfpa.org/freecodes/free_access_document.asp?id=70E04

National Institute for Occupational Safety and Health. (1999). *Promoting safe work for young workers*. Retrieved July 5, 2008, from www.cdc.gov/niosh/99-141.html#contents

National Institute for Occupational Safety and Health. (2003, July). *Preventing deaths, injuries and illnesses of young workers*. Retrieved May 5, 2008, from www.cdc.gov/niosh/docs/2003-128/2003128.htm

National Institute for Occupational Safety and Health. (2004). *Safety checklist program for schools*. Retrieved July 6, 2008, from www.cdc.gov/niosh/docs/2004-101/contents.html

National Institute for Occupational Safety and Health. (2005, May). *Working together for safety-a state team approach to preventing occupational injuries in young people.* Retrieved July 30, 2008, from www.cdc.gov/niosh/docs/2005-134/2005-134d.html

National Institute for Occupational Safety and Health. (2007). *Youth @ Work, talking safety*. Wisconsin edition. Retrieved May 18, 2008, from www.cdc.gov/niosh/talkingsafety/states/wi/entireWI.pdf

National Institute for Occupational Safety and Health. (2008, November). *Bloodborne infectious diseases HIV/AIDS, Hepatitis B Virus, and Hepatitis C Virus*. Retrieved November 23, 2008, from http://www.cdc.gov/niosh/topics/bbp/

National Oceanic and Atmospheric Administration. (n.d.). *Heat stress*. Retrieved November 28, 2008, from http://www.sefsc.noaa.gov/HTMLdocs/heatstress.htm

National Safety Council. (2006). *American workers' safety concerns don't reflect reality.* Retrieved December 12, 2008, from http://www.nsc.org/resources/issues/american_worker_survey.aspx

National Safety Council. (2008). *Off the job safety. Impact of off-the-job injuries and deaths*. Retrieved July 15, 2008, from www.nsc.org/resources/issues/offthejob.aspx

National Young Worker Safety Resource Center. (2005, December 1). *Health and safety training for young workers, how do we really make this work*? Retrieved July 5, 2008, from http://notes.edc.org/HHD/CSN/csnpubs.nsf/cb5858598bf707d58525686d005ec222/77d6665b7484e6b38525714c007db524/$FILE/Health%20and%20safety%20training%20for%20young%20workers%20How%20do%20we%20really%20make%20this%20work.pdf

Occupational Health & Safety. (2007, July 23). *High school students graduate with OSHA 10 hour card.* Retrieved May 18, 2008, from http://ohsonline.com/Articles/2007/07/High-School-Students-Graduate-with-OSHA-10Hour-Card.aspx

Paradise, A. (2008). *Learning influences engagement*. Learning Executive, 1(1).

Postma, J. (2006, April). Addressing occupational health and safety issues among special populations: An innovative and strategic approach. *American Association of Occupational Health Nurses Journal*, 54(4), 145.

Ramsay, J., and Sorrell, E. (2006). Problem-based learning: a novel approach to teaching safety, health and environmental courses. *Journal of SH&E Research*. Retrieved December 2, 2008, from http://www.asse.org/academicsjournal/archive/vol3no2/06summer_ramsay.pdf

Royal Society for the prevention of accidents. (2008, January). *A review of safety education principles for effective practice*. Retrieved date, from www.rospa.com/index.htm

Safetec of America. (2008). *EZ Cleans Plus Kit*. Retrieved November 28, 2008, from http://www.safetec.com/webmodules/catCatalog/dtl_Product.aspx?ID=24

San Diego State University. (2006, December). *New employee safety orientation training checklist*. Retrieved July 5, 2008, from http://as.sdsu.edu/admin/forms/pdf/GENERALUSE/safety_checklist.pdf

Schulte, P., Stephenson, C., Okun, A., Biddle, A. (2005, March). Integrating occupational safety and health into vocational and technical education and other workforce preparation programs. *American Journal of Public Health*, 95(5), 406-407.

Science Blogs LLC. (2007, April 7). *Effect Measure Forum. Putting a mask on wrong.* Retrieved November 27, 2008, from http://scienceblogs.com/effectmeasure/2007/04/putting_a_mask_on_wrong.php

Senor, S. (2005, August). *Safety vision*. Chippewa Valley Technical College. Manufacturing Academy, June 2008.

Senor. S. (2006, May). *Ladder inspection checklist*. Chippewa Valley Technical College. Manufacturing Academy, June, 2008.

Senor. S. (2006, September). *JSA for opening a box with a utility knife*. Chippewa Valley Technical College. Manufacturing Academy, June, 2008.

Senor. S. (2006, November). *Putting on and taking off a fall protection harness*. Chippewa Valley Technical College. Manufacturing Academy, June, 2008.

Senor. S. (2007, March). *Emergency map exercise*. Chippewa Valley Technical College. Manufacturing Academy, June, 2008.

Senor. S. (2007, June). *Us and them*. PowerPoint slide presentation. (Slides #15 and 16). Chippewa Valley Technical College. Manufacturing Academy, June, 2008.

Senor. S. (2007, November). *Forklift inspection form.* Chippewa Valley Technical College. Manufacturing Academy, June, 2008.

Senor. S. (2007, December). *Emergency equipment checklist.* Chippewa Valley Technical College. Manufacturing Academy, June, 2008.

Senor. S. (2008, April). *Ladder safety.* PowerPoint slide presentation. (Slides #3, 6, 8, and 18). Chippewa Valley Technical College. Manufacturing Academy, June, 2008.

Senor. S. (2008, October). *Dust mask coaching exercise.* Chippewa Valley Technical College. Manufacturing Academy, June, 2008.

Statistical Package for Social Sciences (SPSS) Program. (n.d.). *SPSS statistics.* Retrieved October 19, 2008, from http://www.spss.com/statistics/

Stolovitch, H. D. (2001). Learning and performance Solutions: Human performance technology: research and theory to practice. *Performance Newsletter*, Summer/Fall 2001. Retrieved July 20, 2008, from www.hsa-lps.com/Performance_SF_2001.

Taylor, J. (2006). *Curriculum and instruction.* PowerPoint slide presentation. Presented at University of Wisconsin-Stout. Instructional Evaluation for Career and Technical Education.

Texas Department of Insurance, Division of Workers' Compensation. (2006, September). T*eens working in food service*. Retrieved May 12, 2008, from www.tdi.state.tx.us/pubs/videoresource/tgteenfoodsvc.pdf

Texas Engineering Extension Service. (2003). *CareerSafe online youth safety whit*e *paper.* Retrieved July 4, 2008, from www.careersafeonline.com/documents/CSwhitepaper2.pdf

The Acronym Finder. (2008, November). *What does RACE stand for?* Retrieved November 23, 2008, from http://www.acronymfinder.com/Rescue%2c-Activate-alarm%2c-Confine-the-fire%2c-Evacuate%2fExtinguish-(NFPA%2fOSHA-fire-safety)-(RACE).html

U.S. Department of Labor. (2008). *E-laws Fair Labor Standards Act Advisor.* Prohibited occupations for non-agricultural employees. Retrieved May 27, 2008, from www.dol.gov/elaws/esa/flsa/docs/haznonag.asp

U.S. Department of Labor Bureau of Labor Statistics. (2000). *The report on the youth labor force: Occupational injuries, illnesses, and fatalities.* Chapter 1. [Data file].

U.S. Department of Labor Bureau of Labor Statistics. (2000). *The report on the youth labor force: Occupational injuries, illnesses, and fatalities.* Chapter 6. [Data file]

U.S. Department of Labor Bureau of Labor Statistics. (2004). *Census of fatal occupational injuries.* PowerPoint slide presentation. (Slides #14, 15). West High School Technical Education.

U.S. Department of Labor Bureau of Labor Statistics. (2006). *1992 – 2006 Census of fatal occupational injuries (COFI)- current and revised data.* Retrieved May 8, 2008, from www.bls.gov/iif/oshcfoi1.htm#2006

U.S. Department of Labor Bureau of Labor Statistics. (2006). *Injuries, illnesses and fatalities.* [Data file]. Retrieved May 2, 2008, from www.bls.gov/iif/oshsum.htm

U.S. Department of Labor Occupational Safety and Health Administration. (n.d.). *OSH Act of 1970*, Section 5. duties. Retrieved July 5, 2008, from www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=OSHACT&p_id=3359

U.S. Department of Labor Occupational Safety and Health Administration. (1973, January 14). *Permit-required confined spaces.-1910.146*. Retrieved November 25, 2008, from http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9797

U.S. Department of Labor Occupational Safety and Health Administration. (1974, June 27). *Guarding floor and wall openings and holes.-1910.23*. Retrieved November 23, 2008, from http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9715

U.S. Department of Labor Occupational Safety and Health Administration. (1975, May 28). *Powered industrial trucks.-1910.178*.Retrieved November 25, 2008, from http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9828

U.S. Department of Labor Occupational Safety and Health Administration. (1978, October 24). *Portable wood ladders.-1910.25*. Retrieved November 23, 2008, from http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9717

U.S. Department of Labor Occupational Safety and Health Administration. (1981, January 16). *General requirements.-1910.303, electrical.* Retrieved November 23, 2008, from http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9880

U.S. Department of Labor Occupational Safety and Health Administration. (1986). *Material safety data sheet – OSHA 174*. Retrieved November 23, 2008, from http://www.osha.gov/dsg/hazcom/msds-osha174/msdsform.html

U.S. Department of Labor Occupational Safety and Health Administration. (1986, February 21). *Clarification of competent and qualified person, as it relates to subpart P*. Retrieved August 1, 2008, from http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=19389

U.S. Department of Labor Occupational Safety and Health Administration. (1994, April 6). *Non-mandatory compliance guidelines for hazard assessment and personal protective equipment selection.-1910*. Retrieved November 28, 2008, from http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table= STANDARDS&p_id=10120

U.S. Department of Labor Occupational Safety and Health Administration. (1994, November 4). *Permit required confined spaces*. Section III. Summary and explanation of the standard. Preamble to final rule. Retrieved August 4, 2008, from www.osha.gov/pls/oshaweb/owadisp.show_document?p_table= PREAMBLES&p_id=840

U.S. Department of Labor Occupational Safety and Health Administration. (1995, January 26). *Duty to have fall protection.-1926.501*. Retrieved November 23, 2008, from http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10757

U.S. Department of Labor Occupational Safety and Health Administration. (2006, October 14). *Chippewa Valley Technical College joins OSHA in alliance agreement.* OSHA Regional News Release, Region 5.Retrieved May 25, 2008, from www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=NEWS_ RELEASES&p_id=12681

U.S. Department of Labor Occupational Safety and Health. (2007, July). *High school students graduate with OSHA 10 hour card.* Retrieved May 18, 2008, from www.ohsonline.com/print.aspx?aid=49293

U.S. Department of Labor Occupational Safety and Health Administration. (2007, August). *OSHA facts.* Retrieved May 26, 2008, from www.osha.gov/as/opa/oshafacts.html

U.S. Department of Labor Occupational Safety and Health Administration. (2008, February 11). *The regulation and related interpretations for recording and reporting occupational injuries and illnesses.* OSHA recordkeeping handbook. Retrieved December 26, 2008, from http://www.osha.gov/recordkeeping/handbook/index.html

U.S. Department of Labor Occupational Safety and Health Administration. (2008, May). *Teen summer jobs– safety pays.* Retrieved May 12, 2008, from www.osha.gov/SLTC/youth/summerjobs/index.html

U.S. Department of Labor Occupational Safety and Health Administration. (2008, May). *Teen worker safety in restaurants youth 2 work program.* Retrieved July 5, 2008, from www.osha.gov/SLTC/youth/restaurant/index.html

U.S. Department of Labor Occupational Safety and Health Administration. (2008, May). *Teen workers.* Retrieved May 7, 2008, from http://www.osha.gov/SLTC/teenworkers/teenworkers.html

U.S. Department of Labor Occupational Safety & Health Administration. (2008, June). *Young worker initiative. What does my state say?* Retrieved June 2, 2008, from http://www.osha.gov/SLTC/teenworkers/mystate.html

U.S. Department of Labor Occupational Safety and Health Administration. (2008, July). *OSHA fact sheet, outreach training program*. Retrieved April 20, 2008, from www.osha.gov/Publications/OSHA-factsheet-outreach-training.pdf

U.S. Department of Labor Occupational Safety and Health Administration. (2008, July). *Safety and health training, module 4*. Retrieved August 3, 2008, from www.osha.gov/SLTC/etools/safetyhealth/mod4_factsheets_training.html

U.S. Department of Labor Occupational Safety and Health Administration. (2008, September 29). *Personal protective equipment*. Retrieved November 23, 2008, from http://www.osha.gov/SLTC/personalprotectiveequipment/index.html

University of California Berkeley Labor Occupational Health Program. (2001). *Work safe! A curriculum for youth employment programs*. Retrieved July 6, 2008, from www.youngworkers.org/downloads/pdf/wsafetoc.pdf

University of California Berkeley Labor Occupational Health Program. (2004, September). *Keeping California's youth safe on the job*. Retrieved October 22, 2008, from www.youngworkers.org/downloads/pdf/2004Recommendations904.pdf

University of California Berkeley Labor Occupational Health Program. (2004, Fall). *Young worker safety resources.* Retrieved July 6, 2008, from www.youngworkers.org/downloads/pdf/Resources04.pdf

University of California Berkeley Labor Occupational Health Program. (2008, June). *The basics about young worker health and safety*. Retrieved July 5, 2008, from www.youngworkers.org/teens/index.html

University of California Berkeley Labor Occupational Health Program. (2008, June). *Why is job health and safety training important for teens?* PowerPoint slide presentation. (Slide #1). Retrieved July 6, 2008, from www.youngworkers.org/downloads/word/YWTRC%20Presentation.ppt

University of California Los Angeles Labor Occupational Safety and Health Program. (2008, July). *Healthy communities – healthy jobs.* Retrieved July 6, 2008, from www.losh.ucla.edu/youth/curricula.

University of Kentucky Environmental Health and Safety Department. (2006, July 5). *Proper technique for putting on and taking off gloves*. Retrieved November 27, 2008, from http://ehs.uky.edu/ohs/gloveuse.html

University of Rochester Laboratory for Laser Energetics. (2008, November 18). *The safety zone – fire safety.* Retrieved November 23, 2008, from http://safety.lle.rochester.edu/550_fire/550_fire.html

University of South Carolina Environmental Health and Safety. (2008). *Eye wash station operation poster*. Retrieved November 28, 2008, from ehs.sc.edu/Safety%20Sheets/Eyewash%20Station%20Operation%20Poster.doc

University of South Carolina Environmental Health and Safety. (2008). *Safety guide and profiling: Ear plugs*. Retrieved November 28, 2008, from http://ehs.sc.edu/modules/Noise/plugs.htm

University of Vermont Safety Listserv. (2008, July). Retrieved July 30, 2008, from http://list.uvm.edu/cgi-bin/wa?A0=SAFETY

University of Wisconsin-Stout Research Services. (2008, July). *Protocols for conducting research involving human subjects at UW-Stout.* Retrieved May 26, 2008, from www.uwstout.edu/rs/humansubjectsprotocol.shtml

Vicente, K. (2003). *The human factor, revolutionizing the way people live with technology*. New York: Routeledge.

WCBS. (Producer). (1988). *Plan to get out alive*. Videotape. New York, NY.

Weller, N., Kelder, S., Cooper, S., Basen-Engquist, K., Tortolero, S. (2003, Fall). School year employment among high school students – effects on academic, social and physical functioning. *Adolescence*, 38(151), 449.

West, C., De Castro, A., Fitzgerald, S., (2005, July). The youth work force: Unique occupational health considerations and challenges. *American Association of Occupational Health Nurses Journal*, 53(7) 298, 302.

West High School Technical Education. (n.d.). *Hazards in the workplace.* PowerPoint slide presentation. Presented at OSHA Safety and Health Seminar. September 17. 2008.

Wichita-Hutchinson Labor Federation of Central Kansas, AFL-CIO. (2008). *Teens @work what working teens-and their parents-should know about health and safety on the job*. Retrieved October 12, 2008, from http://www.ksworkbeat.org/TeensatWork_/teensatwork_.html

Windau, J., Sygnatur, E., & Toscano, G. (1999, June). *Profile of work injuries incurred by young workers*. Retrieved May 4, 2008, from www.bls.gov/opub/mlr/1999/06/art1full.pdf

Wisconsin Department of Public Instruction. (2008). *Curriculum instruction.* Retrieved June 30, 2008, from http://dpi.wi.gov/dae/tm-curricinstr.html

Wisconsin Department of Public Instruction. (2008). *Health education: A guide to curriculum planning in health education.* Retrieved July 4, 2008, from http://dpi.wi.gov/pubsales/health1a.html

Wisconsin Department of Workforce Development. (2008, June). *Manufacturing academy.* Retrieved June 29, 2008, from www.dwd.state.wi.us/

Wisconsin Technical College. (2008, May). *Geographic Map.* Retrieved May 25, 2008, from www.witechcolleges.com/map.htm

Workers' Compensation Board of British Columbia. (2007). Incident investigation report. *Young worker falls from third-storey balcony.* Retrieved December 12, 2008, from http://www2.worksafebc.com/PDFs/Investigations/IIR2005105910004.pdf

Manufacturing Academy Activity – Competency Matrix
Steven Senor, UW-Stout June 2008

Note: Items and concepts described in the table below identify competencies presented to participants in the Manufacturing Academy, June 2008. The components corresponded to core principles recommended from studies referenced in Chapter One. The principles were designed to help participants counter and respond to at-risk activities or accident causes affecting young, entry-level workers. Fourteen core areas were presented to help participants learn and practice skills to recognize potential hazards and prevent exposure to workplace injuries and illnesses.

At-Risk Activity or Accident Cause	Core Area	Activities	Date	Time
Perceiving hazards	Perception exercises	Slides and exercises Feedback and communications exercises	6/23/2008	1 hour
Reporting hazards	Emergency response	Personal and family emergency maps	6/23/2008	1 hour
	Identifying hazards	Slides and exercises ‘Food for Thought’ videotape ‘Hazard House’ ‘Find the Hazards’ exercise	6/23/2008	1 hour
OSHA regulations	Introduction to OSHA	Mary Bauer, Compliance Specialist, OSHA	6/24/2008	1 hour
	Bloodborne pathogens and disease prevention	Personal protection – providing treatment Cleaning up spills	6/25/2008	1 hour
Stressful conditions	Emergency response	Principles of fire safety Cintas Co. guest speaker Fire extinguisher practical training Personal – family emergency plan	6/24/2008	1 hour
		Adult CPR/AED training	6/25/2008	3 hours
		Adult first aid training, ‘CALM’	6/25/2008	2 hours

At-Risk Activity or Accident Cause	Core Area	Activities	Date	Time
Trying to hurry Alcohol and drugs Inadequate supervision	Incident Analysis	Incident reporting Case history evaluations – NIOSH FACE reports, OSHA Fatal Facts Incident analysis and reporting	6/23/2008	1 hour
Correcting hazards Unsafe equipment Personal protective equipment (PPE)	Safety audits	Selected equipment inspections (ladders, electrical cords, hand tools, emergency equipment) PPE Hazard assessment	6/24/2008	1 hour
Dangerous – inappropriate work	Workplace Violence Prevention	Slides and concepts Drama triangle Listening exercise Small group case history Use of feedback model	6/24/2008	1 hour
Lifting – ergonomics Handling knives PPE – hand protection Slips, trip and fall prevention Transportation-related accidents	Job Safety Analysis (JSA) Topics include: Lifting and carrying; Using a utility knife; Climbing a ladder; Avoiding slips/ trips/ falls; Safely handling chemicals; Defensive driving tactics	How to complete a JSA Team exercises and demonstrations	6/24/2008	2 hours
Inadequate training	Safe work practices and understanding safety	OSHA Fact Sheets, posters and Quick Cards Team presentations on selected topics relevant to the study	6/24/2008 6/26/2008 6/27/2008	1 hour 1 hour 1 hour
Participant Awards	Course completion and awards	Certifications of completion: • OSHA 10 general industry; • Red Cross CPR/First Aid;, • CVTC course completion; • Fire extinguisher training	6/27/2008	1 hour

Note: A total of 20 hours were dedicated to the program.

Day-by-Day Outline, Safety and Health Training Components for the June 2008 Manufacturing Academy

Note: The Manufacturing Academy was conducted June 16 – 27, 2008. Activities presented during the first week – June 16 – 20, 2008 consisted of laboratory tours and instruction in manufacturing design principles. Non-related safety training conducted during the second week (June 23 and June 25, 2008) involved focus on manufacturing engineering.

Daily:

Opening activities
Review
Planning

Date	Time
Monday, June 23, 2008	4 hours
Opening – Introduction Emergency Response Perception and Communications Hazard Recognition Incident Analysis	
Tuesday, June 24, 2008	8 hours
Introduction to OSHA Safety Audits Workplace Violence Prevention Module Fire Safety Job Safety Analyses Participant Research	
Wednesday, June 25, 2008	5 hours
Bloodborne Pathogens Adult CPR/AED training Adult First Aid training	
Thursday, June 26, 2008	2 hours
Participant Research	
Friday, June 27, 2008	1 hour
Participant Research Presentations Participant Awards	
Total hours	20

Core Curriculum – Plan for Manufacturing Academy, 2008

Subject Area – Topic	Estimated Time
1. Interpersonal and team building skills Leadership and communication skills	2 hours
2. Perception and hazard recognition exercises Hazard identification and correction	2 hours
3. The human element in safety and health Recognizing and reducing risk-taking behaviors	2 hours
4. OSHA and general manufacturing regulations Conducing a safety audit	2 hours
5. Defensive driving principles Forklift operation	2 hours
6. First aid and CPR, including 'CALM' Bloodborne pathogens	5 hours
7. Fire safety and fire extinguisher training Emergency preparedness	2 hours
8. Reducing common workplace injuries and illness Safe lifting and ergonomics Reducing cuts and lacerations	1 hour
9. Control of hazardous energy (lock-out/tag-out) Machine guarding Electrical safety Confined space entry	2 hours
10. Occupational health basics Hearing protection Personal protective equipment Heat and cold stress prevention	2 hours
11. Fall protection Safe use of ladders	1 hour
12. "Unintentional" risks Workplace violence prevention Off-the-job safety Reporting incidents and performing incident analyses	1 hour
Student training presentations on selected topics	4 hours
Total	28 hours

Outline for OSHA 10 Hour General Industry Training Program

Required Areas of Focus:

- Introduction to OSHA
- The OSH Act
- The General Duty Clause (5a) (1)
- Inspections, citations and penalties (CFR 1903)
- Recordkeeping (CFR 1904)
- Walking and working surfaces (Subpart D)
- Exits routes, emergency actions plans, fire protection (Subparts E and L)
- Electrical safety (Subpart S)

Additional Areas of Focus (selected from topics below, based on participants and interests):

- General Environmental controls (including lock-out/tag-out and confined space entry (Subpart J)
- First aid and emergency eye wash stations (Subpart K)
- Flammable and combustible liquids (Subpart H)
- Personal Protective Equipment (Subpart I)
- Machine Guarding (Subpart O)
- Hazard Communications (Subpart Z)
- Materials Handling (Subpart N)
- Welding, Cutting, and Brazing (Subpart Q)
- Introduction to industrial hygiene
- Bloodborne pathogens
- Ergonomics
- Safety and health programs

Safety Research Study Participant Number:

Survey – Questionnaire Instructions:
Please read and answer the questions openly and honestly.

1. What jobs or employment have you had? (Please check all that apply)

☐ None

☐ I have worked in a family business (other than farming)

☐ Farm or agricultural work

☐ Other jobs (please list the name of the company or type of business below, such as restaurant, fast food, or discount store)

2. Did you receive a safety orientation from your employer?

☐ Yes

☐ No

☐ I don't remember

3. Have you had any safety training in school?

☐ Yes

☐ No

☐ I don't remember

4. If you had safety training in school, what kind was it?

☐ I have not had any safety training

☐ Safety was mentioned during class, such as in a science lab

☐ First aid/CPR training, such as a baby sitting or lifesaving course

☐ Workplace safety was discussed as part of a health or other class

Safety Research Study (Continued)

5. Have you ever had any safety training outside of school (please check all that apply)

☐ No

☐ Yes – as part of a sports team or athletics

☐ Yes – as part of another after-school activity

☐ Yes – as part of scouting or other non-school activity

☐ Yes – at home, church or with an outside organization

6. What do you think of learning about workplace safety (please check all that apply)

☐ I don't care

☐ I want to wait until after the course is over to see if it was helpful

☐ It doesn't apply to me

☐ It is important only for people working full-time

☐ It may have some value to me now or later in life

☐ I may be able to use the information from the course on or off the job

7. Are you willing to participate in the study after the Manufacturing Academy is over? This would include reporting on how you feel about the safety topics learned, and if you have experienced any workplace accidents or events.

☐ Yes

☐ No

☐ I want to wait until after the Manufacturing Academy is over before deciding

Do you have any comments or suggestions to help with the study? If so, please list below:

Thank you for your time and efforts!

Manufacturing Academy 2008 Pre-test

1. What are the two primary diseases that can be transmitted by blood in the workplace?

2. How much time do you have when a fire starts to find a fire extinguisher, bring it back and use it before the fire becomes out of control?

3. What does RACE stand for in fire safety?

4. What does PASS stand for in using a fire extinguisher?

5. At what height is fall protection required in general industry?

6. At what height is fall protection required in construction?

7. Who is responsible for providing a workplace free of recognized hazards?

8. Who is responsible for following safety rules or regulations?

9. What can an OSHA compliance officer apply if there is a hazard but no direct OSHA regulation?

10. What does MSDS stand for?

11. At what noise level can hearing loss occur?

12. Explain the 4 to 1 rule in ladder safety

13. Severe injuries and deaths are many times the result of performing what types of tasks?

14. Where is a GFCI needed in the workplace?

15. What PPE is needed when entering a construction site?

16. True or false: If you have a driver's license or permit, this allows you to drive a forklift

17. What are the three criteria for defining a confined space?

18. What is the minimum distance you should stand away from an electrical panel when someone is working on it?

19. What is the minimum distance that should be kept clear in front of electrical panels?

20. What are the three confined space entry roles?

Manufacturing Academy 2008 Post-test (Answer Key)

1. What are the two primary diseases that can be transmitted by blood in the workplace?
Hepatitis 'B' and HIV

2. How much time do you have when a fire starts to find a fire extinguisher, bring it back and use it before the fire becomes out of control? ***30 seconds***

3. What does RACE stand for in fire safety? ***Rescue, Activate, Confine the fire, Evacuate***

4. What does PASS stand for in using a fire extinguisher?
Pull the pin, Aim the hose, Squeeze the handle, Sweep the base of the fire

5. At what height is fall protection required in general industry? ***4 feet***

6. At what height is fall protection required in construction? ***6 feet***

7. Who is responsible for providing a workplace free of recognized hazards? ***The employer***

8. Who is responsible for following safety rules or regulations? ***The employee***

9. What can an OSHA compliance officer apply if there is a hazard but no direct OSHA regulation?
The General Duty Clause

10. What does MSDS stand for? ***Material safety data sheet***

11. At what noise level can hearing loss occur? ***85 dBA***

12. Explain the 4 to 1 rule in ladder safety
For every four feet in height, the ladder needs to be extended out one foot

13. Severe injuries and deaths are many times the result of performing what types of tasks?
Unusual, non-routine

14. Where is a GFCI needed in the workplace? ***In potentially wet areas***

15. What PPE is needed when entering a construction site?
Hard hat, safety glasses, foot protection, possibly gloves, fall and hearing protection

16. True or false: If you have a driver's license or permit, this allows you to drive a forklift ***False***

17. What are the three criteria for defining a confined space?
Limited access, able to be entered, not meant for continuous occupancy

18. What is the minimum distance you should stand away from an electrical panel when someone is working on it? ***4 feet***

19. What is the minimum distance that should be kept clear in front of electrical panels? ***3 feet***

20. What are the three confined space entry roles? ***Entrant, attendant, entry supervisor***

Research Consent Form

For Students Participating in June 2008 Manufacturing Academy

Title of Research Study

"An Analysis of Strategies and Interventions for Preventing Exposure to Hazards in Young, Entry Level Workers"

Investigator and Contact Information

Steven Senor, M.S., Program Coordinator
Chippewa Valley Technical College
(715) 874-4627; ssenor@cvtc.edu

This study is being conducted as a project toward meeting the requirements of a graduate degree thesis with the University of Wisconsin – Stout.
Dr. Howard Lee, Advisor, School of Education

Purpose

The purpose of the study is to determine if young entry-level workers can benefit from learning safety and health principles, leading to practicing safe work habits, recognizing potential hazards, and reducing the risk of a work-related injury or illness.

Elements of the Research

1) Emphasize hazard identification; 2) Demonstrate practical competencies learned
3) Focus on workplace and off-the-job safety; 4) Surveys and questionnaires
5) Participant self-reporting; 6) Employer cooperation

Description of the Study

The study will be conducted at the 2008 Manufacturing Academy, supported by funding provided from the State of Wisconsin, Department of Workforce Development. The training will be held June 16 – 27, 2008 at the Chippewa Valley Technical College, Gateway Manufacturing Campus, in Eau Claire, WI. The effectiveness of the program will be measured through the practical application of skills and knowledge learned during the training. The goal will be to provide a base of information for participants to practice on and off the job to recognize hazards and prevent workplace accidents.

Data will be collected from pre-test scores, class activities, and post-test. Self-reporting from participants who enter the workforce will be requested following the conclusion of the program, in order to obtain additional information relative to the knowledge acquired.

Potential Risks

The study will not intentionally mislead or deceive the participants. The study is voluntary and the goal is to provide benefits to the participants without risk or harm. There will be no foreseeable physical, emotional, psychological harm or inconveniences. Any harm to participants is unexpected and unforeseen.

Potential Benefits

The goal of the study is to provide practical information and skills which participants can apply both on and off the job. The knowledge is designed to be practical and of value. An objective of the study is for employers to hire workers (the participants) who have a greater understanding of potential exposures and hazards, as well as the knowledge to work safely in assigned tasks.

Participation

All participants have the right to refuse to be involved in the proposed research. The decision to participate in the research is not binding. Participants may withdraw from the active involvement in the study at any time without negative consequences.

Alternatives to Participation

If a student does not wish to participate in the study, the work he or she completes and submits will not be collected or evaluated.

Confidentiality

Assignments and work performed during the study will be kept in confidence by the researcher and not shared with anyone unless permission is received by the participant, and if under 18, by his or her parent or guardian. No information that discloses personal identity will be released or published without prior and specific consent to the disclosure. Work performed by participants during the June 2008 Manufacturing Academy will not be included in school records.
No personal identification will be revealed. No personal records will be reviewed. There will be no clinical treatment, physical or invasive testing.

Data Collection, Storage and Publication

Information collected will be kept confidential and secure and only the people working with the study will see the data, unless required by law. The data will be kept for four years following the conclusion of the study and then destroyed. The study is designed to be published as a thesis project, in partial fulfillment of a graduate degree in Education.

Reimbursement

Participants of the study will receive a stipend from the State of Wisconsin, Department of Workforce Development for attending the Manufacturing Academy. This stipend will be received independent of participation in the study. Persons who voluntarily participate in the study will receive the same stipend as those who choose not to participate. No additional funds or reimbursement will be provided to persons who participate in the study.

Commercialization and conflict of interest

There will be no apparent, actual, or potential conflict of interest on the part of the researcher, the research institutions or sponsors, of any possibility of commercialization of the research findings. No potential profit is expected or will be solicited as the result of the participants or the study.

Consent

Information in this document has explained the potential harms, benefits, and alternatives of the study. By agreeing to participate, the prospective research participant:

1) has read and understood the relevant information;
2) understands that she or he may ask questions in the future;
3) indicates free consent to research participation by signing the research consent form.

Consent Statement

I have read, or had read to me, the information describing this study. All of my questions have been answered to my satisfaction.

Signature of the Participant: ______________________________

Date ___________

(For students under the age of 18) I allow my child to take part in this study. My child can stop participating at any time without giving any reason and without penalty. I can ask to have the information related to my child returned to me, removed from the research records, or destroyed. I have received a copy of this consent form.

Signature of Parent or Guardian:______________________________________

Date: _____________________

Signature of Investigator: ____

Date: _____________________

Manufacturing Academy 2008 Safety Knowledge and Skills: Performance Evaluation

Name	Today's Date

Stations:

1. In the following picture, list as many home hazards as you can find in two minutes
2. In the following picture, list as many work hazards as you can find in three minutes
3. Demonstrate how to put on and take off disposable gloves without becoming exposed to bloodborne pathogens
4. Demonstrate how to put on a fall protection harness
5. Demonstrate how to put on a dust mask
6. Demonstrate the 'PASS' method for using a fire extinguisher
7. Demonstrate how to properly insert ear plugs
8. Draw an emergency map of an assigned area, indicating primary and secondary evacuation routes and emergency equipment
9. Conduct a ladder inspection using the form provided
10. Conduct an emergency equipment inspection using the form provided
11. Conduct a forklift inspection using the form provided
12. Demonstrate how to use an emergency eye wash station to treat an object in the eye
13. Demonstrate how to safely lift and carry an object
14. Demonstrate how to safely open a box using a utility knife
15. While climbing a ladder, demonstrate the 4 to 1 rule in setting it up, the 'belt buckle' rule, and maintaining '3 points of contact'
16. Provide positive feedback using one of the supplied models
17. Perform a hazard assessment in one of the manufacturing labs
18. Demonstrate the steps for responding to someone who is discovered to be unconscious
19. Clean up a simulated spill of bloodborne pathogens
20. Describe how you would treat someone suspected of experiencing heat stress

Compliance in Employee Safety and Health September 2008 Update

Following is a list of primary regulatory standards and required or recommended provisions for compliance with documentation and training. Please note that this list is not inclusive.

While OSHA standards are referenced, State of Wisconsin statutes (Comm 32) would similarly apply. In addition, there may be other required or implied programs needed, based on the types of hazards or conditions present. Examples include: ergonomics, LASER safety, and chemical handling.

A 'Yes' indicates either the program is either implied or required. There is also the need to verify compliance through documentation and performance (practical or hands-on) training. Please note that programs are needed as relevant conditions or hazards exist. That is, not all programs may be required.

Standard	Written Program	Awareness Training	Authorized Training	Summary of Additional Required or Recommended Components
Fall Protection 1910.22 – 24 (Primarily applies to construction)	Recommend	No	Yes	For authorized employees: training and demonstrating the use of fall protection equipment such as harnesses and lanyards, and conducting inspections. Address housekeeping issues and provide slip/trip/fall prevention training.
Ladder Safety 1910.25 – 27	Recommend	Yes	Yes	For authorized employees: training and demonstrating how to safely use ladders, and regular inspections
Emergency Action Plans 1910.38	Yes	Yes	Yes	Emergency procedures for reporting and responding to a fire or other emergency, emergency contact list, practical evacuation and relocation drills conducted at least annually, along with a critique of the drill, evacuation maps for each area, and alarm systems
Fire Prevention Plan 1910.39	Yes	Yes	Yes	List of fire hazards, proper handling and storage procedures for hazardous materials, emergency contact list
Hearing Conservation 1910.95 (Noise levels are at or exceed 85 decibels)	Yes	Yes	Yes	Training on the effects of hearing loss, use of PPE, hazard assessment, noise monitoring, audiometric testing
Process Safety Management 1910.119 (Where applicable)	Yes	Yes	Yes	Address all elements of the program, annual awareness training for all employees, written assessment, PPE, practical exercises
Hazardous Waste Operations and Emergency Response 1910.120	Yes	Yes	Yes	Authorized employee training from 8 to 40 hours, depending on the hazards and chemicals on-site, response plan, Includes exercises, HazMat team, testing and monitoring
Personal Protective Equipment 1910.132 – 138	Yes	Yes	Yes	Hazard assessments to determine PPE requirements, practical training, signs and labeling and inspections
Workplace Violence Prevention 5 (a) 1	Recommend	Yes	Management	Policies and procedures to address potential situations.

Standard	Written Program	Awareness Training	Authorized Training	Summary of Additional Required or Recommended Components
Respiratory Protection 1910.134	PPE Hazard Assessments	Yes	Yes	Practical training, fit testing, assessment and selection of the types or levels of protection necessary, regular inspections and storage and medical evaluations.
Confined Space Entry 1910.146	Yes	Yes	Yes	Inventory of confined spaces, entry and rescue procedures, monitoring equipment, labeling and permits and training for specific roles
Control of Hazardous Energy (Lock-out/Tag-out) 1910.147	Yes	Yes	Yes	Procedures for each piece of equipment, devices, locks and tags, equipment inventory, practical application and annual audits. Apply disciplinary action specific to LOTO violations.
Medical Services and First Aid 1910.151	As part of emergency action plan	Yes	Yes (selected employees)	First aid and emergency response procedures, adequate supplies and trained personnel
Emergency Eye Wash and Shower Stations 1910.151	No	Yes	Yes	Inventory stations, inspections, stations positioned near potential hazards. Conduct periodic flushing. Avoid small bottles. 10 second distance to stations and 15 minutes capability of flushing
Portable Fire Extinguishers 1910.157	As part of fire prevention plan	Yes	Yes (selected employees)	Inventory of fire extinguishers and related equipment, inspections, training for employees to fight incipient fires
Powered Industrial Trucks 1910.178	Recommend	Pedestrian safety	Yes	Practical training for demonstrating proficiency in operating each piece of equipment. Practical training should also be provided for scissors lifts and other related equipment. Other elements include audits & inspections
Machine Guarding 1910.212	Recommend	Yes	Yes	Regular inspections, hazard recognition, signs and labeling
Welding, Cutting and Brazing – 1910.252 - 254	Recommend	Yes	Yes	Use of hot work permit system, inspections, demonstration of competence, storage and handling
Electrical Safety Related Work Practices 1910.302 - 308 1910.331 – 335	Yes	Yes	Yes	PPE, procedures, inspections, signs and labeling, use of equipment. Note – revised electrical safe work practices incorporate NFPA 70E changes
Asbestos 1910.1001	Yes	Yes	Yes	Inventory of ACM, signs and labeling, abatement procedures, inspections, medical surveillance
Access to Employee Exposure and Medical Records 1910.1020	Yes	Yes	No	Procedures, forms, basic awareness and annual training
Bloodborne Pathogens 1910.1030	Yes	Yes	Yes	Procedures, reporting, PPE and waste disposal. Also, list of employees with occupational exposure and those given HBV vaccination.
Hazard Communications 1910.1200	Yes	Yes	Yes	Labeling, inspections, response procedures, handling, MSDS's, and chemical clearance program
Chemical Hygiene 1910.1450	Yes	Yes	Yes	Procedures, testing, PPE, signs and labeling, monitoring and inspections
Combustible Dust	Recommended	Yes	Yes	The General Duty Clause and other standards could be applied. Reference to NFPA 654 and other consensus standards are also under review.

New, Transferred or Contracted Employee Safety Orientation Schedule
March 2007 Revised

Instructions: New employees are to complete the entire orientation process. Existing employees who transfer to a new department or are assigned a new job or bracket will complete the sections identified and assigned by the safety manager and the department. Contracted employees are also to complete assigned sections. These areas will be highlighted and initialed by the person(s) assigned to complete the orientation.

Day One:

1) Emergency Response Check, and Date Completed ____________

Present and review the plant's emergency plan
Explain how to contact emergency services, such as by dialing 9-1-1
Locate all outside and emergency exits in the assigned work area(s)
Locate and go to the assigned relocation area
Locate and go out to the evacuation – marshalling area
Find power failure phone(s) and first aid kits in the area

2) Welcome and Plant Orientation Check, and Date Completed ____________

General welcome to the plant (or department for transferred employees)
Conduct a basic plant tour, of all departments
Show locations of break rooms, bathrooms, and time clocks
Show how to enter the building using the ID codes and security system

3) General Safety and Security Orientation Check, and Date Completed _________

Review plant security procedures
Review the plant safety manual
Review and sign-off on the plant confidentiality agreement.

4) The Safety Process Check, and Date Completed ____________

Describe the impact of accidents and loss – by frequency and severity
Provide information on basic hazard recognizing and correcting hazards.
Describe how safety is measured
Show how goals are developed

5) Safe Practices and Safe Procedures Check, and Date Completed ___________

Describe the importance of following safe practices and safe procedures.
Review the current plant and department safe practices
Employee review and sign-off on the safe practices
Describe plant requirements and importance of complying with safe practices related to PPE.

New or Transferred Employee Safety Orientation Schedule (continued) 3/07 Revised

5) Incident Reporting Check, and Date Completed ____________

Describe the incident reporting process
Show the employee emergency response guide
Describe the priorities for responding to an incident: taking care of the person, preventing further exposure to the hazard, performing an incident analysis
Describe the incident follow-up process: developing a corrective action plan and holding a roundtable review of the event
Describe the importance of reporting close calls and property damage incidents

6) Hazard Communications Check, and Date Completed ____________

Describe the hazard communications program
Describe the chemical clearance program
Show the location of the plant and department MSDS's
Provide training on hazard communications

Day Two and Day Three

8) Safety Training and Compliance – Practical and Certification (as applicable)

Check and Date Completed or to be Completed

- Forklift lift practical training and practical certification ____________________
- Lock-out/tag-out training and practical certification ____________________
- Fire safety and fire prevention ____________________
- Hazard communications ____________________
- Process safety management principles ____________________
- Bloodborne pathogens practical training ____________________
- Emergency eye wash/shower stations training ____________________
- Use of ladders and preventing slips, trips and falls ____________________
- Respiratory protection overview ____________________
- Hearing protection overview ____________________
- PPE practical training ____________________
- Machine guarding principles ____________________
- Heat stress overview ____________________
- Basic electrical principles ____________________
- Confined space principles ____________________
- Ergonomics ____________________
- Other topics (list) ____________________

Review and Confirmation of New or Transferred Employee Orientation:

This ______________________________ employee orientation has been provided to:
(indicate if new, transferred or contracted)

(The employee is to print and sign their name below)

Print name _________________________ Sign name
____

Employee Number ______________________ Date Completed __________________

The orientation was provided by:
(Print names of all who participated in the orientation process and the topics they presented):

Name	Topic(s) Presented

Note any deficiencies or areas for correction or follow-up training. Note that deficient areas need to be successfully addressed and corrected prior to approval and sign-off by department and plant staff

Sign off and Completion of Orientation Process

The employee identified above has successfully completed the new or transferred employee orientation. Follow-up certification and training will be assigned and completed as planned, in accordance with the safety training schedule. File copies of this form in the employee's training folder.

______________________________ ______________________
Safety Manager Date

______________________________ ______________________
Department Staff Member Date

Manufacturing Academy 2008 Post-Class Survey 1

July 31, 2008

Dear:

Thank you again for participating in the Manufacturing Academy.

The purpose of the survey is to:

1. Follow-up on the safety portion of the Academy
2. See if you have received any other safety training since then
3. Compare the safety training and see if it has helped or benefitted you

The information you provide on this survey is confidential.

No personal information will be shared.

The survey should take about 10 minutes to complete.

Please send the completed survey in the return envelope provided by **August 11, 2008**.

If you have any questions, please contact me:

Steven Senor (715) 874-4627, or email: senors@uwstout.edu

<u>Instructions</u>: Please circle the reply that best answers the question.

Sample: Did you enjoy the safety training given in the Manufacturing Academy?

[✓ Yes] No

1. Have you used any of the safety skills you learned during the Manufacturing Academy? (such as giving first aid or using a fire extinguisher)

   Yes (please identify the skill or skills you performed) No

2. Do you feel that you are now better prepared to work safely since taking the safety training from the Manufacturing Academy?

   Yes No

3. Are you currently working? (Answer yes if the work is either part or full-time)

   Yes No

***** If you are working, please turn the page over to continue the survey.**
If you are not working, you are done with the survey and please mail it back***
Please answer questions 4 – 9 only if you are currently working

4. What is the name of your employer? (For example: Burger King)
The name of my employer is:

5. Has your employer given you any safety training?

No
Yes, just the basics (less than one hour of safety training)
Yes, I received a safety orientation (more than one hour of safety training)

6. Did the safety training you received from your employer help prepare you to recognize any potential job hazards or work safely?

Yes
No
I don't know yet

7. What safety topics did the employer present or discuss? (Please check all that apply)

☐ Reporting injuries or illnesses
☐ Slips, trips and falls
☐ Cuts
☐ Workplace violence prevention
☐ Reporting hazards
☐ Burns
☐ Lifting
☐ Using chemicals
☐ Preventing accidents
☐ Using equipment
☐ Safe driving
☐ PPE

Others (please list any topics not mentioned above):

8. Which of the certificates you earned have been helpful to you? (Please circle any/all that apply)

The Red Cross First Aid card
The Red Cross CPR card
The fire extinguisher card
The CVTC safety certificate
None of the certificates have been helpful to me

9. Did earning the certificates help you either find or keep a job? (Please circle any/all that apply)

Yes – the First Aid card did
Yes – the CPR card did
Yes – the fire extinguisher card did
Yes – the CVTC safety certificate did
None of the certificates have been helpful to me

Thank you very much! Your replies are very helpful and greatly appreciated.
Please return the survey in the envelope provided.

Manufacturing Academy 2008 Post-Class Survey

August 28, 2008

Dear

A survey was sent to you a few weeks ago asking for your opinions on the safety training you received from the CVTC (Chippewa Valley Technical College) training given in June.
If you would you be so kind to answer the questions that would be greatly appreciated and will determine if the training was useful and can benefit other students in the future. Please contact me if you have any questions and thank you for your consideration and time.

The purpose of the survey is to: 1) Follow-up on the safety portion of the Academy, and;
2) See if you have received any other safety training and compare the training to see if it has helped.

The information you provide on this survey is confidential. No personal information will be shared. The survey should take about 10 minutes to complete. Please send the completed survey in the return envelope provided by **September 15, 2008.**

If you have any questions, please contact me: Steven Senor, (715) 874-4627, or email: senors@uwstout.edu

Instructions: Please check the box with the reply that best answers the question.

Sample: Did you enjoy the safety training given in the Manufacturing Academy?

☑ Yes ☐ No

1. Have you used any of the safety skills you learned during the Manufacturing Academy? (such as giving first aid or using a fire extinguisher)

   ☐ Yes ☐ No

2. Do you feel that you are now better prepared to work safely since taking the safety training from
the Manufacturing Academy?

☐ Yes ☐ No

3. Are you currently working? (Answer yes if the work is either part or full-time)

☐ Yes ☐ No

➔ ***** If you are working, please turn the page over to continue the survey.**
If you are not working, you are done with the survey and please mail it back*** ☺
Please answer questions 4 – 9 only if you are currently working

4. What is the name of your employer? (For example: McDonald's)

The name of my employer is: ____________________

5. Has your employer given you any safety training? (Please check one of the boxes)

☐ No
☐ Yes, just the basics (less than one hour of safety training)
☐ Yes, I received a safety orientation (more than one hour of safety training)

6. Did the safety training you received from your employer help prepare you to recognize any potential job hazards or work safely? (Please check one of the boxes)

☐ Yes
☐ No
☐ I don't know yet

7. What safety topics did the employer present or discuss? (Please check all boxes that apply)

☐ Reporting injuries or illnesses
☐ Slips, trips and falls
☐ Cuts
☐ Workplace violence prevention
☐ Reporting hazards
☐ Burns
☐ Lifting
☐ Using chemicals
☐ Preventing accidents
☐ Using equipment
☐ Safe driving
☐ PPE

Others (please list any topics not mentioned above):

8. Which of the certificates you earned have been helpful to you? (Please check all boxes that apply)

☐ The Red Cross First Aid card
☐ The fire extinguisher card
☐ The Red Cross CPR card
☐ The CVTC safety certificate
☐ None of the certificates have been helpful to me

9. Did earning the certificates help you either find or keep a job? (Please circle all boxes that apply)

☐ Yes – the First Aid card did
☐ Yes – the fire extinguisher card did
☐ Yes – the CPR card did
☐ Yes – the CVTC safety certificate did
☐ None of the certificates have been helpful to me

Thank you very much! Your replies are very helpful and truly appreciated.
Please return the survey in the envelope provided.

Kuv hlub koj

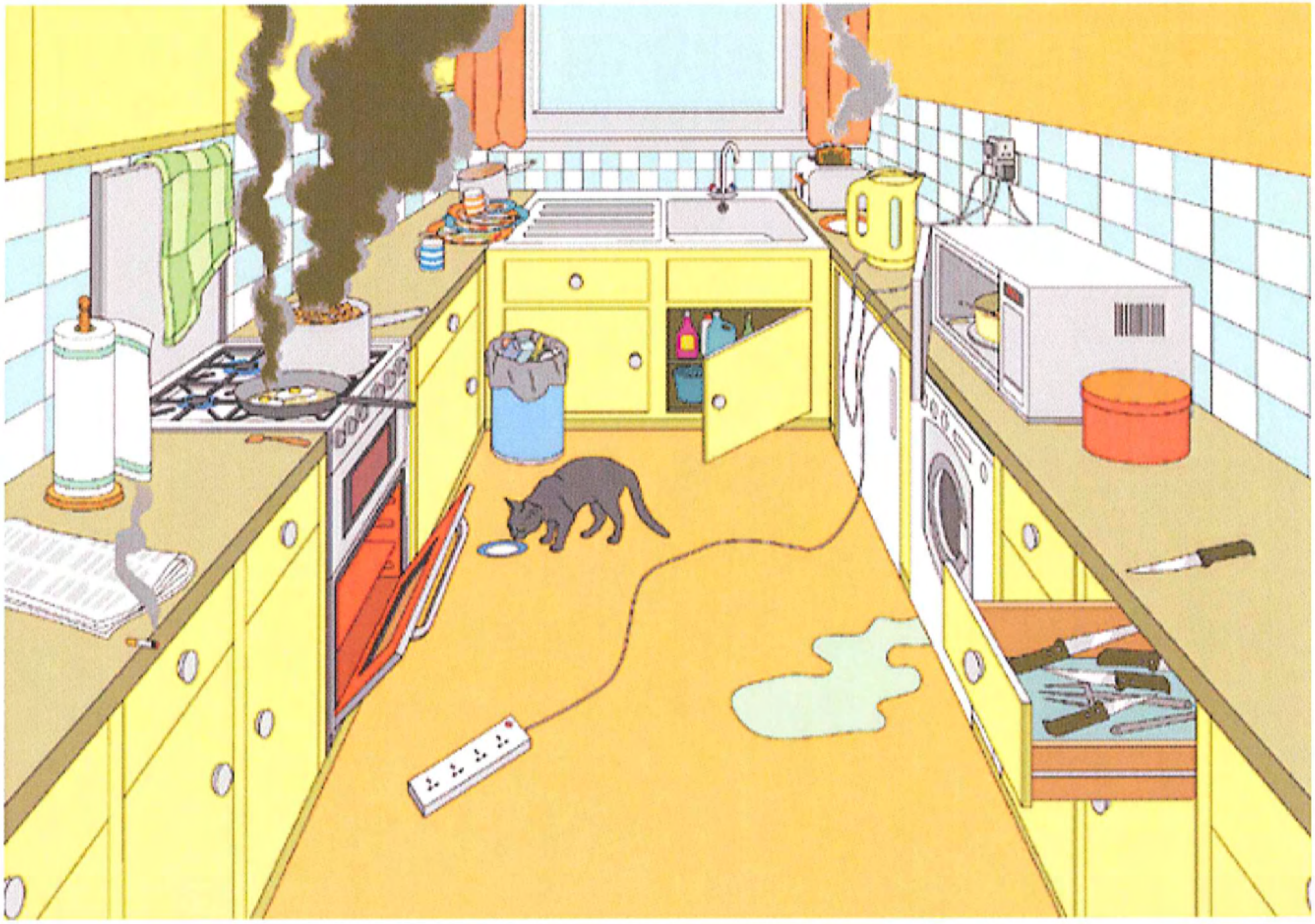
Hazard Elimination Game

Directions: Look at the home hazards slide and list as many hazards as you can in the time provided. Next, list all of the work-related hazards you can see on that slide. Compare your list with your partner's list. Cross out any hazards listed that both of you have. Count out the remaining hazards and that will be your score.

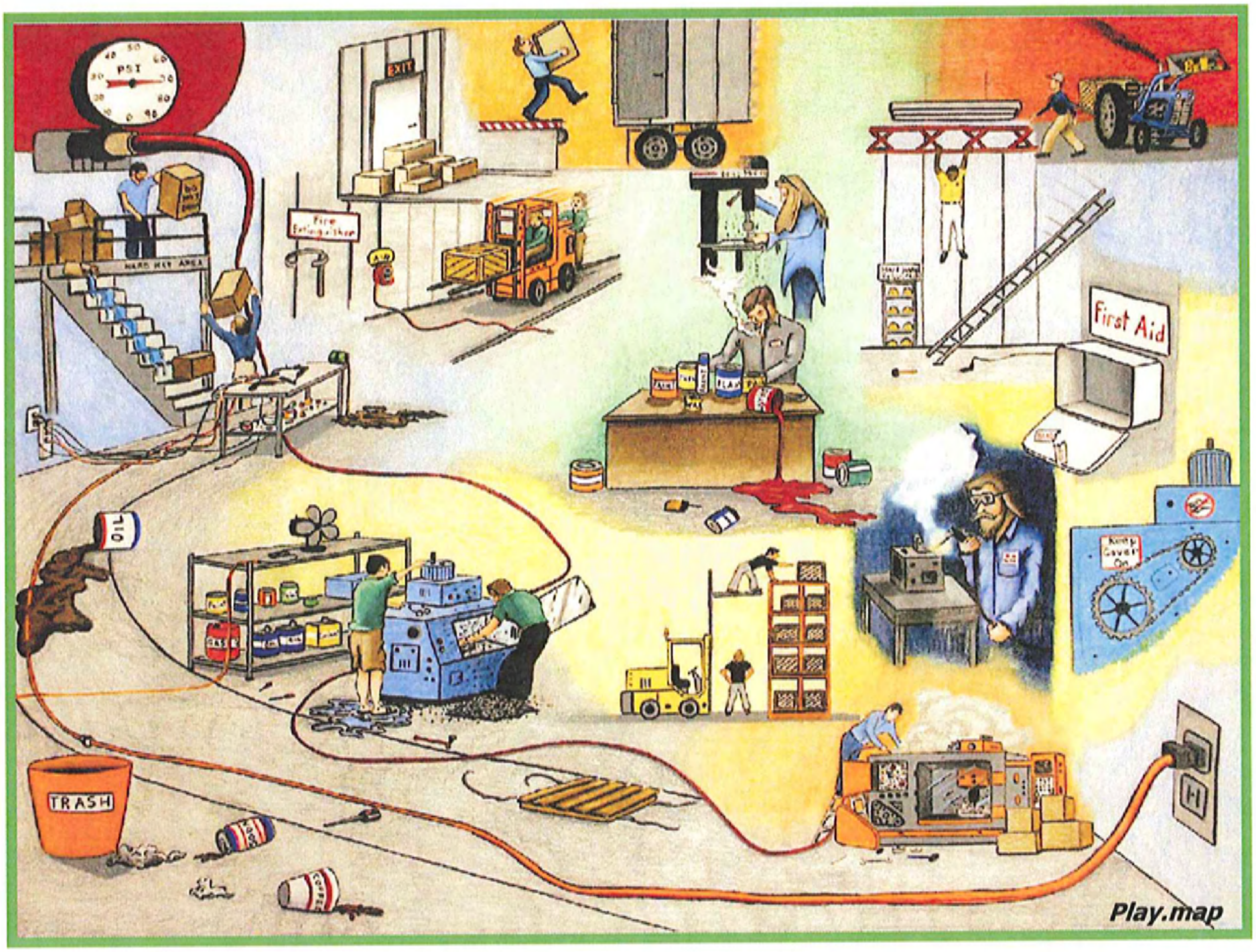
List the Home Hazards	List the Work Hazards

Score ____________________ Score ________________________

Find the Hazards Home Picture



Find the Hazards Work Picture



Putting on and Taking off a Fall Arrest Harness

Position the harness for donning

To straighten it out, drape the harness out along the ground

1) Hold up the harness by lifting the 'D' ring
Make sure all straps are unbuckled and untangled

2) Position the harness
Position the horizontal and vertical straps to the rear

3) Hold the 'D' ring and turn the harness to face you
Position the shoulder straps to the front

4) Grasp both front straps
Alternate hands on the straps (grasp the left strap with your right hand and right strap with your left hand)

5) Slip the harness on like you would a backpack or coat
The 'D' ring should be on your back, between your shoulder blades

6) Straighten out the leg straps to hang down behind you
Make sure the straps and buckles hang straight down

7) Pull the leg straps under your legs and over your thighs
Attach the tongues through the grommets to fit securely

8) Attach the leg straps to the belts on both sides of your body
Make sure the leg straps are snug but not too tight

9) Attach the chest strap
Slide one plate or latch under the other and 'lock' into place

10) Adjust the shoulder straps so that they are snug
If the bottom 'catch' is spring loaded, it can be lifted by pulling down

11) The harness should be snug and also comfortable
If you fall, most of the force will be transferred more evenly

12) Attach the belt under the harness around you
It should fit snugly around your waist

13) Attach the lanyard to the 'D' ring	Depress the catch and attach the lanyard to the side marked 'To "D" Ring'

Removing the harness

1) Remove or have someone help you remove the lanyard from the 'D' ring
2) Remove the belt
3) Unbuckle the chest strap
4) Unbuckle the leg straps
5) Remove the harness, straightening it out and placing it into storage

Coaching Exercise For N95 Dust Masks

Name of Person Wearing the Mask: Date:

Instructions to coaches: Review the tasks with the person wearing the respirator to determine comfort and fit. Please initial when the task is performed successfully.

Activity	Coach Initial
1. Both straps are positioned on the face securely	
2. The straps fit securely, not too loose or tightly	
3. The straps are adjusted to fit comfortably	
4. The mask is positioned and pinched over the nose.	
5. The mask fits comfortably across the nose bridge	
6. There is room for the mask to fit comfortably under the person's safety glasses	
7. The person can talk or move their nose or mouth easily and without restraint	
8. The mask is positioned under the chin	
9. The mask is positioned well on the face and cheeks	
10. The person can breathe comfortably through the mask, or through the inlet valve if one is supplied on the mask	
11. The respirator is properly sized to span the distance from the nose to the chin	
12. The respirator is secured to the face and does not slip loose or come off	
13. The fit remains in place and secure when the person moves their head side-to-side and up and down while taking a few slow deep breaths	

Comments:

Print Name of Coach______________________________

Safety – Emergency Preparedness Map

Please label your primary work area or office:

For emergencies: call ____________________ for help

Your severe weather relocation area is located ________________

Your outside evacuation area is located ________________________

Draw in your area map in the box, using the symbols below:

Primary evacuation route = ━━━━━━━━

Secondary evacuation route = ▬ ▬ ▬ ▬ ▬

Mark fire extinguishers with = Δ

Mark fire alarms = Ⓐ

Mark exits = [E]

Mark hazards with a = ! (and describe them)

Mark any stairs with = ☰

List other emergency equipment by name (such as first aid kits, power failure phones, eye wash stations)

Mark elevators with = ☒

Ladder Inspection Audit

Department	Date of Inspection

Please place a check in the box if the ladder is in good condition.
Place a check in the circle if the item needs correcting
Please use the following codes to identify defects:

1: frame or brackets need repair 2: steps needs repair

3: 'feet' or pads are missing or need repair

4: unit does not open properly 5: excessive wear, dents or damage 6: other (describe)

Ladder description codes: W = wood, A = aluminum, F = fiberglass, S = steel

Identify location of the ladder and the description code	Check if <u>if acceptable</u>	Describe and identify <u>if the is not acceptable</u>

Other areas of focus (please describe):

Date of last Inspection

Repeat items not addressed or corrected from last inspection

Comments:

Inspection performed by:
Please print name
Please sign name

Emergency Equipment Inspection Form

Department | Date of Inspection

Please place a check in the box to answer the question if acceptable.
Place a check in the circle if the item needs correcting

Fire Extinguishers

The extinguisher is visible and not obstructed ☐ ○
There is a sign or labeling near the extinguisher ☐ ○

The locking pin is intact and the tamper seal is unbroken ☐ ○
There is no obvious physical damage, corrosion, leakage, or clogged nozzle ☐ ○
The pressure gauge or indicator is in the operable range or position ☐ ○
(Note: there is no gauge on a type 'B' extinguisher (carbon dioxide model, with a cone instead of a hose.)
The operating instructions on the nameplate are legible and facing outward ☐ ○
Professional service has been performed within the last 12 months ☐ ○
*** **When the above has been completed, initial and date the back of the tag**

Emergency Eye Wash and Shower Stations

There is a sign identifying the emergency eyewash ☐ ○
The area beneath the shower is clear and unobstructed ☐ ○
The shower has been inspected within the last month ☐ ○
The eyewash station is within 100 feet of any potential hazards ☐ ○

First Aid Kit – AED (Automated External Defibulator)

First aid kits are accessible ☐ ○
First aid kits are adequately stocked with supplies ☐ ○
If an AED is present, it is accessible and people are trained in its use ☐ ○

Emergency Lighting

If available and installed, the lights are visible ☐ ○
The lights are in good working order ☐ ○
Press the test button on the fixture to ensure that the lights come on ☐ ○

Other areas of focus (please describe):

Date of last Inspection

Repeat items not addressed or corrected from last inspection

Comments:

Inspection performed by:
Please print name
Please sign name
Date

Forklift Operator's Inspection Checklist July 2007 Revised

****** To be completed at the beginning of each shift *****

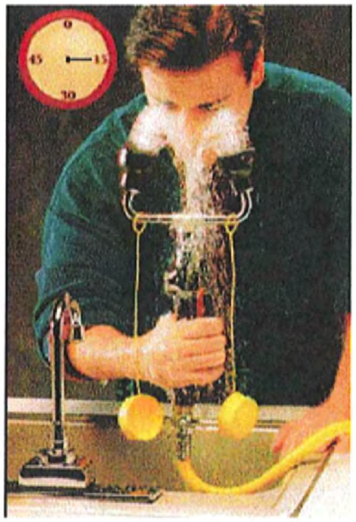
Date	Facility or Department	Forklift Number

Item to be Inspected	1st Shift – List Meter Reading:	2nd Shift – List Meter Reading:	3rd Shift – List Meter Reading:	Indicate any problems or items needing repair
	Ok or not Ok?	Ok or Not Ok?	Ok or Not Ok?	
Look around and under vehicle: Ok = no fluid leaks Not ok = leaks spotted				
Check the brakes: Ok = brakes push evenly Not Ok = problems with the brakes				
Check the alarm Ok = alarm sounds Not Ok = weak or no sound				
Test the steering: Ok = steering wheel turns smoothly, rear wheels turn in the same direction of the steering wheels Not Ok = turning stiff, not responsive				
Test the controls Ok = all controls operate (up and down, side shift, tilt front and back) Not Ok = one or more of the levers do not work properly				
Try the horn Ok = horn beeps loudly Not Ok = weak or no beep heard				
Look at the gauges Ok = can see gauges, at safe levels Not Ok = gauges don't work or are at unsafe levels				
Test the hand controls Ok = hand controls work smoothly Not Ok = controls don't work				
Test the foot controls Ok = foot controls work smoothly Not Ok = controls don't work				
Look at the forks Ok = forks are in good condition Not Ok = bent or cracked forks				

Check the tires Ok = tires are in good condition Not Ok = chunks or pieces missing				
Look at the seat belt Ok = seat belt installed, not tangled Not Ok: Missing or tangled seat belt				
Other (Please describe)				

Before Beginning to Drive, Conduct a Visual and Operational Check.
Report any problems or deficiencies found to your supervisor.

Eyewash Station Operation



The following actions should be taken to operate eyewash stations in the event of a chemical splash to the eyes.

1. Alert co-workers to the chemical splash.
2. Move quickly to the nearest eyewash station.
3. Lean over the eyewash station.
4. Push the lever to activate the eyewash.
5. Hold eyelids open and direct the flow of water into the eyes
6. Continue flushing the eyes for a minimum of 15 minutes.
7. Seek immediate medical help after flushing.

Job Safety Analysis

Department Performing Job	*Job or Operation*	*Title of Person*
	Opening a box using a utility knife	

Required and/or Recommended Personal Protection Equipment
Safety glasses, cut-resistant gloves

Sequence of Basic Job Steps	*Potential Hazard*	*Recommend Safe Job Procedure*
Put on gloves and safety glasses		
Obtain a utility knife		
Remove knife guard	Cut to hand	
Hold and secure the box to be opened	Injury from box shifting while being cut	
Open the box using the knife, cutting away	Cut to body or hand from the body	
When completed, re-sheath the knife	Someone else could be cut	
Return the knife to the proper location		

Analysis by:

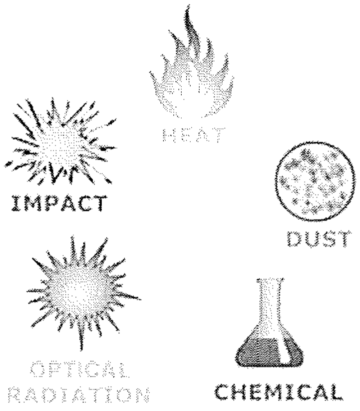
Analysis approved by:

Date Conducted:

Date Revised:

*Page _1_ of _1_*

Workplace Hazard Assessment & Certification
For Compliance with Personal Protective Equipment
Federal OSHA Regulation 29 CFR 1910.132-138



Department: ____________________

No. of Employees ____________

Job Function or Work Area:_____________

Date: _________________

Directions:

1) Walk the workplace and look for hazards or potential hazards which may pose an injury risk.

2) If you determine that a hazard or potential hazard exists, place a check in the box.

3) Next, check the level of seriousness based on the potential for the hazard to occur, and which may require the use of Personal Protective Equipment (PPE).

Existing or Potential Eye and Face Hazards (1910.133)

Risk Level:

	Slight	Moderate	Serious	Severe
	☺	✋	☠	💣
(check any which apply, then assign a risk level)				
☐ Flying particles	____	____	____	____
☐ Heat and hot sparks	____	____	____	____
☐ Dust	____	____	____	____
☐ Molten metal fumes	____	____	____	____
☐ Chemical splash or spray	____	____	____	____
☐ Gases or vapors	____	____	____	____
☐ Light or radiation	____	____	____	____
☐ Other hazards (please describe)	____	____	____	____

Recommendations for equipment selection:

Existing or Potential Hazards to the Head (1910.135)

Risk Level:

	Slight	Moderate	Serious	Severe
	☺	✋	☠	💣
(check any which apply, then assign a risk level)				
☐ Flying particles	____	____	____	____
☐ Falling objects	____	____	____	____
☐ Electrical shock	____	____	____	____
☐ Head bump	____	____	____	____
☐ Other (please describe)	____	____	____	____

Recommendations for equipment selection:

(page 2, 8/06)

Existing or Potential Hazards to Feet (1910.136)

(check any which apply, then assign a risk level)

	Risk Level:			
	Slight 😐	Moderate ✋	Serious ☠	Severe 💣
☐ Falling objects				
☐ Rolling objects				
☐ Piercing of the sole				
☐ Electrical shock				
☐ Other				

(please describe)

Recommendations for equipment selection:

Existing or Potential Hazards to the Hands (1910.138)

(check any which apply, then assign a risk level)

	Risk Level:			
	Slight 😐	Moderate ✋	Serious ☠	Severe 💣
☐ Skin absorption of hazardous chemicals				
☐ Cuts or lacerations				
☐ Severe abrasions				
☐ Punctures				
☐ Chemical burns				
☐ Thermal burns				
☐ Temperature extremes				
☐ Other				

(please describe)

Recommendations for equipment selection

Additional comments:

Survey Conducted By: ______________________________

Follow-up Evaluation Date: __________________________