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“Safety First”, Just a Slogan?

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“Safety First”, Just a Slogan?

Abstract

The objective of this study was to: 1) explore safety and health practices within Career and Technical Education (CTE); and 2) identify the perceived obstacles, which appear to hinder implementation of safety and health programs. **The background** of the study was founded on a general belief that providing safe and secure teaching and learning environments can be an ongoing challenge. “Safety first”, so the slogan goes, has been a longstanding priority of CTE. However, with the rise of curricular assessment demands in schools, has safety taken a back seat to other educational initiative of the day? Through a survey **research method**, CTE instructors were asked questions related to the status of a safety and health program, safety training and assessments completed by students prior to participation within the laboratory as well as the instructor’s perceived barriers to implementing occupational safety and health procedures. **The results** suggested that some laboratory and classroom safety practices are in need of improvement. **The conclusions** would be useful to school administration; faculty, safety compliance personnel and teacher educators interested in the application of enhanced occupational safety and health practices.

Keywords: Career and Technical Education Safety, Engineering and Technology Education Safety, Occupational Education Safety, Classroom and Laboratory Safety, School Safety.

Introduction

Since the beginning of education in schools, teachers have been concerned about the health and safety of their students. A considerable amount of attention has been focused on providing a safe educational environment to promote enhanced learning and skill development (Storm, 1993; Threeton & Walter, 2013). However, recent events have revealed that there is good reason for concern related to safety and health practices within Career and Technical Education (CTE).

For example, in 2013 a tire assembly explosion severely injured a sixteen-year-old that was working in an automotive technology program. As a result of the incident, the student lost the use of his right eye and part of his brain. What followed were six surgeries, including two on his brain, and two months in the hospital, one of which he spent in a medically induced coma. Later during the school year, another student was pinned to a workstation by a vehicle in the same automotive technology program. This incident resulted in the student being slightly injured (Beach, 2014).

Incidents such as this highlight the significance of examining occupational safety and health practices within CTE. While all individuals are susceptible to accidents, occupationally related safety literature has revealed that teens are injured at a higher rate than adult workers (NIOSH, 2007a). Every year, 70 teens die from work injuries in the

U.S., while another 84,000 are injured severely enough as to require a visit to an emergency room (NIOSH, 2007b; UC Berkeley Labor Occupational Health Program, 1997). As an educational platform for the workforce, Career and Technical Educators and administrators must provide a safe teaching and learning environment while concurrently instructing students to work safely in the school and on-the-job. Therefore, the purpose of this research was to examine current occupational safety and health practices within CTE programs to determine if interventions are needed to promote a safe and secure environment for enhanced learning and skill development.

Occupational Safety and Health Practices

Conducting CTE in a manner that promotes learning, but also ensures the safety and health of students is a major point of obligation (Gray & Herr, 1998). However, in spite of all the positive elements associated with CTE, accidents still happen and are extremely serious in some cases (Threeton, 2014). As an example, a 22-year old was killed while working in the machine shop of an educational laboratory. The incident occurred when the student's hair became caught in a lathe, whose rotating axis is used to hold materials like wood or metal being shaped (Henderson, Rosenfeld, & Serna, 2011). In another event, an 11th grade student enrolled in a carpentry program was injured while turning a piece of stock. Despite successfully passing an OSHA 10-hour safety course, the student's ring finger came in contact with the rotating cutting head of a jointer leading to an amputation of the limb (MDPH, 2009). Upon investigation, one of the prescribed recommendations from the National Institute for Occupational Safety and Health (NIOSH) was to implement an Occupational Safety and Health Program to aid in complying with safety regulations (MDPH, 2009).

Given that Career and Technical Education provides a simulated experiential learning structure, instructors must anticipate unsafe situations, which could reasonably be foreseen and design curriculum and instructional practices to minimize the possibilities of such risks (Gray & Herr, 1998). Therefore, preparing the laboratory, educating students, acting as a safety role model, and most importantly implementing an occupational safety and health program can aid efforts (Meanor & Walter, 2010). An occupational safety and health program within CTE is a set of policies, procedures and practices specifically designed to promote a safe teaching and learning environment (Threeton & Walter, 2013). While many states require a structured safety protocol in CTE, little to no research has been conducted to determine whether or not instructors are implementing and enforcing occupational safety and health programs as an element of their curriculum and instruction (CDC, 2012; OSHA, 2013). This question tends to go ignored until an incident occurs, leading to an investigation (MDPH, 2009).

As the standard bearers within the institution, instructors have a major responsibility to consistently evaluate the occupational safety and health practices to promote security (Balamuralikrishna & Dugger, 1995). Therefore, efforts to evaluate occupational safety and health in workforce preparation programs should be conducted in a systematic reflective manner to promote the advancement of safety practices within the institution (Schulte, Carol, Okun, Palassis & Biddle, 2005).

Conceptual Framework

In 2010, the U.S. Department of Labor reported approximately 3.1 million nonfatal occupational injuries and illnesses. Given that CTE is a gateway to the world-of-work, and that over 90% of high school graduates have taken at least one related course (U.S. Department of Education, 2012), Career and Technical Educators have a major responsibility to establish and maintain safe and healthful teaching and learning environments to promote future career success. While there are a multitude of important educational initiatives today, Zirkle (2013) emphasized, that providing a safe teaching and learning environment should be the first priority of every instructor. According H.W. Heinrich (1931) preventable accidents result from a chain of sequential events, which are metaphorically similar to a line of falling dominoes. Therefore, as one domino falls it triggers the next and so on. By removing factors such as unsafe conditions and acts from the learning environment, faculty and administration can prevent this harmful chain reaction.

The foundation of this research began with the premise that accidents should be viewed as preventable by removing unsafe conditions and acts, while promoting enhanced learning through increased educational safety programming. As Storm (1993) noted, the responsibility for the physical welfare of students rests with the instructor. If Career and Technical Educators are responsible for educating future workplace professionals on occupational safety and health practices, it is critical to understand the extent to which they are incorporating safety and health programs into their curriculum and instruction as well as assess what is either helping or hindering them from doing so. Therefore, the conceptual framework in which this research was founded included NIOSH's Safety Checklist Model (CDC, 2012) for establishing Occupational Safety and Health Programs in CTE. According to NIOSH, the key to safe practice within the educational environment while simultaneously promoting enhanced teaching and learning opportunities is to establish a quality occupational safety and health program (CDC, 2012). NIOSH's Safety Checklist Model contains five elements which serve as a guide to establishing effective safety and health programs including: 1) Assuring management commitment; 2) Assuring employee and student involvement; 3) Identifying and prioritizing potential hazards; 4) Eliminating hazards; and 5) Training personnel. Therefore, this model served as the conceptual framework for this research, as it directly corresponds with the primary focus of the study. This study specifically focused on two elements of the model including: 1) Identifying and prioritizing potential hazards (i.e., identifying and prioritizing items, which are obstacles to implementation of a safety and health program); and 2) Training personnel (i.e., safety training provided and assessed prior to student participation in the program laboratory), as educating students and detecting safety concerns is a priority of CTE. Figure 1 is provided to illustrate the conceptual framework in context.

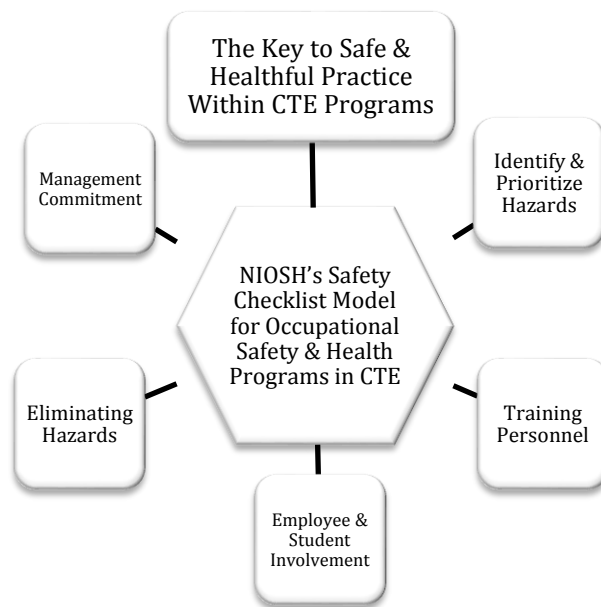


Figure 1. Removal of unsafe conditions and acts via NIOSH safety programming

The Problem

Laboratories and classrooms are often filled with dangerous tools, equipment, processes, materials and supplies, within a wide range of environmental conditions, which are difficult to control. Career and Technical Educators, unlike their academic counterparts, are expected to manage an occupational related learning environment as well as promote safe practice to control for potential hazards common to a specific trade. As scholars have highlighted, the margin for error within some programs is so small that improper program safety and health practices can be the difference between life and death (Threeton & Walter, 2013; Meanor & Walter, 2010; Storm, 1993). Yet, little research has been conducted on this topic to determine the level to which safe and healthful practices are being provided (CDC, 2012; OSHA, 2013). Therefore, this phenomenon creates a problem that requires attention. With the theme of reflection in mind, this research sought to explore the safety and health practices in some of the most hazardous educational programs, including: 1) Automotive Technology; 2) Carpentry; 3) Cosmetology; and 4) Masonry.

Purpose and Research Questions

This topic was investigated for the purpose of providing more information on current occupational safety and health practices within Career and Technical Education to determine if interventions are needed to promote safe and secure teaching and learning environments. Therefore, this study sought to answer the following questions:

1. What is the distribution of practicing instructors with a structured occupational

- safety and health program as an integral component of their curriculum and instruction?
2. What is the distribution of students, which are required to complete safety training and a test with a perfect score prior to participation within the laboratory?
 3. What, if any, barriers do instructors perceive to hinder their ability to implement an occupational safety and health program in their classroom/laboratory?

Methodology

Instrumentation

The primary investigator utilized a survey research method in this investigation. The instrumentation utilized was an investigator-developed survey based on NIOSH's Safety Checklist Model for establishing effective safety and health programs within CTE. The survey included 27 questions, which corresponded with specific elements of NIOSH's prescribed model, including the Identifying and Prioritizing Hazards and Training Personnel elements of the conceptual framework (see Figure 1). The specific survey items included status of a safety and health program, safety training and assessments completed by students prior to participation within the laboratory as well as instructor's perceived obstacles to implementing an occupational safety and health program. Additional items included a demographics section within the final portion of the survey. The survey was reviewed for face and content validity by a panel of current technical educators well versed in proper safety practices, teacher education faculty members, and experts in survey development. After the panel completed the analysis, the primary investigator amended the survey to correspond with the prescribed recommendations.

Following human subjects protocol approval, a pilot study was administered to assess the reliability of the instrumentation as well as determine if there was a need for a formal investigation. Therefore, Career and Technical Educators from the same state, which were not a part of the formal study, completed the survey via the web-based assessment platform, "Qualtrics". Upon analysis of the results, the Cronbach's alpha coefficient was determined to be .833. Further analysis revealed a need for a formal investigation into occupational safety and health practices within CTE.

Target Population

The target population for the formal study included trade and industry CTE instructors at the secondary level in the 30 county, central region of an eastern state. More specifically, individuals eligible to participate in this study were defined as active trade and industry CTE instructors in this eastern state within one of following program areas including automotive technology, carpentry, cosmetology or masonry. Instructors from these programs were specifically targeted, as they represented some of the most hazardous CTE subject area classifications. According to the designated State Department of Education records, there were a combined total of 75 practicing automotive technology, carpentry, cosmetology and masonry instructors in the central

region of the state during the time this research was conducted. Thus, a minimum sample size of 63 was required for the study to represent the population with no more than a 5% margin of error with 95% confidence (Isaac & Michael, 1997).

Data Collection

This research was conducted during the spring of 2013. The appropriate clearance was obtained from the Office for Research Protections regarding the inclusion of human subjects in this research. Like the pilot, the formal study was also conducted using the web-based survey assessment platform, Qualtrics. Given this was a preliminary study and the target population was relatively small, the expert panel charged with reviewing the survey recommended a census investigation method. Therefore, the primary investigator followed this recommendation. In order to obtain an acceptable response rate, Dillman, Smyth, and Christian's (2014) procedures and timelines for conducting Internet surveys were employed. An email pre-announcement, an initial invitation to participate and three email contacts were sent to non-respondents.

Rate of Return

Sixty participants responded to the survey, which provided an overall response rate of 80%. The statistical technique of comparing early and late respondents (Miller & Smith, 1983) was utilized to control for non-response error. Individuals that responded prior to the third contact were considered to be early respondents, while those who responded after the third contact were considered late. A comparison of early and late responses revealed no statistical difference. This process allowed the researchers to generalize to the non-respondents and provided a methodological basis for assuming that they had responded. Therefore, the investigators were able to generalize to the entire population of 75 CTE instructors based on the sample responses (Miller & Smith, 1983).

Participant Demographics

Demographic data is included in Table 1 to describe the respondents of the study.

Table 1

Background of Participants

	<i>N</i>	%
Gender (*n=57)		
Male	42	74
Female	15	26
Designated Program of Institution (*n=60)		
Automotive Technology	20	33
Carpentry	16	27
Cosmetology	15	25
Masonry	9	15
Years of Trade Specific Work Experience (*n=56)		
None	0	0
1 to 5 yrs.	5	9
6 to 10 yrs.	9	16
11 to 15 yrs.	16	29
16 to 20 yrs.	18	32
21 or > yrs.	8	14

Results**Research Question 1**

The first research question sought to identify the distribution of practicing CTE instructors with a structured occupational safety and health program as an integral component of their curriculum and instruction. This question was answered by calculating the frequencies and percentages of the items related to this query within the survey (see Table 2).

Table 2

Participant Response Pertaining to Safety and Health Program Status (n =60)

	Participant Response	
	Yes	No
Does your CTE program implement a structured occupational safety and health program as an integral part of the curriculum and instruction?	56 (93%)	4 (7%)

Research Question 2

The second question sought to assess the distribution to which students were

required to complete safety training and related assessment protocol prior to participation within the designated CTE program. This question was answered by calculating the frequencies of the data collected from the survey, which related to the training personnel elements of NIOSH's prescribed safety and health practices within the model (see Table 3).

Table 3

Findings by Occupational Area: Training Personnel (TP)

Question	Participant Response									
	Automotive		Carpentry		Masonry		Cosmetology		Total	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Do students receive safety training prior to participation within your CTE program laboratory? (*n=55)	16	1	12	2	7	2	13	2	48	7
Are students required to complete a safety test prior to participation within your CTE program laboratory? (*n=57)	18	1	13	1	9	0	11	4	51	6
Are students permitted to participate in laboratory activities without earning a 100% on a safety test? (*n=57)	3	16	2	12	3	6	11	4	19	38
<i>Note.</i> The *n represents the number of participants in the sample who responded to the given question, out of n=60.)										

Research Question 3

The third question sought to identify perceived barriers to implementing an occupational safety and health program via a four point Likert-type scale, as well as a follow-up open-ended text entry item. All participants were given the opportunity to respond to this question regardless of how they answered question one within the survey, as per a recommendation from the expert panel responsible for reviewing the survey for content and face validity. The intent behind this recommendation was to capture the full extent of perceived barriers to implementing an occupational safety and health program.

Upon analysis, the item: *chronic student absences* (M = 2.95, SD = .96) rated the highest among perceived barriers, with 35.7% strongly agreeing (n = 20) and 33.9% agreeing (n = 19). The item: *demands of providing adaptations/accommodations for students with special needs* (M= 2.56, SD = 1.02) was also rated higher among perceived barriers, with 21.1% strongly agreeing (n = 12) and 31.6% agreeing (n = 18). The items rating the lowest in disagreement as perceived barriers included: *serving as a Career and Technical Student Organization (CTSO) advisor* (M = 1.77, SD = .85), which was followed closely by a *lack of personal protective equipment* (M = 1.84, SD = .84) (see Table 4).

Table 4

Perceived Barriers to Implementing an Occupational Safety and Health Program.

Question	N	Mean	SD
Chronic student absences	56	2.95	0.96
Demands of providing adaptations/accommodations for students with special needs	57	2.56	1.02
Lack of funding	57	2.46	0.89
High student enrollment per class	57	2.44	0.89
Lack of adequate classroom/laboratory space	57	2.39	0.94
Demands of the State Department of Education initiatives	56	2.36	0.96
Demands of the integration of academics within curriculum and instruction	57	2.30	0.87
Demands of attending IEP meetings	56	2.30	0.95
The layout of my instructional classroom/laboratory	57	2.25	0.79
The state assessment accountability demands	56	2.20	0.86
Lack of classroom/laboratory organization	57	2.16	0.77
Demands of professional development	57	2.14	1.01
The overall physical condition of my classroom/laboratory	57	2.14	0.72
Lack of classroom/laboratory technology	57	2.11	0.82
Lack of tools, equipment, and or supplies	57	2.05	0.87
Demands of State teacher certification requirements	57	2.02	0.86
Lack of personal protective equipment (PPE)	57	1.84	0.84
Serving as a CTSO advisor	57	1.77	0.85

Note. Scale used 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree. In addition to the questions listed on the Likert-type scale, participants were given the opportunity to provide a text response, allowing them to list any other obstacles that they believe hinder their ability to carry out a health and safety program in their CTE program. Other obstacles (differing from Table 4) included: students' attitudes (mentioned 3 times), lack of time to add/modify safety plans, demands relating to the job that are not related to instructing students, and other instructors who do not "follow through to the same degree".

Conclusions

Research Question 1

While one could presume that trade and industry related CTE programs consistently reflect acceptable safety standards, the results suggested that there may be

reason for concern. The results for question one revealed that 56 (93%) instructors reported having a structured occupational safety and health program as an integral element of the curriculum and instruction. Overall, this finding appears to be very positive with a majority of participants reporting an occupational safety and health program as an integral component of the educational program as is recommended within NIOSH's Safety Checklist Model. However, there were 4 (7%) instructors, which reported not having an occupational safety and health program. Therefore, increased risk may well be associated with CTE programs, which have instructors that do not implement a safety and health program, as it is an effective way to comply with applicable safety and health standards (OSHA, 2013). In order to promote structure, Threeton (2014) recommended a set of essential elements for safety and health programs in CTE, which are briefly summarized in Figure 2. Using this information as a resource, instructors could develop and refine safety programing within the teaching and learning environment.

Essential Elements of Safety and Health Programs
The instructor operates the CTE program in compliance with State and Federal regulations
Records of safety lessons delivered to students are kept on file with the instructor. Appropriate documentation includes: 1) the date when the safety instruction was delivered, 2) a record of corresponding pupil attendance, 3) supporting information sheets and 4) the safety evaluation of each student's knowledge and skill development.
Records of completed safety evaluations are kept on file with the instructor. Appropriate documentation includes: 1) the date the evaluation was completed, 2) the final grade (i.e., a perfect score is required for each student prior to participation in lab related activities) and 3) the student's signature.
Safety rules are visibly posted in the CTE program with clearly defined consequences for violation.
A hazard prevention safety committee has been maintained by the instructor, which includes faculty, administration, students and school employees. Appropriate documentation includes meeting minutes. (i.e., a minimum of four meetings evenly distributed throughout the academic year).
The instructor regularly engages the Occupational Advisory Committee (OAC) in discussions on occupational safety and health elements and needs within program. Appropriate documentation includes meeting minutes.
The instructor has a written maintenance plan within a handbook, file or computer software program for both routine and preventive maintenance. The plan should include: 1) a list of apparatus such as tools, machines, equipment, facilities, etc. that require maintenance, 2) the maintenance requirements and service intervals for each item, 3) the date service was completed and 4) the individual or vendor responsible for the maintenance and or housekeeping task(s).
The instructor regularly conducts safety inspections within the CTE program to identify potential hazards and unsafe practices. Appropriate records include: 1) the date in which the inspection was conducted, 2) a signature of the individual that completed the inspection and 3) the written procedures for corrective action if needed.
The instructor has assured that every hazardous material and substance within the program is appropriately labeled and contains a corresponding Safety Data Sheet (SDS) within a readily accessible file.
The instructor visibly displays a written statement outlining all Personal Protective Equipment (PPE) required to work safely within the CTE program.
The instructor has a written emergency action plan that corresponds with school protocol, but is also unique to the specific CTE program. Appropriate records include: 1) escape procedures, signals and routes, 2) procedures for accounting for all personnel, 3) rescue and medical duties and 4) protocol for reporting emergencies.

Figure 2. Essential elements of safety and health programs for CTE

Research Questions 2

The findings related to safety training and evaluation practices in the CTE program, corresponded with research question two. When asked if students receive safety training prior to participation in the laboratory, 48 (87%) instructors indicated they did, while seven (13%) reported their students did not. Similarly, 51 (89%) instructors revealed their students were required to complete a safety test prior to participation in the laboratory, whereas six educators did not require an assessment. While these findings represent a relatively small distribution of participants whom did not require safety training and assessments of students prior to participation in the laboratory, the results are somewhat troubling, as promoting awareness of hazards in the laboratory environment must be a priority of every educator (Zirkle, 2013).

Another critical finding, which corresponded with research question two included 19 (33%) instructors reporting that they permitted students to participate in laboratory activities without earning 100% on a safety test, including 11 instructors of cosmetology, three automotive technology, three masonry and two from the carpentry program area. This finding is noteworthy, as the margin for error within many trade and industry CTE programs is so small that any form of oversight or related mistake could be life threatening. It could be the one or more items missed on the safety evaluation that causes the greatest harm (Threeton & Walter, 2013). Furthermore, students could find themselves unable to recognize occupational hazards upon transition to the world-of- work.

Research Question 3

The third research question sought to identify perceived barriers to implementing an occupational safety and health program. The questionnaire gauged instructors' perceptions using a four point Likert-type scale (i.e. 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree). At first glance the results for question three are not astounding; the means for each barrier appear to be somewhat neutral. The instructors' responses, for the most part, appear to "disagree" with the question, meaning that these items do not hinder their ability to implement an occupational safety and health program, as most of the barriers' means tend to be around a 2 = disagree. However, a few of the perceived barriers' means were closer to "agree" than "disagree", such as *chronic student absences* (M = 2.95), the demands associated with *adaptations and accommodations for students with special needs* (M = 2.56), *lack of funding* (M = 2.46), and *high enrollment per class* (M = 2.44). Further analysis of these particular barriers revealed close to half of the participants agree that these items are hindering their ability to implement a safety and health program including: *chronic student absences* (n = 39, 65%), the demands associated with *adaptations and accommodations for students with special needs* (n = 30, 50%), *lack of funding* (n = 25, 41.6%), and *high enrollment per class* (n = 24, 40%).

The participants were also provided with the option to offer an open entry text response, in reference to perceived barriers. Instructors noted: students' attitudes (mentioned 3 times), lack of time to add/modify safety plans, demands relating to the job that are not related to instructing students, and other instructors who do not "follow

through to the same degree,” as potential obstacles in implementing a safety and health program.

Intervention strategies appear to be needed in these particular areas to support implementation of safety and health programs. Strategies could range from providing alternative pathways of safety programming for absent students, supplemental learning support for individuals with special needs, expanded funding in the form of grants or other sources and manageable student enrollment for the instructor(s) (see Figure 3).

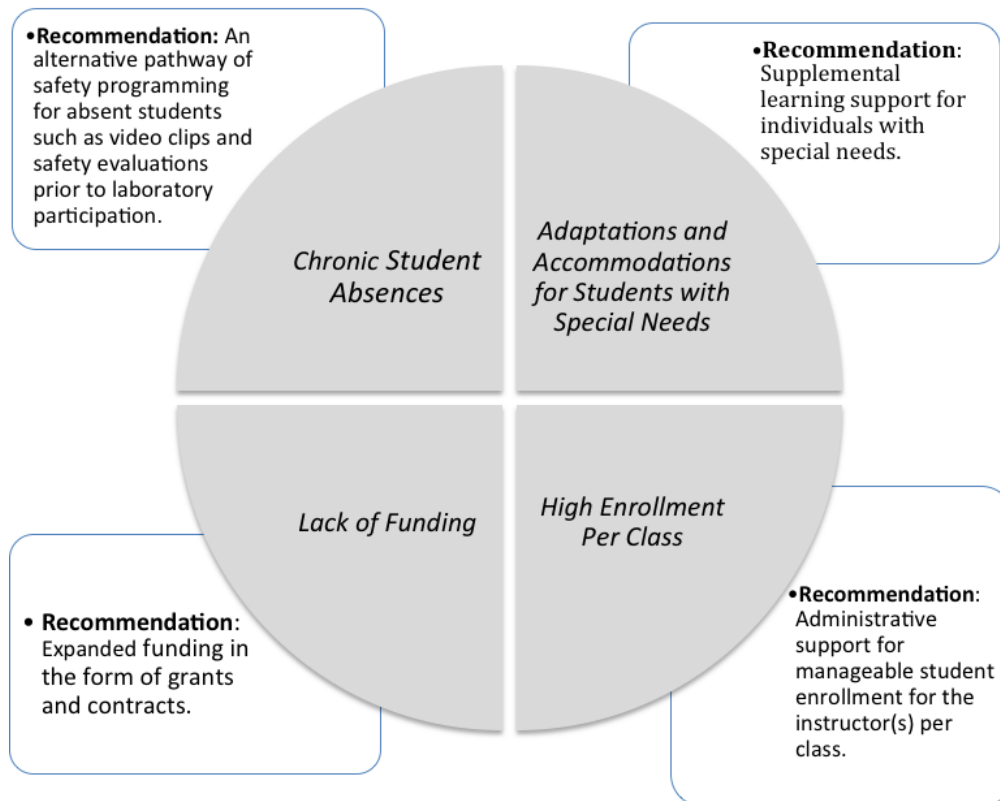


Figure 3. Interventions for perceived barriers to implementing a safety and health program

It is plausible that lack of acknowledged hindrances may be due to the fact that they were not identified in the questionnaire as potential barriers, and therefore went undisclosed by participants. Conversely, the scarcity of perceived barriers could also be owed to the diligence that the surveyed instructors have in implementing occupational safety and health programs in their educational program, and therefore they found no notable barriers

Discussion

We now know there is need for concern related to occupational safety and health practices in specific trade and industry CTE programs While 93% of participants within

this study reported having a structured occupational safety and health program as an integral element of the curriculum and instruction, the results appear to reveal a subgroup of instructors in need of occupational safety and health remediation.

Instructors identified chronic student absences, the demands associated with adaptations and accommodations for students with special needs, lack of funding and high enrollment per class as perceived barriers to implementing safety and health programs. However, there appears to be an additional area of concern, as the results of research question two revealed, a third of the participants within this study permitted students to participate in laboratory activities without earning 100% on a safety evaluation. This finding is of great importance, as the margin for error could be so small that any form of miscommunication within certain elements of the program could be the difference between life and death. While it may take multiple attempts for some students to earn a perfect score on safety evaluations, investment in the remediation process can safeguard life and limb (Threeton & Walter, 2013).

While this research revealed some notable findings, there are a few limitations, which are important to highlight including: 1) the results are not generalizable outside of the target population; and 2) a large portion of the survey items were multiple choice, thus some items may not have been fully captured.

Recommendations

Based on the conclusions of this study the following recommendations are made.

- 1.) School administration and instructors from the designated programs should seek technical assistance from school safety specialists, OSHA, NIOSH and teacher educators to immediately correct the occupational safety and health concerns highlighted in this study. This support should align with NIOSH's Safety Checklist Model (CDC, 2012) and the essential elements highlighted in Figures 2 and 3.
- 2.) Professional development opportunities should be provided to the instructors and school administration, which emphasizes interventions to overcome significant barriers noted within Table 4.
- 3.) Since there is a dearth of occupational safety and health studies within CTE this investigation should be replicated on a larger scale in other parts of the country.

The modern workplace favors those with the, transferable skills, which are provided in Career and Technical Education (Wyman, 2015). Among these transferrable skills, proper safety and health practices are paramount. Upon analysis, safety appears to be a top priority for a majority of participants in this study. "Safety first", does appear to be more than just a slogan with this subgroup of educators. However, there were some areas of concern highlighted, which should be viewed as elements in need of attention. Therefore, further research and professional development should be conducted to advance proper occupational safety and health practices within Career and Technical Education.

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