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An Examination of Safety and Health Practices in Agricultural Mechanics Education

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Abstract

Providing training of safe operations and behaviors in Agricultural Mechanics classrooms and laboratories is an important aspect of the agricultural education teaching and learning environment. The purpose of this survey research study was to examine current occupational safety and health practices within agricultural mechanics programs. The research questions guiding the study were: 1) What is the percentage of practicing agricultural mechanics instructors that have incorporated an occupational safety and health program as a component of their curriculum and instruction? 2) What, if any, deficiencies are associated with safety and health practices within agricultural mechanics programs? 3)What, if any, obstacles do agricultural mechanics instructors perceive to hinder their ability to implement an occupational safety and health program in their classroom and laboratory? The current findings identified obstacles to implementing an occupational safety and health program; including lack of funding and adequate teaching space. Many of the respondents reported acceptable safety standards in the learning environment, as a majority of respondents reported having an occupational safety and health program. However, the results suggest there is room for improvement. Thus, recommendations regarding professional development of teachers that encourage improvement to safety and health practices are provided to agricultural educators, teacher educators, and school administrators.

Keywords: CTE Safety, Agricultural Education Safety, Occupational Education Safety.

Introduction

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). Occupations within agriculture are among the most dangerous. Fatality rates in agriculture occupations were seven times higher in 2011 when compared to private industry (OSHA, 2013). Youth that are hired into these agriculture positions are among the highest at risk for injury. Schulte, Stephenson, Okun, Palassis, and Biddle (2005) state; "Young and new workers experience the highest rates of occupational injuries of any age group" (p. 404). Farm safety education requires multiple groups, including educators, to come together to keep children safe (Runyan, 1993).

Agricultural educators need to be concerned about the health and safety of their students. A great deal of attention has been focused on providing a safe educational environment to promote enhanced learning and skill development (Storm, 1993; Threeton & Walter, 2013; Zirkle, 2013). Teachers must provide students with proper training to prepare them for the dangers in all agricultural program environments; including the agricultural mechanics classroom and laboratory. An essential element to keeping students safe is a safety and health implementation plan that is

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integral to the curriculum and instruction (Threeton & Evanoski, 2014; Zirkle, 2013).

As a training ground for the world-of-work, agricultural education instructors need to promote safety in all aspects of the program including classroom/laboratory instruction, Supervised Agricultural Experience, and the FFA component. Scholars have recommended for a long period of time that further research should be conducted to examine how occupational safety and health is incorporated into educational programs (Balamuralikrishna & Dugger,1995; Schulte, et al., 2005; Threeton & Evanoski, 2014).

Occupational Safety and Health: Deficiencies in Agricultural Education

Conducting classroom and laboratory instruction in a manner that promotes learning, but also ensures the safety and health of the student is a major obligation (Gray & Herr, 1998; Threeton & Walter, 2013). In response to this obligation, the National Institute for Occupational Safety and Health (NIOSH) developed a Safety Checklist Model (CDC, 2012) for establishing effective occupational safety and health programs within Career and Technical Education (CTE), which includes Agricultural Education. An occupational safety and health program within Agricultural Education is a set of policies, procedures and practices specifically designed to promote a safe teaching and learning environment (Threeton & Evanoski, 2014). NIOSH's Checklist Model contains five essential classifications of guidelines including: 1) Assuring management commitment; 2) Assuring employee and student involvement; 3) Identifying and prioritizing potential hazards; 4) Eliminating hazards; and 5) Training personnel. While many states require the use of NIOSH's Safety Checklist Model as the minimum, 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, causing the educational institution, state, or NIOSH to investigate (Threeton & Evanoski, 2014).

As an example, NIOSH recently conducted an investigation into an accident in which an 11th grade student within a New England state was injured while processing a piece of stock on wood working equipment. Despite successfully passing an OSHA ten-hour safety course, the student's ring finger came into contact with the rotating cutting head of a jointer (MDPH, 2009). Following the accident, the student was transported to the hospital, where the finger was amputated at the middle knuckle. The student's instructor was present, but did not witness the incident. One of the prescribed recommendations from NIOSH was that the NIOSH Safety Checklist Model be utilized, as it was designed to aid in complying with OSHA regulations (MDPH, 2009).

With clear guidelines established by NIOSH as well as corresponding state and federal legislation, why are accidents occurring in the laboratory setting? Are instructors utilizing the guidelines? Is safety legislation being enforced? Do students, instructors, and administration understand it? Are the guidelines supported and encouraged by administration? Questions such as these need to be explored in order to gauge what obstacles agricultural education instructors may face in implementing occupational safety and health practices within their designated programs. Yet, little scholarly literature exists which examines if the elements of NIOSH's guidelines are being implemented at the classroom/laboratory level (CDC, 2012; OSHA, 2013). Moreover, Schulte, et al., (2005), concluded that little quantitative information exists on safety practices provided within career and

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technical programs, therefore efforts to evaluate occupational safety and health in workforce preparation programs will require studies that evaluate programs in a systematic manner.

The Problem

An agricultural mechanics program can be a dangerous educational environment (Dyer & Andreasen, 1999; McKim & Saucier, 2011). Agricultural Educators, unlike their academic counterparts, are expected to manage the learning environment as well as promote safe laboratory practices to control for these potential hazards. With careful, structured planning and evaluation, the risks can be minimized for learners. As scholars have highlighted, the margin for error is so small that improper program safety and health practices can be the difference between life and death (Meanor & Walter, 2010; Storm, 1993; Threeton & Walter, 2013). Are agricultural mechanics educators utilizing resources, such as the NIOSH Safety Checklist, to help keep students safe?

Purpose and Research Questions

The purpose of this survey research study was to examine current occupational safety and health practices within secondary agricultural mechanics programs. The specific purpose was to determine if further research and development is needed within the field. While a multitude of studies have examined safety and health practices within the workforce (NIOSH, 2004; Threeton & Evanoski, 2014), few have investigated this topic within agricultural mechanics. Therefore, this research study was conducted to examine current occupational safety and health practices within secondary agricultural mechanics education programs. Specifically, this study sought to answer the following questions:

1. What is the percentage of practicing agricultural mechanics instructors that have incorporated an occupational safety and health program as a component of their curriculum and instruction?
2. What, if any, deficiencies are associated with safety and health practices within agricultural mechanics program?
3. What, if any, obstacles do agricultural mechanics instructors perceive to hinder their ability to implement an occupational safety and health program in their classroom/laboratory?

Conceptual Framework

In 2010, the U.S. Department of Labor reported approximately 3.1 million nonfatal occupational injuries and illnesses. Given that Agricultural Education is a gateway to the world-of-work, and that over 90 percent of high school graduates have taken at least one Career and Technical Education (CTE) related course (U.S. Department of Education, 2012), Agricultural 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 priority of every instructor. According Heinrich (1931) preventable accidents result from a chain of sequential events, which are metaphorically like a line of falling dominoes. Therefore, as one domino falls it triggers the next and so on. By removing factors (metaphorical dominoes) such as unsafe conditions and acts from the learning environment, Agricultural Educators can prevent this harmful chain reaction (Threeton & Walter, 2013).

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

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(1993) noted, the responsibility for the physical welfare of students rests with the instructor. If Agricultural 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. 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, which includes Agricultural Education. 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. Figure 1 illustrates the conceptual framework in context.

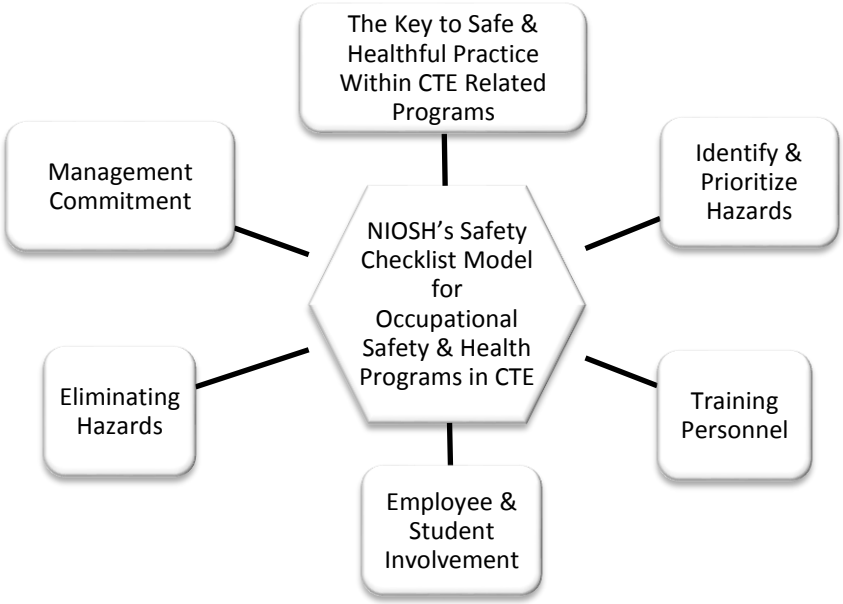

Figure 1. Removal of unsafe conditions and acts via NIOSH safety programing

Methods

Descriptive survey research was conducted utilizing an online survey system to obtain data from secondary agricultural mechanics educators in Pennsylvania. Data collection for this research study is part of a larger study on classroom and laboratory safety. The instrument included a demographic section, as well as Likert-type statements related to the elements of the NIOSH safety checklist model. Procedures outlined by Dillman, Smyth, and Christian (2014) were followed to encourage response of participants.

Target Population of the Study

The target population for the study

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included active educators in Pennsylvania currently teaching Agricultural Mechanics at the secondary level during the Spring of 2014. According to the Pennsylvania Department of Education records, there were a combined total of 156 educators teaching Agricultural Mechanics in Pennsylvania during the Spring of 2014.

Instrumentation

The researchers utilized survey research 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 related settings such as Agricultural Education. The survey included 51 questions, which corresponded with five key elements of NIOSH's prescribed safety and health practices for CTE. Additional survey items included a demographics section as well as perceived obstacles to implementing a safety and health program section. The survey was reviewed for face and content validity by a panel of current Career and Technical Educators well-versed in proper safety practices in Agricultural Mechanics education, 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 of moving demographics to the end of the survey instrument, as well as removing redundant questions. The researcher asked the panel to review the instrument a second time once the suggested amendments were made. The panel expressed their satisfaction with the amendments upon second review. Following human subjects protocol approval, a pilot study was administered to assess the reliability of the instrument. Thirty-five instructors 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, calculated on the 18 Likert-type items (Obstacles), was determined to be acceptable at .833.

Data Collection

Following human subjects protocol approval, the data collection phase of this research was conducted during the Spring of 2014. The data was collected using the web-based survey assessment platform, Qualtrics. In order to obtain an acceptable response rate, Dillman, et al., (2014) procedures and timelines for conducting Internet surveys were employed. An email pre-announcement was sent to let the potential participants know about the email that they would be receiving with the actual survey. One week later, the initial invitation and survey were sent to all Agricultural Mechanics educators in Pennsylvania. Three follow-up emails were sent to obtain a higher response rate. The first reminder was sent two weeks following the initial invitation and the second reminder was sent two weeks following the first reminder. One final reminder was sent one week following the previous reminder. Participants were given one week from the final reminder to respond at which the survey was closed.

Response Rate

Sixty-eight (44%) out of the 156 potential participants responded to the survey. The adjusted response rate, due to unexplained nonresponses, was 37% (n= 57). These unexplained nonresponses consisted of participants completing the first few questions of the survey and not finishing the remainder of the instrument. Therefore, the researchers adjusted the overall response rate downward to 37% to more accurately reflect the overall response rate. While this adjusted response rate is acceptable for survey research (Dillman, Smythe, & Christian, 2014), a statistical technique of comparing early and late respondents (Miller & Smith, 1983) was utilized to control for non-

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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, utilizing the four areas of the NIOSH Safety Checklist, revealed no statistical difference. This process of comparison of early to late respondents allowed the researchers to generalize to the target population (Miller & Smith, 1983).

Results

The results for each of the three research questions are provided in this section. Descriptive statistics are provided for each of the respective objectives.

Background of Participants

Demographic data are presented in Table 1. The majority of participants were male (*n*= 40, 70%), between the ages of 40 and 59 (*n*=30, 53%) who also possessed an Instructional II Teaching Certificate (*n*=42, 74%), and taught at a rural school (*n*=46, 81%).

Table 1

Demographic Data of Participants

	n	%
Gender (n = 57)		
Male	40	70
Female	17	30
Age Range (n = 57)		
20 to 29 yrs	10	18
30 to 39 yrs	16	28
40 to 49 yrs	9	16
50 to 59 yrs	21	37
60 or > yrs	1	2
Level of Teacher Certification (n = 57)		
Instructional/Vocational I	15	26
Instructional/Vocational II	42	74
School Areas (n = 57)		
Rural	46	81
Urban	4	7
Suburban	7	12
Years of Specific Trade Work Experience (n = 56)		
1 to 5 yrs	19	34
6 to 10 yrs	9	16
11 to 15 yrs	6	11
16 to 20 yrs	7	13
21 or > yrs	5	27

Note. The *n* represents the number of the participants in the sample who responded to the given question, out of *n = 68*

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Research Question 1

The first research question sought to identify the percentage of practicing agricultural mechanics instructors with an occupational safety and health program as a part of their curriculum and instruction. Three out of every four instructors, or 52 respondents (76%), reported having an occupational safety and health program as a component of the curriculum and instruction while 16 (24%) did not have such a program.

Research Question 2

The second question sought to identify what, if any, deficiencies were associated with safety and health practices in the Agricultural Mechanics programs. All participants were given the opportunity to respond to the survey items associated with the second research question. This question was answered by calculating the frequencies of the data collected from the survey items, which corresponded with the five key elements of NIOSH's prescribed safety and health practices within the model. The survey items associated with research question two also represented integral components, which if implemented, collectively contribute to a well-structured occupational safety and health program (CDC, 2012). The results of the analysis are displayed within Tables 3 - 6. It should be noted that no deficient safety and health practices were reported within the Employee and Student Involvement classification of NIOSH's Model. Therefore, no corresponding table is displayed for this classification.

A noteworthy finding under the Management Commitment (MC) classification included, 32 (48%) instructors reporting that the safety elements of the agricultural mechanics programs were not regularly evaluated. This finding is also supported in Table 4 where 22 (35%) instructors reported not regularly conducting safety walkthrough inspections to identify potential hazards. Further analysis within the MC classification revealed, 24 (36%) instructors reported not being given adequate time and support from administration to implement an occupational safety and health plan. Moreover, Table 3 and 7 highlight a lack of financial resources as a notable impediment to implementing a safety and health program. These findings are particularly noteworthy, as agricultural mechanics education is one of the most hazardous subject area classifications, which require continuous program evaluation, time and support as well as adequate financial resources dedicated to safety and health. To assist in this area, Balamuralikrishna and Dugger (1995) recommended completing a SWOT (strengths, weaknesses, opportunities, and threats) analysis in evaluating internal and external factors, which contribute to the improvement of occupational safety and health practices within the Career and Technical related educational programs. This strategy could provide valuable insight on areas in need of improvement, if used in concert with NIOSH's Safety Checklist Model (see Table 2).

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Table 2

Findings by Occupational Area: Management Commitment (MC)

Question	Participant Response	
	Yes	No
Are adequate time and support provided from administrators to you, the instructor, to implement the health and safety plan? *(n = 67)*	43	24
Are the health and safety elements of your Agricultural Education program regularly evaluated? *(n = 67)*	35	32
Have top administrators issued a written policy supporting a safe and healthy environment in your school? *(n = 67)*	33	34
Are funds allocated for your Agricultural Education program to implement a health and safety program? *(n = 68)*	31	37

Note. The *n* represents the number of the participants in the sample who responded to the given question, out of *n = 68*

Within the Identify and Prioritize Potential Hazards (IPPH) classification, instructors were asked if students and employees were encouraged to report close calls. Thirty-one (50%) instructors said yes they were, while 30 (49%) were not. This is an important finding related to the culture of an institution, as close calls (i.e., near-miss incidents) often precede accidents. Many close calls can go unreported within Agricultural Education because an injury or damage never occurred (Threeton & Walter, 2013). By not receiving encouragement in this area, improper safety and health habits could inadvertently be promoted to students and school employees alike. If improper practices are cultivated in students, these items may well transfer with them to the workforce (Threeton & Evanoski, 2014). When instructors were asked if they regularly review school injury and illness records to identify areas within the school (i.e., classrooms, etc.) that pose an excess risk, 13 (21%) said yes, while 49 (79%) indicated that they had not. This finding appears alarming on the surface, however given the structure of many public schools, instructors may not have access to these records. Therefore, this is an important item that requires further investigation to determine if it is truly an area of concern.

Further analysis within the IPPH classification revealed 24 (39%) instructors reporting that their program had a maintenance plan, while 38 (61%) reported they did not have this element in place. It is extremely important that agricultural educators establish a plan for maintenance of laboratory apparatus. Breakdowns and the accompanying laboratory interruptions could introduce safety hazards, which hinder the educational process. Therefore, a maintenance plan should be employed by instructors as a platform for record keeping of required services, specific timelines for maintenance, as well as the date and individual responsible for the specific tasks (Storm, 1993; Threeton & Walter, 2013, see Table 3).

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Table 3

Findings by Occupational Area: Identify and Prioritize Potential Hazards (IPPH)

Question	Participant Response	
	Yes	No
Are hearing tests periodically administered in your school? *(n = 62)*	48	14
Do you regularly conduct walkthrough inspections with safety checklists to identify potential hazards within your Agricultural Education program? *(n = 62)*	40	22
Are the appropriate parties such as school employees and students encouraged to report "close calls"? *(n = 61)*	31	30
Are new program purchases such as equipment, tools supplies and chemicals etc., carefully vetted for safety by the occupational advisory committee or program safety committee? *(n= 61)*	30	31
Does your school's incident report form provide space to report chemical release information? *(n = 61)*	30	31
Does your Agricultural Education program have a maintenance plan in which records are kept on required equipment service intervals? *(n = 62)*	24	38
Do you regularly review school injury and illness records to identify whether certain classrooms, buildings, or processes pose an excess risk? *(n = 62)*	13	49

Note. "*n*" represents the number of participants who responded to the question, out of *n= 68*

Within the Hazard Prevention (HP) classification, 37 (63%) instructors reported that their program did not incorporate training in hazard recognition to decrease hazardous exposure. This is noteworthy, as Agricultural Mechanics is one of the most hazardous subject areas in education, which reflect the actual conditions found within the occupational environment. Furthermore, if students do not receive hazard recognition training within the program they could find themselves unable to recognize occupational hazards upon transition to the world-of-work.

Another noteworthy finding within the HP classification included 13 (22%) instructors lacking written safety rules with clear-cut consequences for violations before they occur. While poor safety and health habits may not result in an injury every time, they can eventually catch up with an individual (Meanor & Walter, 2010). If there are no consequences for violation of safety rules, they may be ignored. This phenomenon could reinforce bad safety and health habits in students, which may translate into unsafe workplace practices in the future.

Further analysis within the HP classification revealed 32 (55%) instructors never sought expert advice for solutions to difficult health and safety problems. In reviewing the results of this study, it is evident that some of the participating instructors are in need of safety and health related technical assistance. For example, 24 (41%) of instructors reported not having a written safety and health program plan, while eight participants (14%) noted that point of operation guards were not in place on laboratory equipment (see Table 4). It is extremely important that these educators as well as leadership within the designated schools seek professional support for solutions to difficult health and safety problems (see Table 4).

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Table 4

Findings by Occupational Area: Hazard Prevention (HP)

Question	Participant Response	
	Yes	No
Are routine housekeeping procedures regularly performed within your Agricultural Education program? *(n = 59)*	55	4
Are point of operation guards in place on all equipment within your Agricultural Education program? *(n = 59)*	51	8
Is equipment maintenance regularly performed within your Agricultural Education program? *(n = 59)*	48	11
Does your Agricultural Education program have written safety rules with clear-cut consequences for violations before they occur? *(n = 59)*	46	13
Does your Agricultural Education program have a written safety and health program plan? *(n = 59)*	35	24
Have you ever sought expert advice outside of your school and occupational advisory committee to assist in providing solutions to difficult health and safety problems within your Agricultural Education program? *(n = 58)*	26	32
Does your Agricultural Education program incorporate administrative safety controls such as training in hazard recognition? *(n = 59)*	22	37

Note. The *n* represents the number of the participants in the sample who responded to the given question, out of *n = 68*

The findings related to the Training Personnel (TP) classification revealed 55 (95%) instructors reported that students received safety training as well as a related test prior to participation in the laboratory, while three reported their students did not. While these findings represent a relatively small percentage of participants who did not require safety training and a test of students prior to participation in the laboratory, the results are noteworthy, as providing a safe teaching and learning environment for all students should be the first priority of every educator (CDC, 2012; Zirkle, 2013).

Another notable finding, which corresponds with the TP classification, included 32 (55%) instructors reporting that they permitted students to participate in laboratory activities without earning 100% on a safety test. This finding is noteworthy, as the margin for error within some elements of the Agricultural Mechanics program can be so small that any form of miscommunication or misstep 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). Students could find themselves unable to recognize occupational hazards upon transition to the workplace. 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 (see Table 5).

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Table 5

Findings by Occupational Area: Training Personnel (TP)

Question	Participant Response	
	Yes	No
Do students receive safety training prior to participation within your Agricultural Education program laboratory? *(n = 58)*	55	3
Are students required to complete a safety test prior to participation within your Agricultural Education program laboratory? *(n = 58)*	55	3
Is the original copy of each completed safety evaluation kept on file with you the instructor? *(n = 58)*	47	11
Are students permitted to participate in laboratory activities without earning 100% on a safety test? *(n = 58)*	32	26

Note. The *n* represents the number of the participants in the sample who responded to the given question, out of *n= 68*

Research Question 3

The third research question sought to identify perceived obstacles to implementing an occupational safety and health program measured on a four-point Likert-type scale that ranged from "1 = Strongly Disagree to 4 = Strong Agree", as well as a follow-up open-ended text entry item. Upon analysis, the item: *lack of funding* (M=2.86, SD=.84) rated the highest among perceived obstacle, followed by *lack of adequate classroom/laboratory space* (M=2.61, SD=.87). The items rating the lowest in disagreement as perceived obstacles included: *serving as a Career and Technical Student Organization (CTSO) advisor* (M=1.67, SD=.72), which was followed by *the demands of state teacher certification requirements* (M=1.79, SD=.59). Participants were also provided with an opportunity to enter a text response, allowing them to list any other perceived obstacles to carrying out a health and safety program. Results are shown in Table 6.

Other obstacles (differing from Table 6) included: Administrators lack knowledge and support (mentioned 3 times), lack of time to add/modify safety plans (mentioned 2 times), lack of communication (mentioned 2 times), and "differences in opinion between Agricultural Educators in the building about how procedures should be done" (mentioned 1 time).

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Table 6

Perceived Obstacles to Implementing an Occupational Safety and Health Program.

Questions	*n*	Mean	SD
Lack of funding	56	2.86	0.84
Lack of adequate classroom/laboratory space	56	2.61	0.87
Chronic student absences	54	2.57	0.72
High student enrollment per class	56	2.57	0.87
The layout of my instructional classroom/laboratory	55	2.53	0.88
Demands of providing adaptations/accommodations for students with special needs	57	2.49	0.80
Demands of the State Department of Education initiatives	56	2.41	0.78
Lack of classroom/laboratory organization	56	2.41	0.80
Lack of classroom/laboratory technology	54	2.41	0.88
Demands of professional development	56	2.38	0.68
Lack of tools, equipment, and or supplies	56	2.34	0.84
The overall physical condition of my classroom/laboratory	54	2.33	0.78
Demands of the integration of academics within curriculum and instruction	56	2.16	0.73
The state assessment accountability demands	56	2.13	0.74
Demands of attending IEP meetings	57	2.12	0.73
Lack of personal protective equipment (PPE)	56	1.96	0.69
Demands of state teacher certification requirements	56	1.79	0.59
Serving as CTSO advisor	57	1.67	0.72

Note. Scale used 1 = strongly disagree, 2 = disagree, 3= agree, 4 = strongly agree.
Participants were given the opportunity to provide a text response of any other obstacles.

Conclusions

While one might assume that Agricultural Mechanics programs consistently reflect acceptable safety standards, the results highlighted a number of occupational safety and health practices in need of attention. A majority of instructors reported having an occupational safety and health program as a component of the curriculum and instruction, which is a positive finding. However, nearly one-quarter of participants reported not incorporating a safety and health program, which is concerning. Increased risk may be associated with Agricultural Mechanics programs that do not implement a safety and health program, as it is an effective way to comply with applicable safety and health standards (CDC, 2012; OSHA, 2013). Therefore, the authors would endorse an occupational safety and health program for all Agricultural Mechanics programs to further promote the practices highlighted within NIOSH's Safety Checklist Model.

According to Gray and Herr (1998) and Threeton and Walter (2013), laboratory instruction should be conducted in a manner that promotes learning while ensuring the safety and health of students. The researchers found both of these attributes present within the findings of this study. The analysis related to Research Question Two revealed that there appear to be four marginally deficient classifications of safety and health practices within some Agricultural Mechanics programs including: 1)

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Management Commitment (MC); 2) Identify and Prioritize Potential Hazards (IPPH); 3) Hazard Prevention (HP); and 4) Training Personnel (TP). On a positive note, there were no deficient practices identified within the Employee and Student Involvement classification of NIOSH's Model. Therefore, the overall findings related to Research Question Two appear to be consistent with safety and health deficiencies associated with accidents highlighted in the related literature (MDPH, 2009; MDPH, 2011; NIOSH, 2004).

The third question sought to identify perceived obstacles to implementing an occupational safety and health program (Table 7). At first glance, the results for Question Three are not astounding; the means for each obstacle 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 obstacles' means tend to be around a 2 = disagree. However, a few of the perceived obstacles' means were closer to "agree" than "disagree", such as *lack of funding*, *lack of adequate classroom/laboratory space*, *chronic student absences*, and *high student enrollment per class*.

Based on the findings of this study, intervention strategies are needed to offset these particular obstacles to support implementation of occupational safety and health programs. Strategies could range from providing alternative pathways of safety programming for absent students, strategies in dealing with high student enrollment per class and limitations in classroom/laboratory space as well as expanded financial revenue in the form of grants and contracts. It is plausible that lack of acknowledged hindrances may be due to the fact that they were not identified in the questionnaire as potential obstacles, and therefore went undisclosed by participants. Conversely, the scarcity of perceived obstacles may be due to the diligence that the surveyed instructors have in implementing occupational safety and health programs in their classrooms, and therefore they found no notable hurdles.

Discussion

Findings indicate there is need for concern related to occupational safety and health elements within some Agricultural Education programs in Pennsylvania. While 76% of participants within this study reported having an occupational safety and health program as a component of the curriculum and instruction, the results appear to reveal a subgroup of instructors in need of occupational safety and health remediation.

Instructors identified lack of funding, lack of adequate classroom/laboratory space, chronic student absences, and high student enrollment per class as the highest of perceived obstacles to implementing safety and health programs. However, according to the results of Research Question Two, there appear to be four deficient classifications (i.e., MC, IPPH, HP & TP) of safety and health practices in NIOSH's Safety Checklist Model, which could also be viewed as a hindrance to implementing the safety and health program. Items of specific note included nearly 50% of instructors reporting that the safety elements of their Agricultural Mechanics programs were not regularly evaluated, over 60% indicated that their designated program did not integrate hazard recognition training to decrease hazardous exposure, and another nearly 60% reported no maintenance plan. Furthermore, over half of the instructors reported that they permitted students to participate in laboratory activities without earning 100% on a safety evaluation. The modern workplace favors those with transferable skills, which are provided in CTE related programs (Wyman, 2015). Among these transferrable skills, proper

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safety and health practices are paramount (Threeton & Evanoski, 2014). Upon analysis, safety appears to be a top priority for a majority of participants in this study. However, there were some areas of concern highlighted, which should be viewed as elements in need of attention.

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).
2) Professional development should be provided to the instructors and school administration, which emphasizes interventions to overcome significant obstacles noted within Table 7.
3) Since there are limited occupational safety and health studies within Agricultural Education, this investigation should be replicated on a larger scale within this state as well as other parts of the country.

There are several limitations of this investigation including: 1) the results are not generalizable outside of the target population; 2) the instrumentation format was self-reporting in nature; and 3) a majority of the survey items were multiple choice, thus some occupational safety and health practices may not have been fully captured. The results of this study should be viewed as a contribution of knowledge related to preparation for work, which promotes further research and professional development to advance proper occupational safety and health practices within agricultural mechanics education.

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