Journal of Agricultural Education, 60(2), 54-68
https://doi.org/10.5032/jae.2019.02054

Examining University-level Agricultural Students' Safety Climate Attitudes in the Agricultural Mechanics Laboratory

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Abstract

Educational laboratory management is a paramount issue in agricultural education settings. Agricultural mechanics laboratories are found in many agricultural education programs. One of the most important issues an instructor in agricultural education settings faces is safety in the agricultural mechanics laboratory. Identifying and cultivating a culture of safety in students early on is key to reducing injuries and accidents. The purpose of this study was to gauge safety climate attitudes within a university-level agricultural mechanics laboratory. The population for this study was university-level agricultural students who were enrolled in two agricultural mechanics courses. Through the lens of Ajzen's (1991) theory of planned behavior, the students' safety climate attitudes were assessed by the Safety Climate Attitudes Questionnaire. The highest mean scores were found in the constructs of Personal Motivation for Safe Behavior and Positive Safe Practices. The lowest mean scores were found within the constructs of Risk Justification and Fatalism. We recommend that further study of this topic be conducted in additional agricultural education settings to understand students' attitudes toward safety in laboratory environments.

Keywords: safety; attitudes; agricultural mechanics; laboratory safety

Introduction and Review of Literature

Educational laboratory management is a paramount issue in agricultural education settings (Phipps, Osborne, Dyer, & Ball, 2008). From a historical standpoint, laboratories have existed to provide learning opportunities of many types, with a particular interest in providing hands-on skill and knowledge applications (Twenter & Edwards, 2017), and presently range in type from agricultural mechanics to greenhouse and nursery to agriscience facilities (Phipps et al., 2008; Shoulders & Myers, 2012). This diversity of laboratory types and purposes allows agricultural education to meet a variety of challenges and tasks for students, including specialized skill and knowledge development, experiential learning, an introduction to agricultural industry settings, and hands-on topics that present new and novel opportunities for both students and teachers (Phipps et al., 2008; Shoulders & Myers, 2012; Shoulders & Myers, 2013; Twenter & Edwards, 2017).

As laboratories are a popular portion of modern agricultural education programming (Phipps et al., 2008; Shoulders & Myers, 2012), instructors are expected to be competent in their

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abilities to safely manage such environments (Saucier, Vincent, & Anderson, 2014). Effective and efficient laboratory management often includes budgeting, facilities planning, maintenance needs, and more (McKim & Saucier, 2011a, 2011b; Saucier, McKim, & Tummons, 2012), all of which can contribute to a broader theme of safety. As recently described by Tummons, Langley, Reed, & Paul (2017), safety in laboratory environments is often a concern. Moreover, educational administrators have expressed uncertainty about whether equipment and facilities are up-to-date (Kalme & Dyer, 2000), thus provoking questions about the culture of educational laboratory safety.

In the context of agricultural education settings, agricultural mechanics laboratories are often used to provide hands-on learning experiences (Phipps et al., 2008; Shoulders & Myers, 2012; Shoulders, Blythe, & Myers, 2013). The prominence of agricultural mechanics curricula and laboratories within agricultural education have been considered as program cornerstones (Burris, Robinson, & Terry, 2005; Twenter & Edwards, 2017). Agricultural mechanics-related activities have been used to address farm safety knowledge among secondary students (Schafbuch, Vincent, Mazur, Watson, & Westneat, 2016), have served as a context for mathematics integration (Parr, Edwards, & Leising, 2006), have challenged students' capacities for problem-solving (Blackburn & Robinson, 2016; Pate & Miller, 2011), and have provided positive economic impacts in communities (Hanagriff, Rayfield, Briers, & Murphy, 2014). As such, the impact potential of this curriculum area is certainly worth considering.

Preparing instructors to provide high-quality learning opportunities through agricultural mechanics instruction is of great concern (Burris et al., 2005). Instructors should be prepared to successfully utilize agricultural mechanics facilities and curricula to positively impact students (Burris et al., 2005; McKim & Saucier, 2011a, 2011b). Available resources, including prior and current training in laboratory management (e.g., safety needs), are an important consideration for instructors (McCubbins, Wells, Anderson, & Paulsen, 2017). Recent agricultural education research (Byrd, Anderson, & Paulsen, 2015) has indicated that considerable relationships exist between available teaching resources and teaching satisfaction as well as between tool and equipment adequacy and perceived competency to teach agricultural mechanics (McCubbins et al., 2017). Perhaps such resources impact laboratory safety climate as well.

Instructors in agricultural education settings have many different types of responsibilities, with one of the most important of these being maintaining laboratory safety (Phipps et al., 2008). Laboratory activities represent a large part of most agricultural education programs (Franklin, 2008; McKim & Saucier, 2011a). Students in agricultural mechanics laboratories are exposed to numerous processes which could pose serious injury to students, instructors and other stakeholders (Phipps et al., 2008). When utilizing such environments, instructors have a responsibility to all stakeholders to teach and maintain a high regard for the safety of all who enter the learning laboratory (Phipps et al., 2008).

Not surprisingly, safety education has been a topic that has garnered some interest from agricultural education scholars, particularly in agricultural mechanics. Preyer and Williams (1977) studied "diffusion of safety education" (p. 28) into Alabama agricultural mechanics programs, while Bettis and Crawford (1972) sought to develop an agricultural mechanics laboratory safety scale to "predict whether one student may be prone to have more accidents than another student" (p. 22). Educational administrators have taken a substantial interest in safety education as well, as noted by Gliem and Miller (1993a, 1993b), indicating that they certainly value safe laboratory environments. Interestingly, Dyer and Andreasen (1999) described that instructors may not be entirely current in their knowledge and teaching practices regarding safety, and may be neglecting this vital portion of their positions as safe environment providers. Is this true now? To this end, Dyer and Andreasen (1999) recommended that future research should address "attitudes toward safety." (p. 51).

Identifying and cultivating a culture of safety in students early on is key to reducing injuries and accidents (Gillen, Goldenhar, Hecher, & Schneider, 2013). Safety culture can be defined as the product of individual and group attitudes, perceptions, and values about workplace behaviors and processes that collectively result from safety work units and reliable organizational products (Cox & Flin, 1998). Torner and Pousette (2009) found that four of the main factors that contribute to safety standards were: project characteristics, organization structure, collective group safety values, and individual competencies and attitudes. Instructors in agricultural education settings have a unique opportunity to cultivate a climate of safety among their students, which should be an expectation when considering the power of instructors to set high expectations for safe working practices and conditions (Phipps et al., 2008). This early exposure of a culture focused on safety will allow those students entering the classroom to have appropriate safety competencies, ultimately helping to lead to reduced accidents in the workplace. Educational stakeholders expect that a climate of safety be established in an agricultural mechanics laboratory (Gliem & Miller, 1993a, 1993b), and instructors in agricultural education settings should be expected to meet such expectations (Dyer & Andreasen, 1999).

Theoretical Framework

The theory of planned behavior (Ajzen, 1991) was used to frame this study. This theory built upon concepts of the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), by adding components that accounted for an individual's behavioral control. The theory of planned behavior suggests an individual's behavior is influenced by his or her attitude toward the behavior, subjective norm, and perceived behavioral control (see Figure 1).

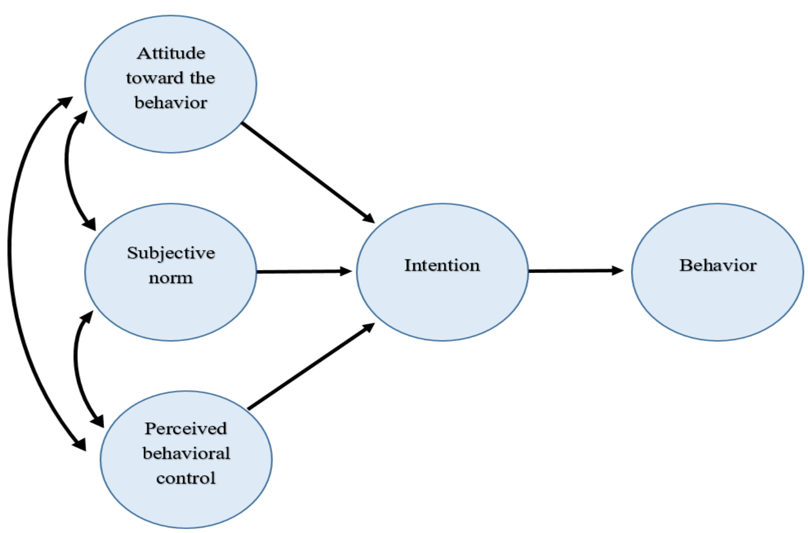

Figure 1. Theory of planned behavior (Ajzen, 1991)

Perceived behavioral control, or "perceived control over performance of a behavior" (Ajzen, 2002, p. 668), is how easy or difficult the individual perceives the performance of the behavior (Ajzen, 1991). Ajzen (1991) indicated an individual's perceived behavioral control often varies between actions and circumstances. In contrast to perceived behavioral control or self-efficacy belief, actual behavioral control describes the individual's actual skills, abilities, and other prerequisites needed to perform the behavior (Ajzen, 1991, 2002). According to the theory of planned behavior, the combination of perceived behavioral control and behavioral intention, serves as a means of directly predicting behavioral achievement (Ajzen, 1991). Ajzen (1991) offered two rationales to explain this linkage: (1) an increase in perceived behavioral control will likely increase effort exerted to successfully achieve a behavior, and (2) perceived behavioral control can sometimes be used as a substitute to measure actual control.

Aside from perceived behavioral control, attitude toward the behavior and subjective norms serve as independent predictors of intention (Ajzen, 1991). Ajzen (1991) indicated attitude toward the behavior refers to an individual's positive or negative evaluation of the behavior in question. Subjective norms, a social prediction factor, accounts for an individual's perceived social pressure to carry out, or not carry out a given behavior (Ajzen, 1991). When an individual has a positive attitude about behavior and perceives the action to be socially acceptable, they are more likely to carry out the particular behavior. The predicting factors of intention (i.e., attitude toward the behavior, social norms, and perceived behavioral control) can independently, or jointly, influence an individual's intention to perform a behavior (Ajzen, 1991). Regarding the measurement of these three factors, Ajzen (2002) reported the measures could be assessed by directly inquiring about individual's capability to perform a given behavior, or indirectly by assessing individuals perceived capability to manage facilitating or impeding factors.

In the lens of the theory of planned behavior (Ajzen, 1991, 2002), the behavior of focus was proper implementation of safety practices by university-level agricultural students in an agricultural mechanics laboratory. A variety of factors were evaluated to assess students' intentions, and perceived abilities to adhere to specified safety practices when working in the laboratory. Serving as direct and indirect determinants of intention to work safely in the laboratory, items which assessed the students' attitudes toward safe behavior and the social pressure they associated with the safe actions were included in the instrument. Moreover, this safety climate attitudes study evaluated the students' perceived control regarding the performance of safe behaviors.

Developing a deeper understanding of the factors which influence students' intentions to work safely can potentially assist instructors who facilitate learning in a laboratory setting to bolster laboratory safety and to develop a strong sense of safety climate. The present study provided insight on the safety climate attitudes of agricultural students in a university-level agricultural education setting. Moreover, the present study of safety climate attitudes aligns with Research Priority 3 of the National Research Agenda (NRA) of the American Association for Agricultural Education (AAAE), Sufficient Scientific and Professional Workforce that Addresses the Challenges of the 21st Century (Stripling & Ricketts, 2016). Safe working environments are extraordinarily important for student well-being and progress in laboratory-based instruction (Dyer & Andreasen, 1999; Phipps et al., 2008; Preyer & Williams, 1977). Reinforcing safety as students leave educational institutions and move into the workforce may help to reduce accidents in their future occupations, thereby possibly helping to avert costs incurred by their future employers. Employers often value safety as a tenet of their organizational cultures (Reese, 2016). Instructors in agricultural education settings are in a prime position to address workforce development needs (Stripling & Ricketts, 2016), and properly-managed, safe laboratory environments can help to serve the best interests of all agricultural education stakeholders (Saucier et al., 2014), including employers associated with the agricultural industry.

Purpose and Objectives

The purpose of this study was to gauge the safety climate attitudes within a university-level agricultural mechanics laboratory. To address this purpose, the following objectives were established to guide this study:

1. Examine safety attitudes of university-level agricultural students within the constructs of *Personal Motivation for Safe Behavior*, *Personal Safety Practices*, *Risk Justification*, *Fatalism*, and *Optimism*.

2. Examine students' opinions of safety instruction in the university-level agricultural mechanics laboratory by demographic characteristics.

3. Determine any perceived differences between students' safety attitudes and demographic characteristics.

Methods and Procedures

The sample population for this study was university-level agricultural students enrolled in introductory agricultural mechanics coursework at Texas A&M University-Kingsville (TAMUK). Upon approval by the TAMUK Institutional Review Board (IRB), the present study was initiated. Students were asked to complete a questionnaire that measured their perceptions of the safety climate in the university-level agricultural mechanics laboratory. This convenience sample was collected from students at TAMUK in one of two agricultural mechanics courses (i.e., "Introduction to Agricultural Systems" [AGSC 1451] and "Agricultural Building Requirements" [AGSC 4353]). Forty-six students (n = 46) completed the survey instrument.

To measure attitudes toward safety, we used a modified version of the Safety Climate Attitudes Questionnaire (Williamson, Feyer, Cairns, & Biancotti, 1997). The questionnaire was modified by substituting the words *employee* with *students*, *employer* with *instructor*, *workplace* with *laboratory*, and *work day* with *classwork*. This consisted of 27 items on a five-point Likert-type scale (1 = *Strongly Disagree*; 2 = *Slightly Disagree*; 3 = *Neutral*; 4 = *Slightly Agree*; 5 = *Strongly Agree*) related to safety: *Personal Motivation for Safe Behavior* (e.g., "*It would help me to work safer if my instructor praised me for safe behavior.*"), *Positive Safety Practices* (e.g., "*There is adequate safety training in the lab."*), *Risk Justification* (e.g., "*When working unsafely, it is because I was in a hurry.*"), *Fatalism* (e.g., "*If I was worried about safety all the time then no work would be done.*"), and *Optimism* (e.g., "*If I work safely I will avoid accidents.*").

Students were then asked to rank the level of adequate instruction they had received in relation to laboratory instruction and safety practices in the agricultural mechanics laboratory. Demographics questions were added at the end of the questionnaire. Validity was established through a panel of experts consisting of nine university agricultural education faculty, two secondary agricultural education teachers, and previous use of the instrument (Williamson et al., 1997). To assess the reliability of the instrument, post-hoc reliability was assessed. The overall Cronbach's alpha reliability coefficient was .78, while the safety attitude constructs had reliability coefficients which ranged from .70 to .85 (*Personal Motivation for Safe Behavior* (α = .74); *Positive Safety Practices* (α =. 85); *Risk Justification* (α =. 70); *Optimism* (α =. 78); *Fatalism* (α =.79)). According to Nunnally and Bernstein (1994), reliability estimates ranging from .70 to .80 are acceptable within the social science research context. Based on this recommendation, the overall and construct reliability coefficients had satisfactory internal consistency.

This study is descriptive, as it also employed a methodology that allowed university-level agricultural students to describe factors that influenced their feelings of laboratory safety climate.

Due to the nature of this study, caution should be taken when generalizing the findings or when making inferences beyond the sample population. The raw scores should be interpreted carefully, as the scales are ordinal. According to Boone and Boone (2012), analysis of Likert-type and Likert-scale data are different and must be reported as such. Likert-type data that do not contribute to a composite scale are treated as individual questions, and reported using descriptive statistics (e.g., median, mode, and frequencies), where Likert-type data that contribute to a composite score (e.g., Likert-scale) are reported using means and standard deviations for variability (Boone & Boone, 2012). Warmbrod (2014) posited that although the individual items fail to represent a mean-item score, "the content of single items (statements) on a Likert scale collectively define, describe, and name the meaning of the construct quantified by the summated score" (p. 32). Ergo, it is appropriate to provide the items, with associated frequencies of response, when describing the unidimensional constructs (Warmbrod, 2014). Based on the aforementioned recommendations (Boone & Boone, 2012; Warmbrod, 2014), means and standard deviations were used to describe Likert-scale data which contributed to a summated score; frequencies, percentages, and modes were used to describe respondents' selections on the individual statements. Moreover, demographic and background data of the respondents were calculated using descriptive statistics (i.e., frequencies and percentages). All data were collected via Qualtrics® and transferred to IBM Statistical Package for the Social Sciences (SPSS®) Version 25, which was subsequently used for data analysis.

Results

Of the 46 respondents involved with this study, two students (n = 2; 4.3%) failed to report their gender and grade classification. There were 36 male respondents (78.3%) and eight female respondents (17.4%). Of those, six were classified as freshmen (13.0%), 10 were sophomores (21.7%), 10 were juniors (21.7%), and 18 were seniors (39.1%). In relation to the number of university-level agricultural mechanics courses students had previously taken, 21.7% (n = 10) had never taken a course, 19.6% (n = 9) had previously taken one course, 32.6% (n = 15) had taken two courses, and 26.1% (n = 12) had previously taken three or more courses. One student (n = 1; 2.2%) did not report the number of university-level agricultural mechanics courses that he/she had previously taken.

The first objective sought to determine university-level agricultural students' safety attitudes surrounding the *Personal Motivation for Safe Behavior*, *Positive Safety Practices*, *Optimism*, *Risk Justification*, and *Fatalism* constructs. The students' scores varied by construct and individual prompt, but some patterns were identified. The students indicated the highest levels of agreement with items belonging to the *Personal Motivation for Safe Behavior* (M = 3.95; SD = 0.84), *Positive Safety Practices* (M = 3.83; SD = 1.03) and *Optimism* (M = 3.44; SD = 1.11) constructs (see Table 1).

Table 1

Mean Student Scores on Safety Attitude by Construct (n = 46)

Construct	*M*	*SD*
Personal Motivation for Safe Behavior	3.95	0.84
Positive Safety Practices	3.83	1.03
Optimism	3.44	1.11
Risk Justification	3.28	1.22
Fatalism	2.34	1.18

Note. 1 = *Strongly Disagree*; 2 = *Slightly Disagree*; 3 = *Neutral*; 4 = *Slightly Agree*; 5 = *Strongly Agree.*

The students indicated the lowest levels of agreement on items associated with the *Risk Justification* (*M* = 3.28; *SD* = 1.22) and *Fatalism* (*M* = 2.34; *SD* = 1.18) constructs.

Based on recommendations from previous literature (Warmbrod, 2014), descriptive statistics were presented to provide insight on the respondents' selections on individual items within each of the five constructs (i.e., *Personal Motivation for Safe Behavior*; *Positive Safety Practices*; *Risk Justification*; *Fatalism*; *Optimism*). The modes associated with the items in the *Personal Motivation for Safe Behavior* were mostly four (*Slightly Agree; n = 6*), while "*It would help me to work safely if the proper equipment was provided more often.*" had a mode of five (*Strongly Agree*) and "*It would help me to work safely if I was rewarded more (grades) for safe behavior.*" had a mode of three (*Neutral).* Of the six items belonging to the construct of *Positive Safety Practices*, four items had a mode of four (*Slightly Agree*) and the items "*The instructor is concerned with students' safety.*" and "*All safety rules and procedures in the lab really work.*" had a mode of five (*Strongly Agree*). All four items pertaining to *Risk Justification* had reported modes of four (*Slightly Agree*; see Table 2).

Table 2

Safety Attitudes of University-level Agricultural Students (n = 46)

Prompt	*f (%)* *1*	*2*	*3*	*4*	*5*	*Md*
It would help me to work safely if my classmates supported safe behavior more often.[a]	1 (2.2)	1 (2.2)	10 (21.7)	18 (39.1)	16 (34.8)	4
It would help me to work safely if the proper equipment was provided more often.[a]	0	2 (4.3)	11 (23.9)	16 (34.8)	17 (36.9)	5
It would help me to work safely if we were given safety training more often.[a]	1 (2.2)	12 (26.1)	14 (30.4)	10 (21.7)	8 (17.4)	4
It would help me to work safely if safety procedures were more realistic.[a]	2 (4.3)	3 (6.5)	14 (30.4)	19 (41.3)	8 (17.4)	4
It would help me to work safely if the instructor carried out more lab safety checks.[a]	1 (2.2)	5 (10.9)	21 (45.7)	12 (26.1)	7 (15.2)	4
It would help me to work more safely if my instructor praised me on safe behavior.[a]	2 (4.3)	3 (6.5)	16 (34.8)	14 (30.4)	11 (23.9)	4
It would help me to work safely if the instructor listened to my recommendations.[a]	1 (2.2)	1 (2.2)	19 (41.3)	18 (39.1)	7 (15.2)	4
It would help me to work safely if I was rewarded more (grades) for safe behavior.[a]	2 (4.3)	5 (10.9)	17 (36.9)	9 (19.7)	13 (28.3)	3
The instructor is concerned with students' safety.[b]	3 (6.5)	1 (2.2)	7 (15.2)	10 (21.7)	25 (54.3)	5
Our instructor supplies enough safety equipment.[b]	1 (2.2)	0	9 (19.7)	18 (39.1)	18 (39.1)	4
All safety rules and procedures in the lab really work.[b]	1 (2.2)	3 (6.5)	11 (23.9)	16 (34.8)	15 (32.6)	5
There is adequate safety training in the lab.[b]	1 (2.2)	1 (2.2)	9 (19.7)	18 (39.1)	17 (36.9)	4
Everybody works safely in the laboratory.[b]	3 (6.5)	7 (15.2)	12 (26.1)	9 (19.7)	15 (32.6)	4

Table 2

Safety Attitudes of University-level Agricultural Students (n = 46) Continued…

Our school checks equipment to make sure it is free of faults.[b]	10 (21.7)	4 (8.7)	12 (26.1)	9 (19.7)	11 (23.9)	4
When I have worked unsafely it is because I didn't know what I was doing wrong at the time.[c]	7 (15.2)	10 (21.7)	12 (26.1)	15 (32.6)	2 (4.3)	4
When I have worked unsafely it is because I was not trained properly.[c]	15 (32.6)	11 (23.9)	12 (26.1)	7 (15.2)	1 (2.2)	4
When I have worked unsafely it is because the right equipment was not provided or working.[c]	11 (23.9)	3 (6.5)	18 (39.1)	10 (21.7)	4 (8.7)	4
When I have worked unsafely it is because I needed to complete the task quickly.[c]	7 (15.2)	3 (6.5)	13 (28.3)	15 (32.6)	8 (17.4)	4
I cannot avoid taking risks in the lab.[d]	10 (21.7)	2 (4.3)	17 (36.9)	9 (19.7)	4 (8.7)	4
Safety works until we are busy then other things take priority.[d]	7 (15.2)	6 (13.0)	13 (28.3)	17 (36.9)	1 (2.2)	1
Accidents will happen no matter what I do.[d]	9 (19.7)	4 (8.7)	10 (21.7)	14 (30.4)	7 (15.2)	1
If I was worried about safety all the time then I would not get my lab work done.[d]	15 (32.6)	8 (17.4)	9 (19.7)	7 (15.2)	4 (8.7)	1
I can't do anything to improve safety in the lab.[d]	17 (36.9)	12 (26.1)	10 (21.7)	4 (8.7)	1 (2.2)	1
Not all accidents are preventable, but most will not be injured in the lab.[e]	2 (4.3)	5 (10.9)	15 (32.6)	17 (36.9)	5 (10.9)	4
It is not likely that I will have an accident because I am a careful person.[e]	3 (6.5)	4 (8.7)	16 (34.8)	17 (36.9)	4 (8.7)	4
In the normal coursework, I do not encounter any dangerous situations.[e]	5 (10.9)	6 (13.0)	17 (36.9)	14 (30.4)	2 (4.3)	4
People that work safely and follow lab procedures will always be safe.[e]	4 (8.7)	6 (13.0)	17 (36.9)	11 (23.9)	6 (13.0)	3

Note. 1 = *Strongly Disagree*; 2 = *Slightly Disagree*; 3 = *Neutral*; 4 = *Slightly Agree*; 5 = *Strongly Agree;* [a]Personal Motivation for Safe Behavior; [b]Positive Safety Practices; [c]Risk Justification; [d]Fatalism; [e]Optimism; *Md* = Mode.

The construct, which contained the statements with the lowest overall modes, was *Fatalism*. Four items from this category (i.e., *Fatalism*) had reported modes of one (*Strongly Disagree*) and the item "*I cannot avoid taking risks in the lab.*" was the only item in this construct which had a mode of four (*Slightly Agree*). The respondents slightly agreed (*Md* = 4) with three items and had neutral feelings (*Md* = 3) about one item associated with the construct of *Optimism*.

Objective two was to measure students' perceptions of safety instruction provided in the university-level agricultural mechanics laboratory by demographic characteristics (i.e., gender, grade classification, etc.). The students' perceptions of safety instruction were operationalized by two items: "*I feel that the students get adequate instruction in safety in the lab.*" and "*Our instructor demonstrates safe use of tools and equipment.*" Of the 46 respondents in this study, only 44 students responded to the demographic items regarding gender and grade classification. Both male (*n* = 36) and female (n = 8) students slightly agreed (Md = 4) with the first statement. Similarly, respondents from both genders responded positively to the second item "*Our instructor demonstrates safe use of tools and equipment.*" Specifically, male students strongly agreed (Md = 5) and female students slightly agreed (Md = 4) with the statement (see Table 3).

Table 3

*Opinions of Laboratory Safety Instruction by Demographic Characteristics (*n *= 44)*

	I feel that the students get adequate instruction of safety in the lab.					Our instructor demonstrates safe use of tools and equipment.				
	f (%)				*Md*	*f (%)*				*Md*
	2	*3*	*4*	*5*		*1*	*3*	*4*	*5*	
Male	1 (2.7)	6 (16.7)	18 (50.0)	11 (30.6)	4	3 (8.3)	6 (16.7)	13 (36.1)	14 (38.9)	5
Female	0	1 (12.5)	3 (37.5)	4 (50.0)	4	0	1 (12.5)	3 (37.5)	4 (50.0)	4
Fr.	0	0	5 (83.3)	1 (16.7)	4	0	0	5 (83.3)	1 (16.7)	4
So.	0	3 (30.0)	3 (30.0)	4 (40.0)	5	0	3 (30.0)	4 (40.0)	3 (30.0)	4
Jr.	1 (10.0)	1 (10.0)	2 (20.0)	6 (60.0)	4	2 (20.0)	1 (10.0)	1 (10.0)	6 (60.0)	4
Sr.	0	3 (16.7)	11 (61.1)	4 (22.2)	4	1 (5.6)	3 (16.7)	6 (33.3)	8 (44.4)	5

Note. 1 = *Strongly Disagree*; 2 = *Slightly Disagree*; 3 = *Neutral*; 4 = *Slightly Agree*; 5 = *Strongly Agree.* Male (n = 36), Female (n = 8), Freshman (n = 6), Sophomore (n = 10), Junior (n = 10), Senior (n = 18); Md = Mode.

When viewed from the standpoint of grade classification, freshman (n = 6) and juniors (n = 10) slightly agreed (Md = 4) with both statements, while sophomores (n = 10) and seniors (n = 18) indicated slight (Md = 4) to strong (Md = 5) agreement with both statements. Specifically, the sophomores strongly agreed (Md = 5) with the statement "*I feel that the students get adequate instruction of safety in the lab.*" and slightly agreed (Md = 4) with the statement regarding the demonstration of safe behavior by the instructor. Conversely, students who identified as seniors slightly agreed (Md = 4) with the first statement and strongly agreed (Md = 5) with the second statement.

Objective three sought to evaluate possible differences between students' perceived safety attitudes by demographic characteristics. Male students (n = 20) indicated higher levels of agreement with statements related to the *Positive Safety Practices* (M = 3.92; SD = 0.93), *Fatalism* (M = 2.63; SD = 1.24), and *Optimism* (M = 3.50; SD = 1.19) constructs, while female students (n = 20) reported higher agreement with items belonging to the *Personal Motivation for Safe Behavior* (M = 4.06; SD = 0.81) and *Risk Justification* (M = 3.33; SD = 1.05) constructs (see Table 4).

Table 4

*Students' Perceived Safety Attitudes by Gender (*n *= 46)*

	Males (*n* = 36)		Females (*n* = 8)	
Construct	*M*	*SD*	*M*	*SD*
Positive Safety Practices	3.92	0.93	3.74	1.29
Personal Motivation for Safe Behavior	3.84	0.83	4.06	0.81
Optimism	3.50	1.19	3.38	1.01
Risk Justification	3.23	1.34	3.33	1.05
Fatalism	2.63	1.24	2.04	1.02

Note. 1 = *Strongly Disagree*; 2 = *Slightly Disagree*; 3 = *Neutral*; 4 = *Slightly Agree*; 5 = *Strongly Agree.*

Both male ($n = 36$; $M = 2.63$; $SD = 1.24$) and female ($n = 8$; $M = 2.04$, $SD = 1.02$). Students indicated the lowest levels of agreement with items belonging to the *Fatalism* construct, but a difference was observed between male and female students, regarding their highest levels of agreement. Males ($n = 36$) showed the strongest agreement towards the *Positive Safety Practices* construct ($M = 3.92$; $SD = 0.93$). Females ($n = 8$) indicated the strongest agreement towards the *Personal Motivation for Safe Behavior* construct ($M = 4.06$; $SD = 0.81$).

Conclusions, Limitations, Implications, and Recommendations

The findings of the present study revealed that students reported moderate to low safety climate attitudes on items related to *Optimism*, *Risk Justification*, and *Fatalism*; slightly higher safety climate attitudes were expressed for *Personal Motivation for Safe Behavior* and *Positive Safety Practices* items. The items belonging to the *Fatalism* construct received the lowest agreement by the students, reflecting the students' views on the controllability and importance of safety. According to Williamson et al. (1997), the *Fatalism* factor is an enduring personal characteristic contributing to safety, which is rarely amendable to change. This finding implies that the agricultural students at TAMUK perceived themselves to have control over their personal safety in the laboratory environment. Conversely, *Personal Motivation for Safety* items received the highest level of agreement, indicating the students were motivated to promote safety in the lab.

In accordance with the findings of the present study, we concluded that the university-level students who participated in this study held safety practices in the agricultural mechanics laboratory in high regard and that the agricultural mechanics course instructor helped to create a culture of safety through safe and effective instruction. In the context of agricultural mechanics education, these conclusions help to shine light on how students value safe working environments and prioritize helping to create and maintain a culture of safety within such settings. We desire that as these students graduate and take positions in their future industries (e.g., production agriculture, classroom teaching, etc.), they will continue to place great priority on safety in their places of employment. Safety has become a staple in many employers' cultures, and it is expected that it will continue to do so in the future (Reese, 2016).

We recognize that the relatively small population of students included in the present study ($n = 46$) serves as a limitation for generalizability. Further, as this study was conducted at only one institution, the results cannot be generalized beyond TAMUK or the respondents. We do recommend, however, that additional research be conducted with other students who engage in university-level agricultural mechanics coursework to develop a firmer grasp of safety climate attitudes with this type of population. As instructors help to set standards and expectations for safety within the environments under their care (Phipps et al., 2008), their training in, and adherence to, proper safety practices, as well as understanding the need for effective laboratory safety management, are vital to ensuring that agricultural mechanics laboratories are conducive to safe operation (Dyer & Andreasen, 1999). Developing a deeper understanding of the safety climate in an educational laboratory environment, along with the safety-related attitudes and perceptions of the students, is paramount to addressing safety needs.

Teacher educators who teach agricultural mechanics coursework should ensure that their own practices mirror what should be occurring in agricultural education program laboratories. As teacher education programs continue to help develop students' agricultural mechanics content knowledge and skills (Burris et al., 2005), consideration should be given to ensuring that preservice teachers are prepared to manage agricultural mechanics laboratories (McKim & Saucier, 2011b). Agricultural mechanics laboratories are often complex places that demand a good deal of attention to function (Saucier et al., 2014). Present in many agricultural education programs nationwide (Shoulder & Myers, 2012; Twenter & Edwards, 2017), agricultural mechanics laboratory teaching is easily expected to be a duty of an instructor. To aid with understanding the safety-related attitudes of preservice teachers, perhaps teacher educators responsible for university-level agricultural mechanics coursework should consider implementing a safety climate attitudes assessment within their coursework. Per Ajzen (1991), attitudes toward a concept or idea (e.g., laboratory-related safety) can ultimately influence intentions to act. Dyer and Andreasen (1999) expressed considerable concern regarding safety education in teacher preparation programs. The use of the Safety Climate Attitudes Questionnaire could serve as a formative, or even summative, assessment of preservice teachers' safety attitudes in a university-level agricultural mechanics course. Further research into the phenomena of teacher preparation programs' safety training could yield useful results for future practice.

Agricultural mechanics curricula and laboratories can serve as excellent vehicles for a multitude of teaching and learning purposes, including facilitating thinking and reasoning skills (Blackburn & Robinson, 2017; Pate & Miller, 2011), emphasizing academic content such as mathematics (Parr et al., 2006), providing economic returns in communities (Hanagriff et al., 2014), and developing opportunities to connect to local stakeholders through service-oriented projects (Schafbuch et al., 2016). These experiences and benefits can certainly result in great strides toward the provision of capable individuals needed by the agricultural industry (Stripling & Ricketts, 2016). To meet these provisions and opportunities, however, instructors must be prepared to ensure that students are working in safe conditions (Phipps et al., 2008) that can help to instill good work-related habits in others. Gillen et al. (2013) noted that the early instillation of following safety practices can be useful to help reduce injuries and accidents. The safety-oriented cultures of many modern organizations desire employees who can follow safety practices and make good judgments (Reese, 2016). Agricultural education at all levels should prepare to address these desires.

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