© Journal of Agricultural Education
Volume 52, Number 3, pp. 75–86
DOI: 10.5032/jae.2011.03075

Agricultural Mechanics Laboratory Management Professional Development Needs of Wyoming Secondary Agriculture Teachers

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Accidents happen; however, the likelihood of accidents occurring in the agricultural mechanics laboratory is greatly reduced when agricultural mechanics laboratory facilities are managed by secondary agriculture teachers who are competent and knowledgeable. This study investigated the agricultural mechanics laboratory management in-service needs of Wyoming secondary agriculture teachers who are responsible for managing agricultural mechanics laboratories. Data were collected with a Web-based questionnaire designed to determine teachers' perceptions of the importance of 70 selected agricultural mechanics laboratory management competencies and their self-assessed ability to perform those competencies. The Borich (1980) needs assessment model was used to assess and evaluate the in-service needs of the teachers. This study found that Wyoming secondary agriculture teachers were in need of agricultural mechanics laboratory management in-service education in the areas of: first aid, correcting hazardous laboratory conditions, and general laboratory safety. Wyoming teacher educators, state agricultural education supervisory personnel, and local professional development coordinators should provide pertinent and continuous in-service education for Wyoming secondary agriculture teachers in the area of agricultural mechanics laboratory management through technical workshops, summer professional development conferences, and university instructed agricultural mechanics courses.

Keywords: agricultural mechanics, laboratory management, professional development needs, secondary agriculture teachers, needs assessment

Introduction & Literature Review

In 1981, the high school in Worland, Wyoming, had recently moved into a new building. Construction delays resulted in the heating system not being operational by the start of classes that year. Two students enrolled in a vocational agriculture course were wearing nylon vests to stay warm while they worked in the agricultural mechanics laboratory. The students were dismantling a 4-wheel-drive pickup, with plans to retrofit it into an irrigation pipe carrier. During the disassembly process, the students found the fuel tank skid pan bolts rusted solid and attempted to use an oxygen-acetylene cutting-torch to sever the bolts. In doing so, they accidentally pierced the fuel tank and ignited the gasoline inside. The gasoline erupted into flames, severely burning both students. Fortunately, the sprinkler system in the new building was functional and quickly suppressed the fire. Both students were emergency air-lifted to a Salt Lake City, Utah hospital, where one of the students died from burns complicated by his nylon clothing. As a result of the accident, the state fire marshal mandated that all vehicles had to have the fuel tanks removed or emptied and flushed prior to being brought into any school laboratory. Additionally, statewide safety workshops were required for all agriculture teachers who managed agricultural mechanics laboratories.

In the 30 years that have passed since the statewide safety education mandate, many of the Wyoming secondary agriculture teachers who participated have retired. Currently, the only mandated agricultural mechanics laboratory safety education secondary agriculture teachers receive in Wyoming, is during their pre-service teacher education program. Similarly, since 1981, the number of mandatory university instructed agricultural mechanics courses at the University of Wyoming have been reduced, which is not unlike other teacher education programs. Despite the lesser number of mandatory, university-instructed, agricultural mechanics courses, many secondary agriculture teachers rely on the agricultural mechanics laboratory to offer students unique hands-on opportunities to develop valuable academic and vocational skills (Hubert, Ullrich, Lindner, & Murphy, 2003).

The agricultural mechanics laboratory is a valuable asset to an agricultural education program (Herren, 2010) and is a component of "any high quality agricultural education program" (Phipps, Osborne, Dyer, & Ball, 2008, p. 303)—providing opportunities for students to actively engage in scientific inquiry and application (Osborne & Dyer, 2000). Students learn important psychomotor skills in agricultural mechanics education; much of that instruction takes place in the school agricultural mechanics laboratory (Johnson, Schumacher, & Stewart, 1990). Thus, a great deal of instructional time is spent in the agricultural mechanics laboratory. In many cases, up to two-thirds of the total instructional time in secondary agricultural education programs is devoted to laboratory instruction (Shinn, 1987). The agricultural mechanics laboratory must be a safe and well organized environment if optimum student learning is to occur (Shinn, 1997), which is achieved through effective management (Saucier, Schumacher, Funkenbusch, Terry, & Johnson, 2008). Thus, the ability to effectively manage, maintain, and improve laboratories is a characteristic of an effective agriculture teacher (Roberts & Dyer, 2004).

Hubert et al. (2003) noted the importance of thorough laboratory instruction; "if skill development is the focus of laboratory instruction, then thorough attention to all its components, including safety instruction, is essential" (p. 3). To provide a safe and efficient laboratory learning environment for agricultural mechanics students, agricultural educators must possess the proper knowledge and skills associated with teaching in and managing the agricultural mechanics laboratory (Saucier et al., 2008). Dyer and Andreasen (1999) suggested that new agriculture teachers were inadequately educated in safety and experienced teachers were even less safety conscious. Despite numerous studies that have noted a need for agricultural educators to possess and apply proper knowledge and skills associated with the agricultural mechanics laboratory (Fletcher & Miller, 1995; Johnson et al., 1990; Saucier, Terry, & Schumacher, 2009; Schlautman & Silletto, 1992), in some cases suggesting that agricultural educators may not receive adequate education prior to beginning their teaching careers or after accepting their first teaching position. Barrick and Powell (1986) found that first year agriculture teachers rated managing laboratory learning as a highly important ability for agriculture teachers. The first year agriculture teachers in their study also indicated that their level of knowledge concerning the management of laboratory learning was low.

Purpose and Objectives

According to the *National FFA Career Development Events Handbook* (2006), "an agricultural mechanics education is comprised of strong technical content and complimented by the development of practical, hands-on skills" (p. 43). Unless secondary agriculture teachers are competent in agricultural mechanics laboratory management, it is unlikely that they are capable of safely and effectively guiding agricultural education students in the development of practical, hands-on skills. The purpose of this study was to describe the in-service needs of secondary agricultural education teachers in Wyoming who are responsible for managing an agricultural mechanics laboratory. The following research objectives guided the study:

1. Describe selected personal and professional characteristics of secondary agricultural education teachers in Wyoming.
2. Describe the perceived importance of selected agricultural mechanics laboratory management competencies by secondary agriculture teachers.
3. Describe secondary agricultural education teachers' perceived ability to perform selected agricultural mechanics laboratory management competencies.

4. Prioritize the agricultural mechanics laboratory management competencies and constructs in need of improvement, as perceived by secondary agriculture teachers.

Procedures

The population for this non-experimental, quantitative study was secondary agriculture teachers in Wyoming during the spring of 2009. The *2008-2009 Wyoming Agricultural Education Directory* included a total of 47 secondary agriculture teachers. Due to the relatively small number of subjects, a census ($N = 47$) was conducted to more accurately describe the characteristics of the population and reduce potential error associated with subject selection and sampling.

The data collection instrument developed by Johnson et al. (1990) and modified by Saucier et al. (2009) was used in this study. A two-section instrument was used to address the research objectives of this study. The first section consisted of a double-matrix containing 70 statements representing agricultural mechanics laboratory management competencies. The 5-point summated rating scale, double-matrix allowed subjects to respond to each statement twice; once rating the perceived level of importance for each competency (1 = *No Importance*, 2 = *Below Average Importance*, 3 = *Average Importance,* 4 = *Above Average Importance*, 5 = *Utmost Importance*), and once rating the individual's ability to perform each competency (1 = *No Ability*, 2 = *Below Average Ability*, 3 = *Average Ability,* 4 = *Above Average Ability*, 5 = *Exceptional Ability*). The second section sought to identify individuals' demographic characteristics (e.g., age, gender, years of teaching experience, highest degree obtained).

The instrument developed by Johnson and Schumacher (1989) included 50 competencies developed through a modified Delphi technique, with input from a national panel of agricultural mechanics education experts, and was reported to be valid. Johnson et al. (1990) modified Johnson and Schumacher's instrument to include a double-matrix format to assess the perceived importance of each competency and the perceived ability of the individual to perform each competency. A later study (Saucier, et al., 2009) modified Johnson, Schumacher, and Stewart's instrument by splitting multiple-component or *double-barreled* and *triple-barreled* competencies into single-component competencies; thus, the original 50 competencies were expanded to 70 competencies.

The design and format of the data collection instrument was guided by the suggestions of Dillman (2007). The electronic questionnaire was created and distributed to a panel of experts using web-hosted software provided by Hosted Survey™ to assess face validity. The panel of eight experts consisted of faculty members from two Land-Grant Universities, the Wyoming State FFA advisor, and the researchers.

Saucier et al. (2009) assessed content validity of their instrument using a panel of experts that consisted of agricultural education and agricultural systems management faculty members who judged the instrument to be valid. The panel further identified five constructs: laboratory and equipment maintenance; laboratory teaching; program management; tool, equipment, and supply management; and laboratory safety. This study used the exact competencies previously determined to be valid in the study conducted by Saucier et al.; therefore, the constructs were considered to be valid.

To estimate reliability of the instrument for this study, Cronbach's alpha coefficients were calculated using data collected in a study of secondary agriculture teachers in Missouri during 2008 ($n = 110$). Because data were collected in a similar manner, with a sample of a population with similar characteristics, using the same data collection instrument used in this study, the data were deemed appropriate to estimate initial reliability of the data collection instrument for use in this study. Therefore, Cronbach's alpha coefficients were calculated for the scales (importance and ability), yielding coefficients of .97 and .97 ($n = 110$) respectively. The Cronbach's alpha coefficients for the five constructs—laboratory and equipment maintenance; laboratory teaching; program management; tool, equipment, and supply management; and laboratory safety—ranged from .87 to .90 ($n = 110$). Using the data collected for this study, *post hoc* Cronbach's alpha coefficients were calculated for the scales (importance and ability), yielding coefficients of .96 and .97 ($n = 37$) respectively. The Cronbach's alpha coefficients for the five constructs ranged from .84 to .90 ($n = 37$).

Methods

Dillman's (2007) data collection protocol was followed for this study. After five points of contact, a response rate of 78.70% (n = 37) was obtained. Non-response error was a relevant concern; therefore, procedures for handling nonrespondents were followed as outlined as *Method 2* in Lindner, Murphy, and Biers (2001). Days to respond was used as the independent variable in regression equations, where the primary variables of interest were regressed on the variable days to respond, which yielded no significant results (p = .182). Therefore, external validity did not threaten the generalizability of the findings of this study to the target population (Lindner et al., 2001).

Data Analysis

Data were analyzed using SPSS® version 17.0 for Windows™ platform computers. Research objective one sought to describe the demographic characteristics of secondary agriculture teachers in Wyoming; thus, frequencies and percentages for gender, level of academic degree attained, and enrollment in agricultural mechanics courses during high school were reported. Mean and standard deviation were reported for age, length of teaching experience, and number of classes taught per semester that included agricultural mechanics competencies.

Research objective two sought to describe the perceived importance of selected competencies of agricultural mechanics laboratory management competencies by secondary agriculture teachers. Research objective three sought to describe secondary agricultural education teachers' perceived ability to perform selected agricultural mechanics laboratory management competencies. Secondary agriculture teachers were asked how important each competency was to them and what was their ability to perform each competency. Mean, standard deviation, minimum value, and maximum value were reported.

Research objective four sought to prioritize the agricultural mechanics laboratory management competencies and constructs in need of improvement, as perceived by secondary agriculture teachers in Wyoming. To determine where discrepancies existed, two ratings had to be taken into account simultaneously; hence, the Borich (1980) needs assessment model was utilized to determine the discrepancy for each competency. Mean weighted discrepancy scores (MWDS) were calculated for each competency using the MWDS calculator add-on for SPSS (McKim & Pope, 2010). To prioritize the competencies in need of attention, competencies were ranked, from high to low, using the mean weighted discrepancy scores. To prioritize the constructs in need of attention, a mean of MWDS ($\overline{x}_{\text{MWDS}}$) was calculated for each construct. Constructs were then ranked from high to low, using the $\overline{x}_{\text{MWDS}}$. Competencies or constructs with high MWDS, or $\overline{x}_{\text{MWDS}}$, indicated the areas needing the most improvement.

Finding

Research objective one sought to describe the personal and professional characteristics of secondary agricultural education teachers in Wyoming. Demographic data for gender, level of academic degree attained, and enrollment in agricultural mechanics courses during high school are reported in Table 1. Table 2 contains demographic data for age, length of experience, and number of classes taught per semester that included agricultural mechanics competencies.

Table 1
Selected Demographics of Secondary Agriculture Teachers in Wyoming (*n* = 37)

Characteristic	*f*	%
Gender		
Male	26	70.30
Female	11	29.70
Highest degree achieved		
Bachelor's	23	62.20
Master's	14	37.80
Enrolled in agricultural mechanics classes during high school		
Yes	29	78.40
No	8	21.60

Table 2
Selected Demographics of Secondary Agriculture Teachers in Wyoming (*n* = 37)

Characteristic	*M*	*SD*	*Min*	*Max*
Age	37.00	10.60	23	60
Years of teaching experience	11.86	9.51	1	35
Classes taught per semester that include agricultural mechanics competencies	4.03	1.99	0	7

Research objective two sought to describe secondary agriculture teachers' perceived levels of importance of selected competencies of agricultural mechanics laboratory management. Providing students safety instruction (*M* = 4.89; *SD* = 0.31), selecting protective equipment for student use (*M* = 4.68; *SD* = 0.58), enforcing a student discipline policy (*M* = 4.65; *SD* = 0.59), and documenting student safety instruction (*M* = 4.62; *SD* = 0.59) were perceived to be the competencies with the highest levels of importance; all of which were related to maintaining a safe laboratory environment for students. Two competencies had mean importance values less than 3.0, and therefore, were perceived to have a below average level of importance: conducting an agricultural mechanics public relations program (*M* = 2.95; *SD* = 0.94), and planning an agricultural mechanics public relations program (*M* = 2.81; *SD* = 0.88); both related to activities that do not take place in the laboratory environment.

Research objective three sought to describe secondary agriculture teachers' perceived ability to perform selected agricultural mechanics laboratory management competencies. Mean values of secondary agriculture teachers' perceived ability to perform selected competencies ranged from 2.95 to 4.29. Secondary agriculture teachers' perceived themselves as possessing an average ability to perform 90% (*n* = 60) of the 70 competencies. Secondary agriculture teachers' perceived themselves as possessing a below average ability to plan an agricultural mechanics public relations program (*M* = 2.95; *SD* = 0.74). Whereas, secondary agriculture teachers' perceived themselves as possessing an above average ability to perform six competencies: providing students safety instruction (*M* = 4.29; *SD* = 0.70), selecting protective equipment for student use (*M* = 4.16; *SD* = 0.73), developing a student discipline policy (*M* = 4.14; *SD* = 0.79), maintaining a student discipline policy (*M* = 4.05; *SD* = 0.85), documenting student safety instruction (*M* = 4.05; *SD* = 0.70), and safely handling hazardous materials (*M* = 4.00; *SD* = 0.75).

Research objective four sought to prioritize the agricultural mechanics laboratory management competencies and constructs in need of improvement, as perceived by secondary agriculture teachers in Wyoming. MWDS of agricultural mechanics laboratory management competencies ranged from 4.15 to -0.75. The competencies with the highest MWDS were related to safety, with the highest discrepancy (MWDS = 4.15) associated with administering first aid. One competency—ordering equipment/tools/supplies—had a MWDS of 0.00; therefore, no discrepancy existed. Seven competencies (10%) had negative MWDS and were considered a negative discrepancies. The negative MWDS indicates that the secondary agriculture teachers' perceived ability to perform each competency was higher than the perceived levels of importance of the associated competency.

Agricultural mechanics laboratory management constructs in need of improvement were ranked from high to low using the $\overline{x}_{\text{MWDS}}$. Laboratory safety was the construct most in need of improvement ($\overline{x}_{\text{MWDS}}$ = 2.72); followed by laboratory and equipment maintenance ($\overline{x}_{\text{MWDS}}$ = 1.51); laboratory teaching ($\overline{x}_{\text{MWDS}}$ = 1.27); and tool, equipment, and supply management ($\overline{x}_{\text{MWDS}}$ = 1.21). Program management ($\overline{x}_{\text{MWDS}}$ = 1.12) was the construct least in need of improvement.

Additional data regarding secondary agriculture teachers' perceived levels of importance of agricultural mechanics laboratory management competencies, perceived ability to perform competencies, and MWDS of agricultural mechanics laboratory management competencies are presented in Table 3, ranked by MWDS. Definitions of agricultural mechanics laboratory management competencies are provided in Table 4. Grand means for importance of competencies, grand means for ability to perform competencies, and $\overline{x}_{\text{MWDS}}$ for agricultural mechanics laboratory management constructs are reported in Table 5.

Table 3
Competency Rankings

			Importance		Ability	
Rank	Competency	MWDS	*M*	*SD*	*M*	*SD*
1	Administering first aid	4.15	4.51	0.65	3.59	0.96
2	Correcting hazardous laboratory conditions	3.95	4.57	0.60	3.70	0.78
3	Properly installing and maintaining safety devices and emergency equipment (e.g., fire extinguishers, first aid supplies, machine guards, etc.)	3.59	4.43	0.69	3.62	0.89
4	Safely disposing of hazardous materials (e.g., flammables, acids, compressed gas cylinders)	3.54	4.51	0.73	3.73	0.77
5	Maintaining the agricultural mechanics laboratory in compliance with OSHA standards	3.51	4.32	0.75	3.51	0.80
6	Conducting regular safety inspections of the laboratory	3.35	4.43	0.65	3.68	0.78
7	Modifying facilities to accommodate students with disabilities	3.22	3.83	0.93	3.00	0.85
8	Developing a system to document achievement of student competencies	3.12	4.27	0.77	3.54	0.84
9	Developing a maintenance schedule for agriculture mechanics equipment	3.07	4.05	0.81	3.29	0.85
10	Providing students safety instruction	2.91	4.89	0.31	4.29	0.70
11	Developing an accident reporting system	2.88	4.43	0.65	3.78	0.89
12	Modifying equipment to accommodate students with disabilities	2.84	3.76	0.89	3.00	0.78
13	Maintaining healthy environmental conditions in the laboratory	2.72	4.38	0.68	3.76	0.68
14	Documenting student safety instruction	2.62	4.62	0.59	4.05	0.70
15	Maintaining a student discipline policy	2.62	4.62	0.59	4.05	0.85
16	Safely handling hazardous materials	2.59	4.57	0.65	4.00	0.75
17	Developing a procedure to bill students for materials used in project construction	2.49	4.19	0.70	3.59	0.80
18	Operating within the constraints of an agricultural mechanics budget	2.49	4.19	0.78	3.59	0.96

19	Making major agricultural mechanics lab equipment repairs	2.45	3.78	0.98	3.14	0.98
20	Selecting protective equipment for student use (e.g., safety eyewear)	2.40	4.68	0.58	4.16	0.73
21	Safely storing hazardous materials	2.28	4.43	0.77	3.92	0.86
22	Enforcing a student discipline policy	2.26	4.65	0.59	4.16	0.83
23	Developing an identification system to deter tool/equipment theft	2.19	3.86	0.75	3.29	0.85
24	Performing routine maintenance of agricultural mechanics lab equipment (e.g., adjust belt tension, lubricate moving parts, dress grinding wheels)	2.02	4.16	0.60	3.68	0.88
25	Estimating time required for students to complete projects/activities	1.98	3.86	0.79	3.35	0.75
26	Diagnosing malfunctioning agricultural mechanics lab equipment	1.97	3.84	0.99	3.32	0.91
27	Arranging equipment in the agricultural mechanics lab to enhance safety/ efficiency/learning	1.90	4.14	0.82	3.68	0.75
28	Developing a student discipline policy	1.84	4.54	0.56	4.14	0.79
29	Developing educational projects/activities for students	1.81	3.95	0.81	3.49	0.80
30	Developing a written statement of agricultural mechanics lab policies/ procedures	1.78	4.38	0.76	3.97	0.87
31	Developing procedures to facilitate the storage/checkout/security of tools/equipment	1.70	3.70	0.78	3.24	0.80
32	Developing an agricultural mechanics laboratory budget	1.68	4.14	0.67	3.72	0.87
33	Maintaining protective equipment for student use (e.g., safety eyewear)	1.65	4.35	0.82	3.97	0.73
34	Recognizing characteristics of quality tools/equipment	1.55	4.10	0.70	3.73	0.80
35	Developing objective criteria for evaluation of student projects /activities	1.52	4.03	0.64	3.68	0.72
36	Updating agricultural mechanics course offerings	1.50	3.70	0.88	3.28	0.81
37	Promoting laboratory safety by color coding equipment/marking safety zones/posting appropriate safety signs and warnings	1.44	3.81	0.97	3.43	0.83
38	Developing an adequate inventory of laboratory consumable supplies	1.38	3.92	0.76	3.57	0.83
39	Developing a file of service/operator manuals for agricultural mechanics lab equipment	1.35	3.84	0.87	3.49	0.93
40	Equipping work stations for each skill area (e.g., cold metal, arc welding, small engines, electricity, etc.)	1.28	3.95	0.81	3.62	0.86
41	Developing a procedure to insure proper agricultural mechanics lab clean up	1.22	4.11	0.77	3.81	0.81
42	Making minor agricultural mechanics lab equipment repairs	1.20	4.02	0.76	3.73	0.90
43	Utilizing technical manuals to order replacement/repair parts for agricultural mechanics lab equipment	1.14	3.84	0.80	3.54	0.90
44	Maintaining a file of service/operator manuals for agricultural mechanics lab equipment	1.11	3.72	0.73	3.43	0.83
45	Making minor repairs to the agricultural mechanics laboratory facility.	1.09	4.03	0.73	3.76	0.68
46	Installing stationary power equipment (e.g., assembling equipment, connecting to a power source, performing preliminary adjustments)	1.08	3.65	0.86	3.35	0.86

47	Arranging for a professional service person to make major equipment repairs (e.g., replace switches bearings)	1.02	4.19	0.81	3.95	0.88
48	Identifying equipment required to teach agricultural mechanics skills	1.01	4.14	0.67	3.89	0.88
49	Identifying supplies required to teach agricultural mechanics skills	0.98	4.02	0.76	3.78	0.85
50	Developing a rotational plan to move students through agricultural mechanics skill areas	0.98	3.62	0.95	3.35	0.95
51	Maintaining an adequate inventory of consumable supplies	0.92	3.78	0.71	3.54	0.69
52	Maintaining a file of educational projects/activities	0.90	3.45	0.69	3.70	0.70
53	Selecting current references/technical manuals	0.85	3.49	0.69	3.24	0.68
54	Developing a file of educational projects/activities for students	0.81	3.73	0.80	3.51	0.73
55	Identifying tools required to teach agricultural mechanics skills	0.66	4.08	0.76	3.92	0.89
56	Identifying current references/technical manuals	0.65	3.46	0.65	3.27	0.61
57	Planning student recruitment activities for the agricultural mechanics program	0.65	3.46	1.04	3.27	0.96
58	Conducting shop inventory (e.g., tools/equipment/consumable supplies)	0.64	3.97	0.69	3.81	0.78
59	Implementing student recruitment activities for the agricultural mechanics program	0.64	3.40	0.90	3.21	0.89
60	Designating work stations for each skill area (e.g., cold metal, arc welding, small engines, electricity, etc.)	0.60	3.70	0.81	3.54	0.73
61	Developing procedures for efficient storage/distribution of consumable supplies	0.50	3.68	0.85	3.54	0.69
62	Preparing bid specifications for equipment/tools/supplies	0.46	3.40	0.83	3.27	0.80
63	Ordering equipment/tools/supplies	0.00	3.59	0.72	3.59	0.69
64	Silhouetting tool/ equipment cabinets	-0.08	3.03	1.01	3.05	1.00
65	Maintaining computer based student academic records	-0.10	3.72	0.87	3.76	0.83
66	Conducting an agricultural mechanics public relations program	-0.24	2.95	0.94	3.03	0.83
67	Planning an agricultural mechanics public relations program	-0.38	2.81	0.88	2.95	0.74
68	Storing protective equipment for student use (e.g., safety eyewear)	-0.41	3.78	0.82	3.89	0.66
69	Developing computer based lab management reports	-0.49	3.00	0.97	3.16	0.88
70	Constructing welding booths, work benches, storage areas, etc.	-0.75	3.46	0.80	3.68	0.97

Note: Importance Scale: 1 = No Importance, 2 = Below Average Importance, 3 = Average Importance, 4 = Above Average Importance, 5 = Utmost Importance; Ability Scale: 1 = No Ability, 2 = Below Average Ability, 3 = Average Ability, 4 = Above Average Ability, 5 = Exceptional Ability

Table 4
Definitions of Agricultural Mechanics Laboratory Management Competency Constructs (Saucier et al., 2009)

Competency Construct	Definition
Laboratory safety	Activities that an agriculture teacher must perform to maintain a safe laboratory learning environment
Laboratory and equipment maintenance	Maintenance activities that an agriculture teacher must perform to keep the laboratory and equipment in working order
Laboratory teaching	Educational activities conducted in the laboratory by the agriculture teacher to ensure academic and vocational success
Tool, equipment, and supply management	Activities conducted by the agriculture teacher to ensure that all tools, equipment, and supplies are secured and in proper quality and quantity to facilitate the learning process
Program management	Activities conducted by the agriculture teacher to plan, guide, assess, and evaluate the agricultural mechanics program

Table 5
Wyoming Agricultural Mechanics Laboratory Management Competency Constructs Ranked by $\overline{x}_{\text{MWDS}}$ *(n = 37)*

			Importance		Ability	
Rank	Competency Construct	$\overline{x}_{\text{MWDS}}$	$\overline{X}$	*SD*	$\overline{X}$	*SD*
1	Laboratory safety	2.72	4.40	0.43	3.79	0.52
2	Laboratory and equipment maintenance	1.51	3.90	0.47	3.51	0.55
3	Laboratory teaching	1.27	3.98	0.48	3.67	0.56
4	Tool, equipment, and supply management	1.21	3.86	0.48	3.57	0.51
5	Program management	1.12	3.77	0.51	3.50	0.50

Conclusions–Implications–Recommendations

Wyoming secondary agriculture teachers require in-service education to address discrepancies that existed between the teachers' perceived importance of agricultural mechanics laboratory management competencies and their ability to perform the competencies. Secondary agriculture teachers in Wyoming varied greatly in experience from one to 35 years, more than one-third hold a master's degree, and most had at least participatory experience in agricultural mechanics as high school students. The average secondary agriculture teacher in Wyoming taught four courses per semester that involved some facet of agricultural mechanics.

Secondary agriculture teachers in Wyoming recognized agricultural mechanics laboratory management competencies as being important. Nearly all of the competencies were determined to be at least of average importance, nearly half of which were perceived as being of above average importance. Secondary agriculture teachers' perceived themselves as being able to perform most of the competencies at an average level and very few competencies at an above average level. Most of the agricultural mechanics laboratory management competencies that Wyoming secondary agriculture teachers require in-service education in are related to safety. Similarly, agricultural mechanics laboratory management constructs in need of improvement were related to tasks required to maintain a safe laboratory learning environment and to keep the laboratory and equipment in working order. Wyoming secondary agriculture teachers are most competent in program management activities that are necessary to plan, guide, assess, and evaluate the agricultural mechanics program.

In-service education is necessary to address discrepancies that exist between the teachers' perceived importance of agricultural mechanics laboratory management competencies and their ability to perform the competencies. In-service education cannot address all discrepancies at once; therefore, pertinent and continuous in-service education should be facilitated each year and focus on one agricultural mechanics laboratory management competency at a time beginning with the highest priority construct—laboratory safety. To further address the in-service discrepancies of secondary agriculture teachers, teacher education programs must provide the necessary pre-service coursework to develop well prepared and knowledgeable agriculture teachers who can safely and effectively educate students in the development of agricultural mechanics knowledge and competencies. A longitudinal study of pre-service and in-service secondary agriculture teachers' perceived importance of agricultural mechanics laboratory management competencies and their ability to perform the competencies would provide teacher education programs an additional gauge of the adequacy of agricultural mechanics curriculum in their pre-service teacher education program.

Secondary agriculture teachers must be competent and knowledgeable. In some cases, teachers taught up to seven courses per semester, possibly early in their careers and with limited experience. Agricultural mechanics laboratories can be an invaluable resource to agriculture teachers. Well prepared and knowledgeable agriculture teachers can safely and effectively guide agricultural education students in the development of practical, hands-on skills and agricultural mechanics education. However, without competent and knowledgeable agriculture teachers, the agricultural mechanics laboratory can quickly become an underutilized and unsafe environment.

Although 30 years have passed since the unfortunate accident in the Worland High School agricultural mechanics laboratory which resulted in the death of two students, safety is no less important. In a time when applied coursework has been reduced—in some cases to meet the requirements of *highly qualified* under the *No Child Left Behind Act*—mandating additional agricultural mechanics coursework to address the need for laboratory safety education during the pre-service teacher education program may not be realistic. Teacher educators must engrain the concept of self-directed learning (Knowles, Holton III, & Swanson, 2005) in their students, so teachers understand that it is their obligation to remediate or expand their knowledge when needs are identified.

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