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An Assessment of Agricultural Mechanics Safety Instruction Conducted at Agricultural Teacher Education Programs Across the United States

Steve Forsythe
Assistant Professor of Agriculture

Mid-America Nazarene College
Olathe, Kansas

Since passage of the Smith-Hughes Act of 1917 agricultural mechanics instruction has been envisioned as an integral part of the vocational agriculture program. However, the very nature of the agricultural mechanics laboratory or shop is conducive to safety hazards and the potential for possible accidents. A danger has always existed, but there is today a broadened scope and complexity in agricultural shops across the United States. Modern complex machinery found in today's shop can quickly sever an arm or leg as easily as it processes woods or metal.

Vocational agriculture teachers should be concerned with keeping their students safe and free from harm. This is no easy task, as the problems of sophisticated equipment, overcrowded class sizes, and shop facilities place a burden on the public school and more directly on the vocational agriculture instructor. Agricultural teachers have a moral and legal responsibility to act with caution and prudence to keep their students free from accidents and hazards.

Agricultural teacher education programs across the states are responsible for preparing future agricultural teachers for competency in many areas of study. Agricultural mechanics is one of these areas which includes safety as a crucial aspect. The health and safety of students should always be a primary consideraton of any school program. Some teacher educators have recently expressed misgivings over the sufficiency of influence being exerted by teacher education programs in agricultural mechanics. Their concern was that vocational agriculture students should be given proper concepts and practices in safety. For the student to get these safety concepts and practices, the agriculture teachers must have the necessary training and expertise to instill these very things in their own students.

Objectives

The purpose of this study was to assess selected areas of safety instruction in agricultural mechanics conducted at agricultural teacher education programs across the United States. The specific objectives of the study were:

1. To determine the amount of importance currently placed on selected areas of safety instruction by agricultural teacher education programs.

2. To determine the amount of time spent on selected areas of safety instruction.

3. To determine the amount of training agricultural mechanics teacher educators have had in selected areas of safety.

4. To determine where agricultural mechanics teacher educators received their training or preparation in selected content areas of safety instruction.

5. To determine the level of safety preparaton of agricultural education students across the United States.

6. To determine the academic homes and teaching assignments o the agricultural mechanics teacher educators.

Methods and Procedures

A questionnaire was developed and mailed to agricultural mechanics teacher educators at 87 agricultural teacher education programs in the United States. Teacher educators were asked to respond to questions concerning demographic data, questions related to topic importance, amount of training, time spent teaching, where trained, and level of safety preparation of agricultural education students. A self-addressed, stamped envelope was enclosed with the questionnaire to encourage a prompt response and return. A cover letter from the researcher was enclosed explaining the importance and value of the study and its relationship to the continued success of agricultural teacher education across the United States. A follow-up letter was mailed to all non-respondents two weeks after the first mailing. The week before the final deadline for all data collection, 1C random telephone calls were made to those non-respondents in the study.

The population for this study was derived from the list of agricultural mechanics teacher educators identified in the 1980-81 Agriculture Teachers Directory. Additional names of agricultural mechanics teacher educators were secured from Dr. Harold Parady of the American Association for Vocational Instructional Materials and Mr. Byron Rawls of the National Future Farmers of America (FFA) Center. In an attempt to contact every agricultural mechanics teacher educator the United States, the researher also contacted 18 agricultural education department heads and requested the names of faculty specifically involved in agricultural mechanics teacher education. The population of this study consisted of 103 agricultural mechanics teacher educators. Ninety-five teacher educators representing 92% of the population responded to the mailed questionnaire.

Analysis of Data

Descriptive statistics were determined to be the most appropriate analysis to use in this assessment. The descriptive statistics se-

lected were frequency distributions, percentages, and mean responses. For each area of the questionnaire, a frequency count and percentage response by category was calculated as well as the mean response. A mean response was calculated as well as an indication of the dispersion of responses in each of the four FFA regions across the United States. Likert-type scales were specifically developed for data pertaining to objectives 1, 3, and 5.

Findings

Importance

Table 1 presents the regional mean responses and the national means by category importance of 36 selected content areas of safety instruction. A five point Likert-type scale was used to determine the amount of importance currently placed on selected aspects of safety instruction by agricultural teacher education programs. All aspects of shop environment were perceived to be of "much" or "very much" importance by the teachers from all four FFA regions. The content areas of organizing the shop (3.55) and keeping house (3.57) were considered to be of "very much" importance. All the content areas categorized as aspects of safety education and enforcement-accident prevention were perceived to be of "much" or "very much" importance. Protecting the eyes had the highest national mean response at 3.72 for the eight content areas of accident prevention.

Time Spent

For areas of safety instruction in agricultural mechanics involving aspects of shop environment, safety education, and accident prevention most agricultural teacher educators spent from 1-5 hours of class and shop time on most content areas of safety. However, almost 20 percent or more of the respondents from each FFA region reported spending 6-10 hours of class and shop time on the safe use of electric arc welding and gas cutting and welding equipment.

Amount of Training

Table 2 indicates the summary of returns for the teacher educators' perceived amount of training. Agricultural mechanics teacher educators had at least "some" training in every area of safety but one. "Little" training was reported for the aspect of safety education involving maintaining student medical data with a national mean of only 1.37. Teacher educators believed they were trained the most in the areas of using arc welding and gas welding equipment with respective national means of 3.28 and 3.20.

Table 1

Regional Comparison of Importance of Selected Aspects of Shop Environment

Category	Mean Responses as to Importance by Region: Western Region (N=31)	Central Region (N=26)	Eastern Region (N=21)	Southern Region (N=17)	National (N=95)
Shop Environment					
Color coding of shop	3.02	2.82	3.18	3.08	3.02 (Much)*
Locating fire extinguishers	3.45	3.18	3.40	3.49	3.38 (Much)
Locating safety equipment	3.38	3.22	3.32	3.43	3.33 (Much)
Locating exits	2.75	2.84	3.21	3.40	3.05 (Much)
Locating work stations	2.99	3.10	3.05	3.20	3.08 (Much)
Locating stationary power equipment	3.15	3.18	3.25	3.22	3.20 (Much)
Controlling fumes	3.50	3.24	3.37	3.67	3.44 (Much)
Controlling noise pollution	3.05	2.62	2.90	3.34	2.97 (Much)
Using main power disconnect systems	2.96	2.70	2.87	3.34	2.96 (Much)
Using safety signs	3.16	3.30	2.59	3.22	3.07 (Much)
Using safety lanes	2.85	2.74	2.77	3.02	2.84 (Much)
Organizaing the shop	3.67	3.30	3.56	3.67	3.55 (Very Much)
Storing combustibles	3.23	3.32	2.68	3.64	3.21 (Much)
Storing project materials	3.04	2.76	2.87	3.40	3.01 (Much)
Keeping house	3.59	3.39	3.37	3.94	3.57 (Very Much)

Table 1
(continued)

Regional Comparison of Importance of Selected Aspects of Safety Education

Category	Mean Responses as to Importance by Region: Western Region (N=31)	Central Region (N=26)	Eastern Region (N=21)	Southern Region (N=17)	National (N=95)
Safety Education for:					
Using stationary equipment	3.51	3.28	3.37	3.58	3.43 (Much)
Using hand tools	3.45	3.14	3.58	3.61	3.44 (Much)
Using portable power equipment	3.55	3.26	3.63	3.79	3.55 (Very Much)
Using chemicals & solvents	3.25	2.89	3.37	3.25	3.25 (Much)
Using arc welding equipment	3.64	3.24	3.85	3.67	3.60 (Very Much)
Using gas cutting & welding equipment	3.64	3.61	3.83	3.79	3.71 (Very Much)
Keeping student safety records	2.76	2.54	2.63	3.05	2.74 (Much)
Maintaining tools & equipment	3.42	3.35	3.73	3.79	3.57 (Very Much)
Recognizing shop emergencies	3.49	3.05	3.28	3.17	3.24 (Much)
Establishing emergency procedures	3.26	3.18	3.35	3.40	3.29 (Much)
Developing & locating emergency aid stations	3.18	2.87	3.18	3.40	3.15 (Much)
Presenting Red Cross, CPR & First Aid training	2.37	2.43	2.46	2.75	2.50 (Much)
Maintaining student medical data	1.95	2.10	2.53	2.16	2.18 (Some)

Table 1
(continued)

Regional Comparison of Importance of Selected Aspects of Enforcement - Accident Prevention

Category	Mean Responses as to Importance by Region: Western Region (N=31)	Central Region (N=26)	Eastern Region (N=21)	Southern Region (N=17)	National (N=95)
Enforcement/Accident Prevention					
Using safety tests	3.34	3.01	2.80	3.28	3.10 (Much)
Using safety inspections	3.20	3.30	3.11	3.20	3.20 (Much)
Disciplining students in the shop	3.47	2.99	3.30	3.66	3.35 (Much)
Supervising students	3.55	3.45	3.73	3.94	3.66 (Very Much)
Developing general safety rules	3.44	3.28	3.32	3.70	3.43 (Much)
Developing specific safety rules for tools & equip.	3.43	3.37	3.42	3.79	3.50 (Very Much)
Protecting the eyes	3.80	3.61	3.59	3.88	3.72 (Very Much)
Providing protective equip.	3.62	3.34	3.59	3.79	3.58 (Very Much)

* Importance scale: 3.50-4.00=very much, 2.50-3.49=much, 1.50-2.49=some, 0.50-1.49=little, 0.00-0.49=none

Table 2

Regional Comparison of the Amount of Training
in Selected Aspects of Shop Environment

Category	Mean Responses as to Training by Region: Western Region (N=31)	Central Region (N=26)	Eastern Region (N=21)	Southern Region (N=17)	National (N=95)
Shop Environment					
Color coding of shop	2.68	2.33	2.06	2.37	2.36 (Some)*
Locating fire extinguishers	2.39	2.28	2.08	2.28	2.25 (Some)
Locating safety equipment	2.34	2.24	1.87	1.81	2.06 (Some)
Locating exits	2.44	1.80	2.32	2.02	2.14 (Some)
Locating work stations	2.62	2.45	2.27	2.16	2.37 (Some)
Locating stationary power equipment	2.52	2.33	2.37	2.08	2.32 (Some)
Controlling fumes	2.31	2.51	2.03	2.37	2.30 (Some)
Controlling noise pollution	2.18	1.99	1.82	1.90	1.97 (Some)
Using main power disconnect system	2.31	1.91	1.96	2.43	2.15 (Some)
Using safety signs	2.40	2.14	2.03	1.72	2.07 (Some)
Using safety lanes	2.37	2.06	2.03	2.19	2.16 (Some)
Organizing the shop	2.91	3.07	2.75	2.84	2.89 (Much)
Storing combustibles	2.60	2.78	2.53	2.31	2.55 (Much)
Storing project materials	2.58	2.16	2.15	2.52	2.35 (Some)
Keeping house	2.91	2.68	2.35	2.78	2.68 (Much)

Table 2
(continued)

Regional Comparison of the Amount of Training in Selected Aspects of Safety Education

Category	Mean Responses as to Training by Region: Western Region (N=31)	Central Region (N=26)	Eastern Region (N=21)	Southern Region (N=17)	National (N=95)
Safety Education for:					
Using stationary equip.	3.20	2.82	2.92	2.72	2.91 (Much)
Using hand tools	3.26	3.22	3.04	2.81	3.08 (Much)
Using portable power equip.	3.36	2.85	2.98	2.81	3.00 (Much)
Using chemicals & solvents	2.68	2.64	2.25	2.22	2.44 (Some)
Using arc welding equip.	3.43	3.32	3.18	3.22	3.28 (Much)
Using gas cutting & weld welding equipment	3.52	2.97	3.06	3.25	3.20 (Much)
Keeping student safety records	2.39	2.02	1.77	2.72	2.22 (Some)
Maintaining tools & equip.	3.12	2.85	2.87	2.84	2.92 (Much)
Recognizing shop emergencies	2.81	2.26	2.32	1.78	2.29 (Some)
Establishing emergency procedures	2.44	2.03	2.03	2.06	2.16 (Some)
Developing & locating emergency aid stations	2.42	2.10	1.99	1.55	2.01 (Some)
Presenting Red Cross, CPR & First Aid training	2.28	1.64	1.68	1.84	1.86 (Some)
Maintaining student medical data	1.65	1.49	.96	1.40	1.37 (Little)

Table 2
(continued)

Regional Comparison of the Amount of Training in Selected Aspects of Enforcement - Accident Prevention

Category	Mean Responses as to Training by Region: Western Region (N=31)	Central Region (N=26)	Eastern Region (N=21)	Southern Region (N=17)	National (N=95)
Enforcement/Accident Prevention					
Using safety tests	2.84	2.53	1.75	2.37	2.37 (Some)
Using safety inspections	2.81	2.47	1.99	2.46	2.43 (Some)
Disciplining students in the shop	3.15	2.58	2.15	2.96	2.71 (Much)
Supervising students	3.25	1.93	2.51	2.96	2.66 (Much)
Developing general safety rules	2.76	2.47	2.44	2.61	2.57 (Much)
Developing specific safety rules for tools & equip.	3.04	2.62	2.63	2.66	2.73 (Much)
Protecting the eyes	3.17	2.80	2.32	2.02	2.57 (Much)
Providing protective equip.	3.13	2.58	2.42	2.64	2.69 (Much)

* Training scale: 3.50-4.00=very much, 2.50-3.49=much, 1.50-2.49=some, 0.50-1.49=little, 0.00-0.49=none

Summary

In the interest of conciseness, the following summary of findings is presented regarding as assessment of agricultural mechanics safety instruction in teacher education programs across the states:

1. In two areas of safety instruction: Shop environment and enforcement-accident prevention, teacher educators indicated they received most of their training from individual preparation and study.

2. In the area of safety education a higher number and percentage of the 95 teachers indicated being trained in a college or university.

3. Very few teacher educators in agricultural mechanics believed their students were "very well prepared" in safety instruction involving aspects of shop environment, safety education, and enforcement-accident prevention.

4. The majority of teacher educators believed their students were "adequately prepared" in every area of safety but one. Over one-half of the teachers did not teach any form of first aid instruction.

5. Nineteen percent of the eastern FFA region teacher education programs have no agricultural mechanics facilities in which to teach safety.

Table 3 was developed to show the academic homes and teaching assignments of the agricultural mechanics teacher educators. Of the 95 teacher who participated in the study, 31 or 32.6% had 100% academic appointment in agricultural engineering. Twenty-nine teacher teacher educators 30.5% of the total had 100% academic appointments in agricultural education. Nationally, 21 respondents, or 22.1%, held joint appointments, while only 14 teachers educators or 14.8% held academic appointments within another department.

Forty-one percent of the teacher educators had a 100% teaching assignment in agricultural mechanics. Fifty-four, or 56.8% of the respondents did not have a full-time teaching assignment in agricultural mechanics.

Conclusions

An analysis of the data collected in this study was used to develop the following conclusions:

1. In agricultural mechanics teacher education the enforcement-accident prevention aspects of safety are considered most important.

Table 3

Faculty Status and Teaching Assignment of Agricultural Mechanics Teacher Educators by FFA Region

Status/assignment	Western region (N=31) N	%	Central region (N=26) N	%	Eastern region (N=21) N	%	Southern region (N=17) N	%	National (N=95) N	%
Academic appointment										
100% Agr. Engineering	6	19.4	13	50.0	7	33.3	5	29.4	31	32.6
100% Agr. Education	12	38.7	4	15.4	3	14.3	10	58.8	29	30.5
Joint Appointment	8	25.8	6	23.0	5	23.8	2	11.8	21	22.1
Within Another Dept.	5	16.1	3	11.6	6	28.6	0	0	14	14.8
Total	31	100.0	26	100.0	21	100.0	17	100.0	95	100.0
Teaching ssignment										
100% Teaching Assignment in Agri. Mechanics										
Yes	17	54.8	16	61.6	6	28.6	2	11.8	41	43.2
No	14	45.2	10	38.4	15	71.4	15	88.2	54	56.8
Total	31	100.0	26	100.0	21	100.0	17	100.0	95	100.0

2. Teacher educators are spending more time on topics related to the safe use of tools and equipment while devoting less time to topics on creating a safe environment in which to work and on prevention of accidents in the shop.

3. Agricultural mechanics teacher educators are better prepared in aspects of safe use of tools and equipment and on enforcement of safety rules and accident prevention, but have limited training in creating a safe shop environment.

4. Today's teacher educators in agricultural mechanics had to secure much of their training on their own.

5. Overall, teacher educators believe their students are competent in safety. However, they also believe that many graduate with insufficient preparation in the area of first aid instruction.

6. It would appear that teacher educators in agricultural mechanics have an identity problem, due to the fact that there is no set pattern to the academic homes and teaching assignments of agricultural mechanics teacher educators, and few teacher educators have full-time teaching assignments in agricultural mechanics.

7. Agricultural education graduates from other than the eastern FFA region are better trained in safety, perhaps due to the lack of agricultural mechanics facilities at several teacher education programs in that region.

8. While teacher educators believe very strongly about the need and importance of safety instruction in agricultural mechanics, much of their instruction on topics of safety appears to be incidental in nature without a structured or a formal sequence.

9. Some agricultural education graduates appear to have little opportunity to develop safety competency due to the fact that several teacher education programs require their students to enroll in only one or two agricultural mechanics-related courses.

10. In considering all aspects of safety instruction in agricultural mechanics, today's teacher education programs contain a minimal amount of experiences and instruction designed to develop teacher competency in the area of safety.

Recommendations

The following recommendations are made by the author as a result of this study:

1. That agricultural teacher education programs appropriate funds for and require their teacher educators in mechanics to be further trained in aspects of creating a safe shop environment through opportunities such as sabbaticals and National Safety Council field schools, seminars, and other types of in-service educational activities.

2. That agricultural teacher education programs and state departments of vocational education initiate a series of in-service summer workshops and training schools in the area of emergency first aid care for both new and experienced agricultural teachers.

3. That teacher education programs offer a formal safety class in agricultural mechanics complete with a supplemental lab section which would be a part of a required curriculum for all agricultural education majors.

4. That individual agricultural education programs with no agricultural mechanics facilities implement a cooperative arrangment with local area vocational-technical schools and local departments of vocational agriculture who have adequate shop facilities that allow the agricultural mechanics teacher educators to teach safety in an actual shop setting.

5. That teacher education programs explore ways to fund the creation of a full-time faculty position in agricultural mechanics teacher education with the responsiblity of that faculty member to include safety instruction.

6. It is recommended that further research be continued in agricultural mechanics safety instruction that involves the development of a core of safety curriculum materials specifically for agricultural mechanics teacher education.

References

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