Improving Instruction in Safety in the Laboratory Setting

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Safety instruction in agricultural mechanics laboratories has received considerable emphasis in the last 25 years. In the late 1960s and early 1970s most states in the U.S. passed laws or acts related to wearing Industrial Quality Eye Protection in school laboratories. In 1968 the American National Standards Institute (ANSI) established standards for Industrial Quality Eye Protection. In 1979 these standards were revised and have become the standard for most state laws or acts.

Teacher educators in agricultural mechanics have placed considerable emphasis on safety instruction both in teacher preparation courses and in agricultural mechanization courses taken by undergraduate agricultural education students. Bear and Hoerner (1986) in their Planning, Organizing and Teaching Agricultural Mechanics manual, included four chapters related to safety: Personal Safety, the School Safety Program, Responsibility and Liability, and Instructional Safety Programs. This manual is used in many teacher education programs across the U.S. with the hope of improving safety in the agricultural mechanics instructional program.

Hoerner and Bettis (1987) developed a power tool safety instructional packet which included a student manual covering 30 common power tools and an instructors guide consisting of lesson plans on each power tool, transparency masters for part identification on each power tool and a 15 item, safe/unsafe, safety exam over each of the 30 power tools. In addition, safety posters and microcomputer programs have been developed to supplement this power tool safety instructional packet.

Safety instruction has also been emphasized in inservice courses related to various agricultural mechanization topics for teachers who are presently teaching in high school or area school programs.

Even with all this concern and emphasis we still have school laboratory accidents. Further, in every state we read about legal cases where a teacher or school is being taken to court for a liability suit resulting from a school laboratory accident.

The purpose of this study was to find out what is being done related to safety instruction in agricultural mechanics programs in Iowa. Specific objectives for the study were:

1. Identify Factors Related to Safety Instruction in Iowa Secondary Ag Mechanics Programs.
2. Determine Level and Type of Safety Instruction Provided in Iowa Secondary Ag Mechanics Programs.
3. Identify Techniques most commonly included in Safety Instruction in Iowa Secondary Ag Mechanics.
4. Determine Effective Methods for Providing Safety Instruction for Instructors in Iowa Secondary Ag Mechanics Programs.
5. Determine Differences in Instructor Perception of Importance and Preparedness for Selected Safety Instruction Techniques.

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Review of Literature

Safety is being free from danger and injury. Conditions which reduce the possibility of injury to students should be created and maintained in all agricultural laboratories. This requires a continual, systematic analysis of the laboratory environment. It also requires the development of safety consciousness on the part of the instructor and students.

To help develop safety consciousness, safety education must be used. Some individuals in agricultural laboratories are not aware of the dangers which exist. Others know the safety practices but fail to follow them. Safety education involves making people aware of hazardous conditions and teaching them how to perform dangerous activities safely. Thus, there are three major elements in safety education: awareness, attitude and performance.

Safety in agricultural laboratories begins by properly installing and maintaining equipment. Safety features, such as protective shields, must be in place. The design of laboratory facilities is important in creating an environment with a minimum of safety hazards. (Lee, 1980)

In the past some vocational agriculture instructors have been criticized for not keeping up-to-date in reference to safety rules and practices required of agriculture students (Hoerner & Ahrens, 1966). The instructor is the motivating central figure in educating students to practice safe working habits and in developing safety attitudes. Further the instructor is also the one who must bear the brunt of criticism should an accident occur. Students watch and imitate the action of the instructor. Therefore, it is up to the instructor to set a good example for students by not only requiring the students to follow the safety rules but also making sure the instructor follows the rules themselves, while working in the agricultural mechanics laboratory.

Daniels (1980) indicated "Perhaps the most important responsibility of any teacher in an agricultural mechanics setting is to ensure the safety of the student."

Students should be educated by schools or universities in ways which will best create a change of behavior or attitude in their employment away from the formal teaching situation. Educators hope that safety practices become part of the students behavior.

Many accidents occur after the student returns to the farm. A study conducted with Iowa farmers, (Silletto, 1976), revealed the average farm accident resulted in a loss of 9.68

days from normal activities. There was one accident for every 5.66 farms and about 20 percent of the accidents occurred in leisure activities. About three percent of the *accidents* resulted in physically handicapped victims.

"Today's students are tomorrow's workers. They must develop necessary safety attitudes and consciousness" (Bekkum & Hoerner, 1980). They also indicated students must be provided with the necessary instruction to develop safe and skillful working habits. An effective safety instruction program requires considerable planning and continued effort. It must be an integral part of the total instructional program.

Evaluation of educational programs should be a continual process. Everett (1981), recommends that "evaluation of facilities should be included if we are to provide an effective and safe learning environment for our students".

Results of a study on teaching safe use of power equipment, (Bettis, 1971), indicated that high school agricultural mechanization programs did have a slight positive effect on power tool safety and the use of power tools. The study also supported the use of study guides in teaching power tool safety.

"Each of us, as vocational agriculture instructors, has our own ideas of the proper method for teaching safety. There is no right answer to the problem of how to instill a safe-working attitude. The best system is one that develops a safety awareness that our students practice in all facets of the vocational agriculture curriculum as well as in the community." (Pristupa & Foster, 1980).

Pristupa and Foster listed several steps which can be taken to help insure that your students will not become accident victims while participating in agricultural mechanics programs. They were as follows:

- Teach an introduction unit in general education.
- Teach specific safety information in conjunction with specific agricultural mechanics units.
- Administer safety exams.
- Maintain a safety file for each student.
- Maintain personal emergency data on each student.
- Train students in first aid emergency procedures and CPR.
- Require practicums for operating and maintaining power equipment.
- Involve students in your safety program.
- Post safety signs next to all power equipment.
- Safety starts with you - the instructor.

Reynolds (1980), asks the question, "Do safety instruction tests and demonstrations guarantee that serious accidents will not occur? Absolutely not!!" Reynolds indicated an adequate laboratory safety program requires more than the development of the knowledge and skills involved with machine operation and laboratory activities. It also requires the development and maintenance of a safety attitude. Habits must be formed to insure that a safety conscious atmosphere will always be maintained as a matter of daily practice in the agriculture mechanics laboratory.

Educators working with youth in the agricultural mechanics laboratory, outside the laboratory on the driveway, in a court yard, at a construction site, or on the school's land laboratory, could be held responsible for an accident and /or fatality according to Bear (1980). Bear expressed concern that an accident or fatality could result in a lawsuit to determine your personal liability responsibility. Either of these situations will attract the attention of your beneficiary and/or you!!

The proper type of eye protection was not being used in 1980 according to Hoerner and Bekkum (1980). Most states had laws regulating the wearing of proper eye protection in mechanics courses. Although this law existed, many students were not wearing the protection. The instructor must enforce laws, codes, and regulations, set up to protect students from harm and instructors from unnecessary legal action.

Hoerner (1979) indicated the law also stated "Visitors to shops and laboratories shall be furnished with and required to wear the necessary safety devices too." Laws and codes for schools are a little like the speed limit. They are not only a good idea, but they are the law.

Bettis (1972) in a study using a shop safety attitude scale determined it was possible to predict certain types of accident experiences using a written shop safety attitude scale. This scale could be used alone or in combination with other instruments.

Possible student injury could be reduced by making a list of all safety infractions as indicated by Linhardt and Long (1980). They suggested taking the list of safety infractions and attacking each one of them as if it were the enemy.

Additional research in all areas of safety education related to agriculture is needed according to Everett (1980).

Competencies necessary to succeed as a instructor were included in any well-planned pre-service program for the certification of vocational agriculture teachers. Brown (1980) believed the retention and perfection of these skills and concepts until they are ready to be used or put to the test in actual job situations, were alarmingly low.

Everett (1980) indicated that inservice safety education programs should be conducted for instructors teaching safety. Effects of an inservice program should be measured to determine its impact on facility safety.

Gliem (1976) suggested providing the schools with a list of safety references available for teaching units about safety and then teachers could select the references they wanted to use.

According to Berkum (1980), there are several times during an instructor's teaching experience that the instructor will consider leaving teaching to pursue some other occupation. One reason was because the instructor hadn't been able to set priorities. A priority which must be set is that of teaching safety along with skills and understanding.

Dr. Daryl Hobbs, Director of Rural Development and Professor of Sociology at the University of Missouri concluded his presentation at the National Seminar - Trends, Issues, and New Directions Affecting Agricultural Education by challenging each person to seek ways of solving problems. "If you're not a part of the solution, you are part of the problem!" (Lee, 1980).

Methods and Procedures

A thirty-item survey instrument was developed with the assistance of selected teacher educators in the Midwest. The instrument was field tested with graduate students and former vo. ag. instructors. Using a table of random numbers, a random sample of 125 Iowa Agricultural Science, Technology and Marketing (ASTM) instructors was selected to participate in the study. This was approximately 50 percent of the Iowa instructors.

The survey instrument along with a self-addressed, stamped envelope was mailed on December 9, 1988. A follow-up letter and survey were mailed on January 6, 1989. In early February telephone calls were made to approximately 25 instructors. On March 1, 1989, 93 usable surveys (75%) had been returned.

Data were coded into an IBM microcomputer using the Word Perfect 4.2 computer program. These data were transferred to the ISU mainframe computer for statistical analysis using SPSSx procedures. Statistical analysis included: Frequencies, T-Test, ANOVA and Correlations.

Table 1. Selected demographic data means for instructors involved in safety instruction survey

Factor	Mean
Years teaching experience at secondary level	13.3 years
Agricultural mechanics semester credits completed	
Undergraduate	12.6 credits
Graduate	3.3 credits
Percent time spent in agricultural mechanics college courses on safety instruction	10.4 percent

Findings

As noted in Table 1, instructors in the sample have taught a mean number of 13.3 years with a range of 1-40 years of teaching experience. The mean number of agricultural mechanics undergraduate and graduate semester credits completed in college were 12.6 and 3.3 credits respectively. Time spent on safety instruction in agricultural mechanics courses was 10.4 percent.

Further demographic data collected related to past experiences of instructors prior to teaching at the secondary level. Approximately 98 percent of the instructors were reared or worked on a farm while 55.9 percent had worked as a farm operator. Eighty-seven (93.5%) of the teachers completed shop classes in high school and 48 of the 93 instructors (51.6%) worked in an agricultural related industry prior to teaching at the secondary level.

As noted in Table 2, 47 instructors (50.5%) reported having over $200,000 of liability insurance through their school or professional organization while 31.2 percent had from $100,000 to $149,000 of liability insurance.

Additional personal liability insurance was carried by 17 instructors (18.3%) with a mean value of $435,294.

The mean number of students enrolled in ASTM programs in this study was 43.9 students with a range of 12 to 115. Instructors taught an average of 2.0 agricultural mechanics classes per semester with a mean of 9.9 students per agricultural mechanics class.

Table 2. Dollar amount of liability insurance through school or professional organization

Dollar Value Range	Number	Percent
9-24,999	3	3.2
25,000 - 49,999	2	2.2
50,000 - 99,999	9	9.7
100,000 - 149,999	29	31.2
150,000 - 199,999	3	3.2
Over 200,000	47	50.5
Totals	93	100.0

Instructors were asked to report the number of minor accidents, those not requiring doctor or nurse attention and major accidents, those requiring doctor or nurse attention for the past five years. As shown in Table 3, instructors reported a mean of 7.7 minor accidents with a range of 0 to 40 and a mean of .66 major accidents over the past five years. Further, 57 teachers (61.3%) reported that they had no major accidents over the past five years. If we eliminate these 57 teachers, the mean number of major accidents were 1.4 accidents per department where accidents did occur.

Table 3. Accidents reported by Iowa secondary agricultural mechanics instructors over the past five years by type of accident

Type of Accident	Mean	Range
Minor accidents	7.7	0-40
Major accidents	.66	0-5

Instructors were also asked to reveal whether they completed and filed accident reports and the percentage of time they had access to a nurse in their school building. Forty-nine instructors (52.7%) indicated that accident reports were completed and filed. The mean percent of time during the school day when a nurse is available was 40.3 percent with a range of 0-100 percent. Sixteen instructors, 17.2 percent reported a zero percent of time that a nurse is available.

Data in Table 4 reveal types and styles of industrial quality eye protection provided in the agricultural mechanics laboratory. As noted the most common style was the spectacle type with side shields with 93.5 percent of the programs providing this style. Next was goggles with 87.1 percent providing this style. Spectacle type without side shields was provided in 24.7 percent of the programs. Almost 40 percent (39.8) provided some other style of eye protection.

Instructors were asked what method was used for furnishing eye protection for students. School furnished at no cost and students must obtain their own eye protection each were

Table 4. Eye protection types and styles provided or available for agricultural mechanics laboratory instruction

Type and Style	Protection	
	Not Provided	Provided
Spectacle type with side shields	6.5	93.5
Spectacle type without side shields	75.3	24.7
Goggles	12.9	87.1
Other, i.e. visitor goggles	60.2	39.8

Table 5. Mean number of weeks in 4-year agricultural mechanics program and percent zero weeks by basic agricultural mechanics units of instruction

Unit	Mean	Range	% Zero Weeks
Arc Welding	7.4	0 to 36	6.5
Ag Carpentry & Structures	7.3	0 to 18	7.5
Oxy-Acetylene Welding	5.1	0 to 36	6.5
Small Gas Engines	5.0	0 to 36	37.6
Ag Machinery Service & Maintenance	4.3	0 to 18	20.4
Tractor Service and Maintenance	3.8	0 to 25	29.0
Basic Ag Electricity	3.7	0 to 18	24.7
Concrete Construction	2.3	0 to 9	31.2
Soil & Water Engineering	1.9	0 to 9	38.7
Hot & Cold Metals	1.3	0 to 8	48.4
Electric Motors	1.0	0 to 5	49.5
Electric Controls	.4	0 to 5	69.9

rated at 45.2 percent while only 9.6 percent of the schools furnished eye protection for a rental fee.

Students store and bring to class was the most common method for storing eye protection, 50.6 percent, while 32.3 percent of the programs stored eye protection in school made cabinets. Only 17.2 percent had student eye protection stored in commercial cabinets.

Data in Table 5 reveal the mean number of weeks that basic agricultural mechanics units are included in the four-year program. As noted the most commonly taught units of instruction were Arc Welding, Oxy-Acetylene Welding and Ag Carpentry with mean percent zero weeks of 6.5, 6.5 and 7.5 respectively. These same units were taught for the greatest number of weeks with Arc Welding yielding a mean of 7.4 weeks, Ag Carpentry 7.3 weeks and Oxy-Acetylene Welding 5.2 weeks.

The least commonly taught units in weeks of instruction were Electric Controls (.4 weeks), Electric Motors (1.0 weeks) and Hot and Cold Metals (1.3 weeks). Further, these same units were most commonly not included in the 4-year program as noted by the mean percent zero weeks of 69.9 percent for Electric Controls, 49.5 percent for Electric Motors and 48.4 percent for Hot and Cold Metals.

The instructors were asked to indicate the number of hours they spend teaching safety in each unit of agricultural mechanics. As shown in Table 6, two of the most commonly taught units, Ag Carpentry and Arc Welding also received the greatest number of hours of instruction on safety, 3.9 and 3.8 hours respectively. Tractor Service and Maintenance followed with a mean of 3.6 hours of instruction on safety.

Table 6. Mean number of hours in 4-year agricultural mechanics program on safety instruction and percent zero hours by units of instruction

Unit	Mean	Range	% Zero Hours
Ag Carpentry and Construction	3.9	0 to 16	3.2
Arc Welding	3.8	0 to 20	2.2
Tractor Service and Maintenance	3.6	0 to 40	10.8
Oxy-Acetylene Welding	3.0	0 to 20	2.2
Basic Agricultural Electricity	2.5	0 to 10	3.2
Ag Machinery Service & Maintenance	2.2	0 to 10	16.1
Small Gasoline Engines	2.1	0 to 10	7.5
Hot and Cold Metals	1.4	0 to 10	7.5
Soil and Water Engineering	1.1	0 to 5	25.8
Concrete Construction	1.1	0 to 4	18.3
Electric Motors	1.0	0 to 5	11.8
Electric Controls	.9	0 to 5	7.5

The least number of hours was spent in teaching safety in Electric Controls (.9), Electric Motors (1.0), Concrete Construction (1.1) and Soil and Water Engineering (1.1) hours. Percent zero hours would indicate the percent of programs where the unit was taught but no hours were spent on teaching safety. The units with the lowest percent of zero hours were Arc Welding and Oxy-Acetylene Welding, 2.2 percent respectively. The unit with the highest percent of zero hours was Soil and Water Engineering (25.8%) meaning that over 25 percent of the instructors teaching this unit did not spend any time in teaching safety related to Soil and Water Engineering.

Instructors were also asked what percent of their total ASTM instructional program was instruction in agricultural mechanics. The mean percent was 25 with a range of 5 to 55 percent. When asked what percent of the agricultural mechanics instructional program was instruction in safety, the instructors reported a mean of 10.8 percent with a range of 1 to 33 percent.

Table 7. Safety instructional techniques used in agricultural mechanics programs

Safety Technique	Percentage	
	Not Used	Used
Teacher Demonstrations - Power Tools	4.3	95.7
Teacher Demonstrations - Hand Tools	5.4	94.6
Students Pass Safety Exams	9.7	90.3
Students Study Subject Matter	4.0	86.0
Student Demonstrations - Power Tools	22.6	77.4
Student Demonstrations - Hand Tools	20.4	79.6
Cleanup Schedule Used	26.9	73.1
a. Safety Engineer	84.9	15.1
b. Cleanup Foreman	39.8	60.2
Students' Safety Exams are Filed	32.3	67.7
Unscheduled Safety Inspections Conducted	67.7	32.3
Scheduled Safety Inspections Conducted	75.3	24.7
Students Have Copy of Iowa Eye Safety Law	79.6	20.4

Table 8. Safety instructional materials used in agricultural mechanics programs

Instructional Materials	Percentage	
	Not Used	Used
Manuals and Booklets	12.9	87.1
Worksheets	18.3	81.7
Transparencies	22.6	77.4
Slides & Filmstrips	28.0	72.0
Videotapes	52.7	47.3
16mm Films	53.8	46.2
Microcomputer Programs	84.9	15.1

When asked to identify the teaching style or technique used in teaching safety, 38.6 percent of the instructors revealed they taught safety as a block or separate unit while 61.4 percent of the instructors indicated they taught safety by integrating into agricultural mechanics units.

Shown in Table 7 are safety instructional techniques used in agricultural mechanics programs. As noted, the most common safety instructional technique used in teaching safety included Teacher Demonstration-Power Tools (95.7%), Teacher Demonstration-Hand Tools (94.6%) and Students

Table 9. Safety materials used or available for students in agricultural mechanics laboratory

Safety Materials	Percentage	
	No	Yes
Industrial Quality Eye Protection	2.2	97.8
Welding Gloves	4.3	95.7
Shop Coats and Coveralls	26.9	73.1
Welding Aprons and Jackets	44.1	55.9
Hearing Protection, Ear Muffs	67.7	32.3
Dust Masks	71.0	29.0
Hearing Protection, Ear Plugs	77.4	22.6
Hard Hats	81.7	18.3
Respirators	84.9	15.1
Bump Caps	97.8	2.2
Steel Toed Shoes	97.8	2.2

Pass Safety Exams (90.3%).

The least commonly used safety instructional techniques as shown in Table 7 included Safety Engineer used During Cleanup, 15.1 percent; Students Have Copy of Iowa Eye Safety Law, 20.4 percent and Scheduled Safety Inspections Conducted, 24.7 percent.

Data in Table 8 reveal safety instructional materials used in agricultural mechanics programs. As shown, the most commonly used safety instructional materials were Manuals and Booklets followed by worksheets (81.7%). The least commonly used instructional materials was Microcomputer Programs with only 15.1 percent of the instructors indicating they were used in teaching safety.

The most commonly used or available safety materials for students in the agricultural mechanics laboratory were: Industrial Quality Eye Protection (97.8%) and Welding Gloves (95.7%) as revealed in Table 9. Further, Bump Caps and Steel Toed Shoes were the least commonly used or available safety materials, 2.2 percent respectively.

Data in Table 10 reveal safety equipment and materials available in the agricultural mechanics laboratory. Safety Exits Marked (94.6%), First-Aid Kits (92.5%) and Fire Extinguishers (92.5%) were the most commonly available safety equipment and materials. The most common type of

Table 10. Safety equipment and materials available in the agricultural mechanics laboratory

Equipment and Materials	Percentage	
	No	Yes
Safety Exits Marked	5.4	94.6
First Aid Kit	7.5	92.5
Fire Extinguishers	7.5	92.5
Welding Exhaust System	9.7	90.3
Fire Alarm	12.9	87.1
Fire Blanket	17.2	82.8
Welding Booths with Screens/Curtains	25.8	74.2
Safety Guards on all Equipment	31.2	68.6
Safety Cans for Flammable Liquids	36.6	63.4
Vehicle Stands	44.4	55.6
Safety Poster Near Power Tools	46.2	53.8
Safety Zones around Power Tools	45.2	54.8
Safety Cabinet for Explosive Materials	47.3	52.7
Safety Rules Near Power Tools	64.5	35.5
Color Coding Power Tools	68.6	31.2
Engine Exhaust System	72.0	28.0
Non-Skid Areas around Power Tools	75.3	24.7
Iowa Eye Safety Law Posted	75.3	24.7

fire extinguishers available in laboratories were the ABC and the A type extinguishers. The least common type was the B or flammable liquid type. Also noted in Table 10, Iowa Eye Safety Law Posted (24.7%) and Non-Skid Areas around Power Tools (24.7%) were the least commonly available safety equipment and materials in Iowa agricultural mechanics laboratories.

Some safety studies reviewed indicated that the size of the agricultural mechanics laboratory had a bearing on safety instruction and laboratory safety. Data in Table 11 indicate that 43 percent of the Iowa agricultural mechanics laboratories were in the 1000-1999 square foot range while 38.7 percent were in the 2000-3000 square foot range. Only seven programs (7.5%) revealed laboratories of less than 1000 square feet in size.

Table 11. Size of Iowa agricultural mechanics laboratories

Value Range	Number	Percent
Less than 1000 sq.ft.	7	8.5
1000 - 1999 sq.ft.	40	43.0
2000 - 3000 sq.ft.	36	38.7
Greater than 3000 sq.ft.	10	10.8
Totals	93	100.0

Table 12. Age of Iowa agricultural mechanics laboratories

Value Range	Number	Percent
Less than 5 years	4	4.2
5-14 years	25	26.9
15-25 years	34	36.6
Over 25 years	30	32.3
Totals	93	100.0

Table 13. Method for presenting instruction related to agricultural mechanics safety

Method	Percentage	
	No	Yes
Undergraduate Education-Ag Mech Courses	16.1	83.9
Integrate Safety in Ag Mechanics Workshops	24.7	75.3
Workshop on Teaching Ag Mechanics Safety	34.5	64.5
Graduate Courses on Teaching Safety	50.5	49.5

The age of Iowa agricultural mechanics laboratories is shown in Table 12. As revealed, 36.6 percent of Iowa laboratories were 15-25 years of age while 32.3 percent were over 25 years of age. Only four programs, 4.2 percent were less than five years of age.

One of the objectives of this study was to determine the most effective method for preparing instructors for teaching safety in the agricultural mechanics program. As noted in Table 13, 83.9 percent of the instructors believed that the most effective method was undergraduate education through agricultural mechanization courses. The least effective method according to beliefs of Iowa instructors was through graduate courses on teaching safety, 49.5 percent.

A majority of Iowa agricultural mechanics instructors believe they are moderately prepared to teach safety with 64 instructors (68.8%) checking this preparation value while 16

Table 14. Degree instructors believe they are prepared to teach agricultural mechanics safety

Preparation Value	Number	Percentage
Very Well Prepared	16	17.2
Moderately Prepared	64	68.8
Somewhat Prepared	12	12.9
Poorly Prepared	1	1.1
Totals	93	100.0

instructors (17.2%) believe they are very well prepared, note Table 14. Only one instructor felt he/she was poorly prepared for teaching safety.

The instructors were asked to rate 16 selected safety techniques on a 1-5 scale as to the importance they believe the technique was and how well they feel they were prepared to provide instruction in this technique. Data in Table 15 reveal instructor importance and instructor preparedness for the 16 selected safety techniques. T-Test statistical analysis was used to determine significant differences between importance and preparedness for 16 selected safety techniques. As noted in Table 15, 10 of the 16 techniques yielded differences significant at the .01 level between importance and preparedness. The instructional technique, Iowa Safety Laws yielded the greatest significant difference with a mean difference of 1.02 with importance receiving a mean value of 3.47 and preparedness 2.45. The highest rated technique for both importance (4.78) and preparedness (4.20) was Industrial Quality Eye Protection. These mean values were significantly different at the .01 level of probability.

Other safety instructional techniques yielding significant mean values between importance and preparedness included: Accident Report Forms, First-Aid Materials, Safely Operating Power Tools, Safely Using Hand Tools, Fire Extinguisher Types, Electrical Safety, Welding Exhaust Systems and Engine Exhaust Systems. Further, as noted in Table 15, the overall means of 3.91 for importance and 3.49 for preparedness were found to be significantly different at the .01 level of probability. Three instructional techniques: Administering Safety Exams, Clean Up Schedules and Color Coding Tools yielded higher means for preparedness than importance. However, none of these means were significantly different.

Table 15. Agricultural mechanics instructors and teaching safety ratings for selected safety techniques, means and T-Test probabilities

Safety Technique	Mean Ratings		T-Tests
	Importance	Preparedness	Prob
Iowa Safety Exams	3.47	2.45	0.001**
Industrial Quality Eye Protection	4.78	4.20	0.001**
Administering Safety Exams	3.61	3.73	0.308
Accident Report Forms	3.57	3.01	0.001**
Clean Up Schedules	3.68	3.93	0.054
Lab Safety Inspections	3.26	3.09	0.210
First-Aid Materials	4.33	3.68	0.001**
Color Coding Tools	3.04	3.05	0.928
Power Tool Safety Posters	3.08	3.01	0.527
Power Tool Operation Posters	3.29	3.03	0.062
Safely Operating Power Tools	4.69	3.99	0.001**
Safely Using Hand Tools	4.55	4.02	0.001**
Fire Extinguisher Types	4.53	3.92	0.001**
Electrical Safety	4.38	3.63	0.001**
Welding Exhaust Systems	4.41	3.71	0.001**
Engine Exhaust Systems	3.84	3.23	0.001**
Overall Mean	3.91	3.49	0.001**

Summary and Conclusions

Safety instruction in agricultural mechanics is believed to be an important phase of the secondary instructional program. New laws and safety standards have placed additional emphasis on the importance of teaching safe practices and developing safe work habits as well as providing a safe environment in which to work and learn.

The objectives of this study of Iowa Agricultural Science, Technology and Marketing (ASTM) instructors were to:

- identify factors related to safety instruction.
- determine the level and type of safety instruction.
- identify techniques commonly used in safety instruction.
- determine effective methods for providing safety instruction.
- determine differences in instructor perception of the importance and preparedness for selected safety instruction techniques.

The following summarizes the major findings and conclusions of the study.

1. Over 50% of the instructors have at least $200,000 of liability insurance with 18.3% carrying additional liability insurance.
2. Instructors reported a mean of 7.7 minor accidents and .66 major accidents for the past 5 years.
3. The most common style of eye protection provided is the spectacle type with side shields.
4. Teachers spend 10.8% of their Agricultural Mechanics instructional time in teaching safety.
5. Manuals and booklets and worksheets are the most commonly used safety instructional materials.
6. Industrial quality eye protection and welding gloves are the most commonly used safety materials by students.
7. A majority of the teachers (84.0%) believe that they should receive their safety instruction in undergraduate agricultural mechanics courses.
8. Almost 18% of Iowa instructors believe they are very well prepared to teach ag mechanics safety while 68.8% believe they are moderately prepared.
9. Iowa secondary agricultural mechanics instructors level of preparedness was significantly lower than level of importance for 10 of the 16 selected safety techniques and for the overall mean.
10. The instructional technique, Iowa safety laws yielded the greatest significant difference between importance and preparedness with a mean difference of 1.02 while color coding tools produced the least difference with the preparedness rating being .01 above importance.

Implications for Safety Instruction in Preservice and Inservice Courses

The results of the study of Iowa's Agricultural Science, Technology and Marketing Instructors provide implications for college-level teacher education preservice and inservice courses. The authors suggest the following implications.

Instructors should become better prepared to provide instruction related to Industrial Quality Eye Protection (IQEP). This could be accomplished by placing additional emphasis on this topic in the preservice agricultural mechanization courses for undergraduates and inservice courses for graduate students. Emphasis should be placed on types and applications of IQEP, standards for eye protection and practices for sanitation of eyewear.

Instructors need to become more knowledgeable about the Iowa Safety Laws. Here again, this information needs to be presented in preservice and inservice classes.

Instruction related to operating power tools should received increased emphasis in related agricultural mechanization courses. Techniques including teacher demonstrations, student demonstrations, conducting safety inspections of power tools and completing knowledge and performance tests should be used to provide the additional emphasis required.

Instruction in electrical safety needs to receive greater emphasis in the undergraduate program. Preservice programs in teacher education should include a course or unit in electricity. The subject is too broad to simply provide a few additional lessons in the basic agricultural mechanization courses presently taken by undergraduates.

Undergraduate agricultural mechanization programs should emphasize preparation for instruction related to: first-aid materials, safely operating power and hand tools, accident report forms, fire extinguisher types and welding and engine exhaust systems.

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POSTER SESSION

Using a Visiting Committee For Department Evaluation

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The Department of Agriculture at Abilene Christian University (ACU) has functioned under a Departmental Advisory Board (DAB) since the early 1980's. The DAB evolved into a Visiting Committee (VC) in 1985 after the University adopted this system in 1983 for departmental evaluation. The VC is composed of nine-members representing three sub-groups including academia, users and practitioners. The VC's primary function involves periodic review of departmental activites, including conferences with faculty and students. Ideally, advice and counsel from the VC in helping plan a future course of action, policy and/or program is intended from these periodic reviews. Written reports, sent through appropriate administrative channels, ultimately reach the University's Board of Trustees.

Since 1985, the VC's evaluations have been instrumental in broadly enhancing faculty development, proprietary management and use of departmental resources, physical facilities, student and alumni morale, curricula and teaching. Specifically, the VC has encouraged faculty development via departmental commendations to administrators, recommendations on salary competitiveness, faculty enrichment through research opportunities, request for sufficient travel monies to attend at least one national/international and one state or regional professional meeting per year, suggestions regarding specific teaching/research loads, proposals for hiring new faculty and curricula revision. Additionally, faculty exposure to current changes in the industry while re-exposing the VC to the university environment and the specific mission of the Department and the University have proved to be beneficial. The VC concept is an effective vehicle for enhancing departmental evaluation, faculty development and ultimately, improvement of teaching.