# 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.

## 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

**Presented by Bekkum at the 36th Annual NACTA Conference, June 19, 1990 at Morrisville College, Morrisville, NY. Bekkum is an associate professor and Hoerner is an professor in the Department of Agricultural Engineering at Iowa State University.**

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 |