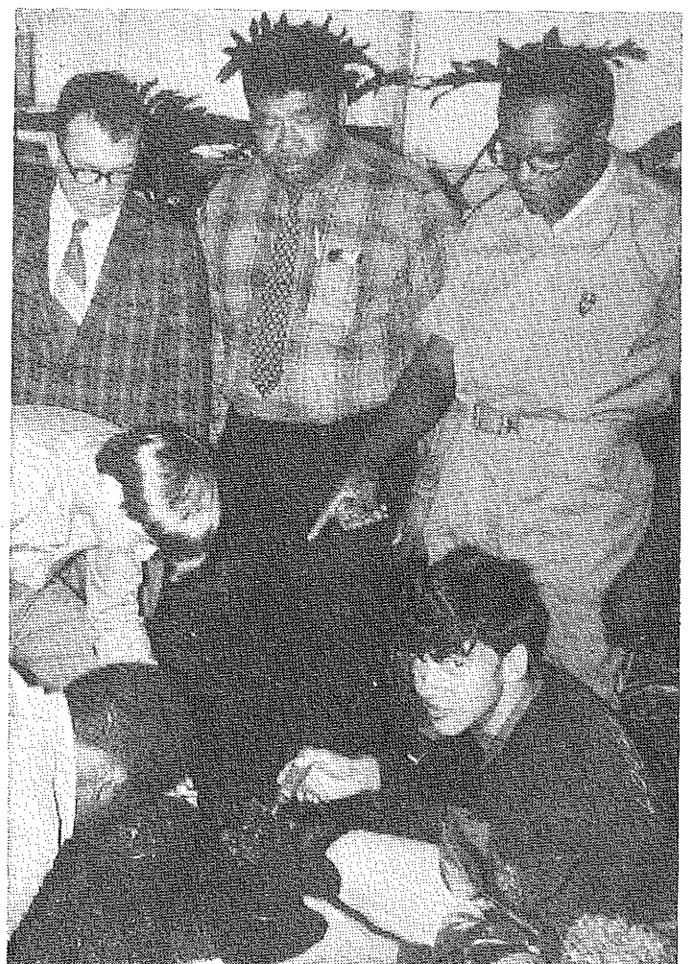
Dennis Dazey, (right), State President of the Illinois FFA, President Nixon, Governor Ogilvie of Illinois and the beautiful queen of county fairs watch while an exhibitor shows his holstein cow at the Illinois State fair. (Photo by the Chicago Tribune)

STORY IN PICTURES

by Robert Walker,

University of Illinois

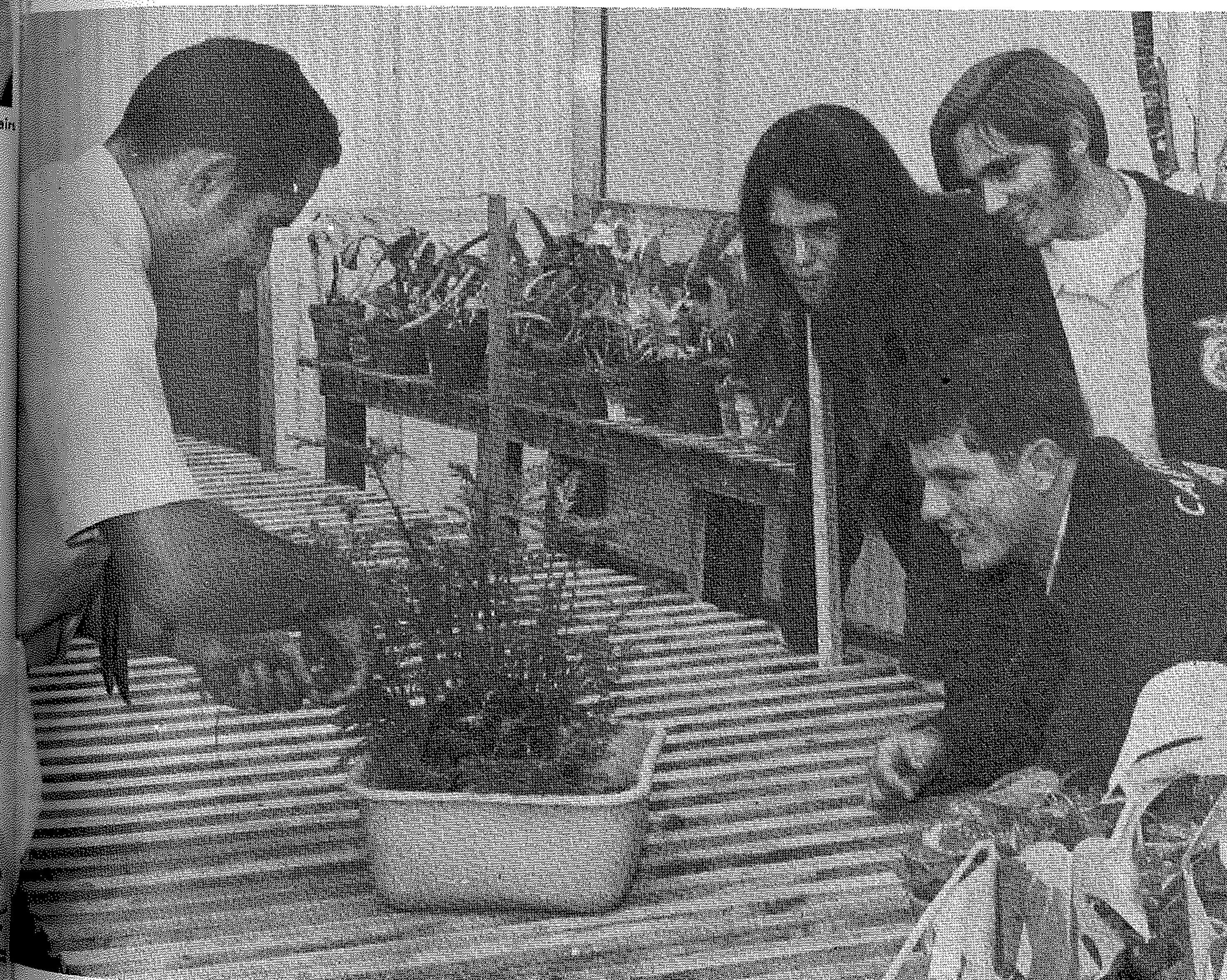


Clemeal Harry, Vocational Agriculture Teacher at Folsom Jr. High School in St. Tammany Parish, Louisiana explains to his administrators, Principal Alfred Greenwood, (center), and Assistant Principal Earl Warren, (left), a skill in horticulture being put into practice by some of his students. (Photo from J. C. Simmons, Area Supervisor, Franklinton, Louisiana)

Mel Warner briefs Ron Lindeman of Sleepy Eye and John McCracken of Springfield, vocational agriculture teachers, who spent 3½ days studying the Grain Terminal Association as part of a graduate course in agricultural education at the University of Minnesota. (photo from Farmers Union Grain Terminal Association)

Agricultural Education

Volume 44 January, 1972 Number 7



Featuring —

AGRICULTURAL MECHANICS

The
Agricultural Education
Magazine

EDPRESS

Vol. 44 January 1972 No. 7

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THE AGRICULTURAL EDUCATION MAGAZINE is the monthly professional journal of agricultural education. The publication is managed by an Editing-Managing Board and is printed at The Lawhead Press, Inc., 900 East State Street, Athens, Ohio 45701.

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COVER PHOTO

Vocational agriculture instructor, Mel Souza, Morro Bay High School, California, demonstrates to horticultural students, Rowina Schlitz, Nick Dunton (right front) and Andy Domenghini how to prune a redwood burl. (Photo by William Wills, Agricultural Mechanics Specialist, California State Polytechnic College).

Editorials

From Your Editor . . .

ARE YOU PREPARED?


Roy D. Dillon

It is with great personal and professional pleasure that I begin this tenure as Editor of the Agricultural Education Magazine. It is my hope that through the coming issues, Agricultural Educators at the secondary, post-secondary, state departments of education, and university levels will gain and contribute ideas which will help us all perform our job—*to help young people and adults prepare for their next pursuit!*

Research shows there is a need for workers in the field of Agricultural Mechanics, both on and off-the-farm. The available research also shows there are several levels of jobs, and competencies required for these jobs. The implications for planning wise educational programs are strong. *First,* the teacher should identify the employment opportunities in Agricultural Mechanics in the local, area, and state because we know people will migrate. An employment opportunity is a job opening due to employee turnover, death, retirement, or promotion. *Second,* he should identify the levels of jobs and competencies needed by workers in each job. Excellent instructional materials are available from several sources once the teacher determines which specific curriculum components he needs. *Third,* are teachers conducting vocational programs which will expose young people to the world of work, especially at the elementary and junior high levels? Are junior high students learning basic carpentry skills, since many are using these tools at home anyway? Are secondary and post-secondary students obtaining marketable skills in Agricultural Mechanics, learned either on-the-job or in a school laboratory simulation situation?

The instructional area of Agricultural Mechanics is a very important part of most secondary school vocational agriculture programs, making up from 25 to 50 per cent of the course time depending on the local situation. It is essential that the teacher have an *adequate background* in the Agricultural Mechanics areas in which he will provide instruction. He should prepare himself through on-farm or agribusiness experience prior to college graduation, coursework while in college, or in-service workshops or schools taken after beginning teaching.

The Agricultural Mechanics phase of vocational programs at secondary and post-secondary levels enable many students who are not succeeding in the regular academic program to succeed in the mechanically oriented courses.

The basic reason we are educators is to help others achieve successful competencies. How well is your Agricultural Mechanics program organized to do this job?

—RDD

Guest Editorial

AGRICULTURAL MECHANICS


C. C. Eustace

In this day of modern American agriculture, there is a great need for mechanics skills both in farming and in many ag-related occupations. Taking care of the up-to-date machinery and equipment needed to operate a large modern farm requires much greater technology and skill than was required in the days of horse-drawn implements.

Kansas farmers own $1.1 billion worth of farm power and machinery today. This is book value, not what it would cost to replace present equipment. Net annual income of these same farmers for 1970 was slightly less than $½ billion. This indicates that farmers need the knowledge it takes to properly operate, service, and maintain their machinery to postpone as long as possible those expensive overhauls and replacements.

Our courses in vocational agriculture are frequently referred to as "traditional" by many people. Tradition is defined in the dictionary as "something handed down from the past, an inherited culture, attitude, etc." Those of us who have been connected with the early vocational agriculture programs know that great changes have taken place in ag. mechanics, that we have learned from and built on the past, and that more changes will be needed in the future.

The vocational agriculture teacher has to have a wide variety of mechanical skills to meet the needs of farm boys and young men engaged in the business of farming. The ag. mechanics area of instruction deals primarily with the unspecialized mechanical activities carried on during the daily operation of a farm and the performance of these activities in a proficient manner. Proficiency in the use and maintenance of equipment is among the first requirements for survival of the family-type farm today. No other part of the vocational agriculture program offers a greater opportunity to the teacher for immediate visible and tangible results than does ag. mechanics. No other part of the vocational agriculture program is accepted more eagerly by the students than well planned and conducted ag. mechanics classes. No other vocational program offers the wide variety

The Vocational Agriculture teacher has to have a wide variety of mechanical skills to meet the needs of farm boys and young men engaged in the business of farming.

of useful mechanics skills that is available from a well-trained ag. teacher equipped with a good farm shop.

The ultimate goal of a farm mechanics training program for the boy who plans to return to the farm should be the ability to protect the investment in farm power, machinery, buildings, and equipment through proper operation, adjustment, preventive maintenance, and repair. Minor construction projects are also a part of the goal. This ability requires a wide variety of manual skills, knowledge, and judgment.

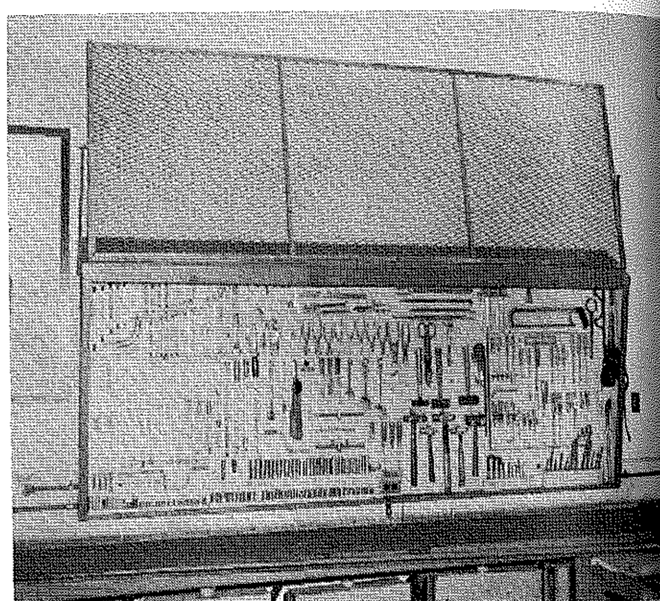
The high school farm mechanics program should progress from the simple to the more complex. Freshmen boys still need to be acquainted with the hand tools and the proper usage of each tool. They need to learn to properly sharpen chisels, plane irons, screw drivers, and drill bits. Each one of these jobs should be accompanied by appropriate shop safety practice training.

Each job should be studied in class. Each student should take notes on steps and procedures to be followed or have an exercise sheet explaining the procedure to be followed. A systematic approach to teaching students new skills such as the "traditional" procedure of explanation, demonstration, and execution for teaching job skills is still hard to beat.

The agriculture mechanics information outlined in the courses listed in this article is taught in Kansas vocational agriculture departments. Variations in scheduling and emphasis may be found due to local facilities, enrollments, and community needs.

Below is a suggested list of areas for skill development for beginners in agricultural mechanics:

1. Sketching and drawing as applied to learning simple shop skills and construction of small projects which involve the skills being studied. Learning of symbols in blueprint reading, reading working drawings, figuring a bill of material.
2. Tool conditioning including hand tools, chisels, wood auger bits.
3. Cold metal work
   a. marking
   b. cutting with
      (1) hacksaw
      (2) cold chisel
      (3) bolt cutters
   c. cutting holes in metal with a drill
4. Hot metal work
   a. light and use gas or coal forge
   b. make gate hook
   c. make hammer wedges
   d. draw out, sharpen, and temper cold chisel
5. Sheet metal and soldering
   a. tin copper
   b. tin two pieces metal and sweat together
   c. solder small hole
   d. bring soldering job from home
6. Carpentry
   a. measuring and marking wood using steel tape, carpenter square, try square
   b. sawing board with hand saw
   c. selecting lumber
   d. splicing electric wire
7. Fundamentals of electricity—safety practices
   a. nature of electricity and electrical terms
   b. how electricity can work for you
   c. cost of electric power compared to other sources
   d. splicing electric wire
   e. fuses and circuit breakers
   f. repair an extension cord
8. Concrete work
   a. aggregates and their use
   b. mixing of dry ingredients
   c. cement-water ratio
9. Safe tractor operation
   a. maintenance to be done by tractor operator
   b. safety practices needed in tractor operation
   c. driving a tractor
   d. hitching a tractor to a load
10. Study and introduction to arc and acetylene welding
    a. selection of an arc welder
    b. striking an arc
    c. making a stringer bead
    d. padding



An example of the type tool board which is very popular in Kansas.

In learning a skill, it is desirable that the student complete a small project to take home. For example, a neat drawing of a nail box and the finished painted nail box for carpentry, possibly a feed scoop for sheet metal and soldering work, a foot scraper for cold metal work and concrete, a drop cord for electricity, and replacing a hammer handle for tool fitting are all good projects. A simple project well done will develop enthusiasm, pride, and self confidence in a student. It also makes a favorable impression on the parents.

Practically all of the sophomore, junior, and senior farm mechanics work we are using will fall under the five headings listed below:

1. Agricultural construction and maintenance
2. Farm power and machinery
3. Farm buildings and conveniences
4. Farm electrification
5. Soil and water management

The sophomore year in many of our schools has a two-period class, which is especially valuable in agricultural

(Continued on page 192)

CHANGE NEEDED IN AGRICULTURAL MECHANICS CURRICULA

Wiley B. Lewis

Wiley B. Lewis
Curriculum Materials Specialist
Virginia Polytechnic Institute

and

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Ralph J. Woodin

Extensive revision of agricultural mechanics offerings in production agriculture curricula are needed. This need originates in fast changing applications of agricultural mechanics to modern farming as well as change in the agricultural mechanics skills of today's students of vocational agriculture. These are some of the findings of a recent study completed at The Ohio State University.[1]

Teachers of vocational agriculture can find change taking place in agriculture, education, and their communities. They can observe the influence of this change on the person with whom they work.

In the production phase of the vocational agriculture program, change has affected agricultural mechanics. Manufacturers of agricultural production and shop tools and equipment are continuously attempting to improve products and to introduce new ones. These new and improved products as well as new and improved techniques for operating, maintaining, repairing, or constructing them imply a need for providing new and improved knowledge and skills to students in agricultural mechanics classes.

Confronted with this situation, one would expect to find considerable change taking place in agricultural mechanics curricula. However, this is not so. The Ohio study revealed that teachers in only one-third of the vocational agriculture departments offering production agriculture instruction had revised their agricultural mechanics curricula during the past year. Departmental curricula were reported as being revised through the addition, deletion, expansion, and restriction of specific instructional units.

A Suggested Change

The writers believe that agricultural mechanics curricula should be changed in another way—to ensure that the instruction provided is related to the activities students perform as part of their educational programs and will perform in their proposed occupations. This requires that the curricula be altered to provide related instruction at a time which more nearly coincides with the student's initial performance of the associated activity. This change, we believe, can be initiated by the teacher without requiring a major change in administrative policy.

TABLE 1
PERCENTAGE OF VOCATIONAL AGRICULTURE STUDENTS ENROLLED IN PRODUCTION AGRICULTURE CLASSES WHO REPORTED THE SCHOOL GRADE IN WHICH THEY FIRST OPERATED, MAINTAINED, AND REPAIRED GASOLINE TRACTORS N = 983

Activities	Total	School Grades			
		6 or below	7-8	9-10	11-12
Operated	78.9	45.7	22.7	9.7	0.8
Maintained	62.7	20.8	26.8	13.8	1.3
Repaired	46.1	8.3	18.0	17.0	2.8

But how can this change be carried out? The answer to this question—or even a partial answer—could prove to be of value to teachers of vocational agriculture in attempting to improve their agricultural mechanics curricula. Several ways in which this change might be implemented are examined below.

Implementation

It should be noted from the information summarized in Table 1 that a rather high percentage of production agriculture students reported they operated, maintained, and repaired gasoline tractors before entering the eleventh grade. Since teachers participating in the study reported that instruction related to the areas of emphasis—operation, maintenance, and repair — was generally offered in grades eleven and twelve, it can easily be conceived that many students will have established initial performance patterns — either good or bad — related to these activities before formal instruction is provided.

Data summarized in Figure 1 indicates that while students begin performing different activities at varying times, few begin the initial performance of an activity related to farm power and machinery items in agricultural mechanics classes during the eleventh and twelfth grades. Teachers reported that this is the period in which most instruction related to the operation, maintenance, and repair of such items was provided.

An educational opportunity gap often exists between the time a student begins to perform an activity and the time when related formal instruction is provided as revealed by this study. The existence of such a gap—not only in farm power and machinery but also in the areas of agricultural construction and maintenance, rural electrification and processing, farm buildings and conveniences, and soil and water conservation — necessitates that a curriculum which will improve the relevance of two events, initial activity and related instruction, be devised. To do this, the time of occurrence of one or both events must be altered.

Since it would be impossible to change times at which students begin performing most mechanical activities, the time at which related instruction is offered should be altered. As part of this concept, basic instruction con-

(Continued on next page)

cerning the operation and maintenance of electric motors, materials-handling equipment, and farm power and machinery items such as balers and gasoline tractors should be introduced near the beginning of the vocational agriculture program—preferably in the first year of the program.

Opposition

But echoes from the past can be heard. You cannot introduce areas of specialized study that soon! What about basic mechanical skills? What about the individual who discovers that he really does not want to farm?

In attempting to answer such responses one should consider at least three conditions. *First,* educators have found that students are capable of performing higher level activities than were previously thought possible.[1] They are finding that much of the blame for poor student performance should be placed on the poor use of teaching techniques and materials instead of the students' inability to perform specific tasks. Data presented in Figure 1, when compared with the year in vocational agriculture in which teachers provided related instruction, indicate that the students' actual performance often exceeds the teachers' perception of their abilities.

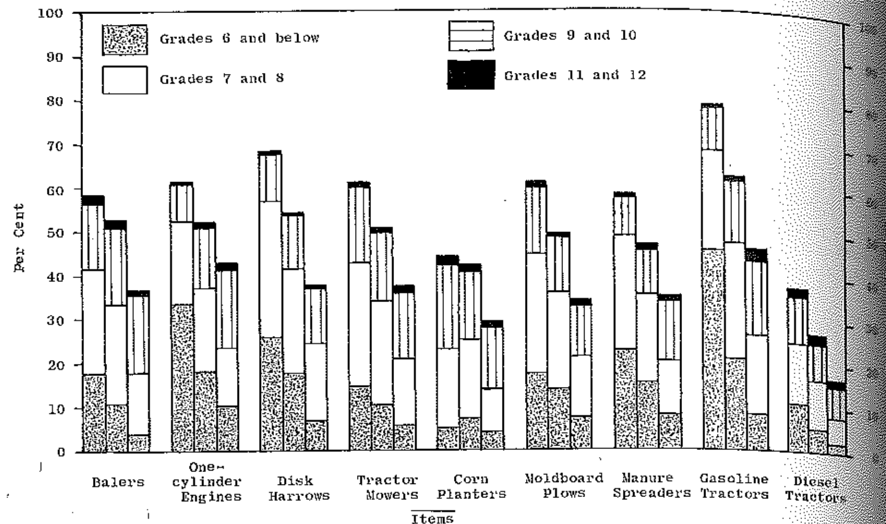
Second, data shown in Figure 2 reveals that many basic mechanical skills could and should be taught before the student enters the first year vocational agriculture program. While many students reported performing the operations listed, their initial performance of the operations generally occurred before entering the ninth grade. On the other hand, teachers reported related instruction was provided during grades nine and ten.

In addition, much of the instruction provided as part of the agricultural construction and maintenance or basic skills area dealt with items not generally used on the farm. For example, less than one-third of the young and adult farmers surveyed reported using such items as power hack-saws, acetylene welders, forges, portable electric grinders, table circular saws, radial-arm saws, band saws, jointers, wood-turning lathes, metal-turning lathes, and thickness planers. Perhaps our basic skills area needs to be revamped.

Third, the basic purpose of the production agriculture program is to develop those skills and abilities which are of value to farming and related occupations. Students enrolled in production courses should be given the opportunity to develop these skills. Even students who fail to enter a production agriculture occupation have reported that agricultural mechanics instruction provided in such programs was of value in other occupations.[2]

Figure 1

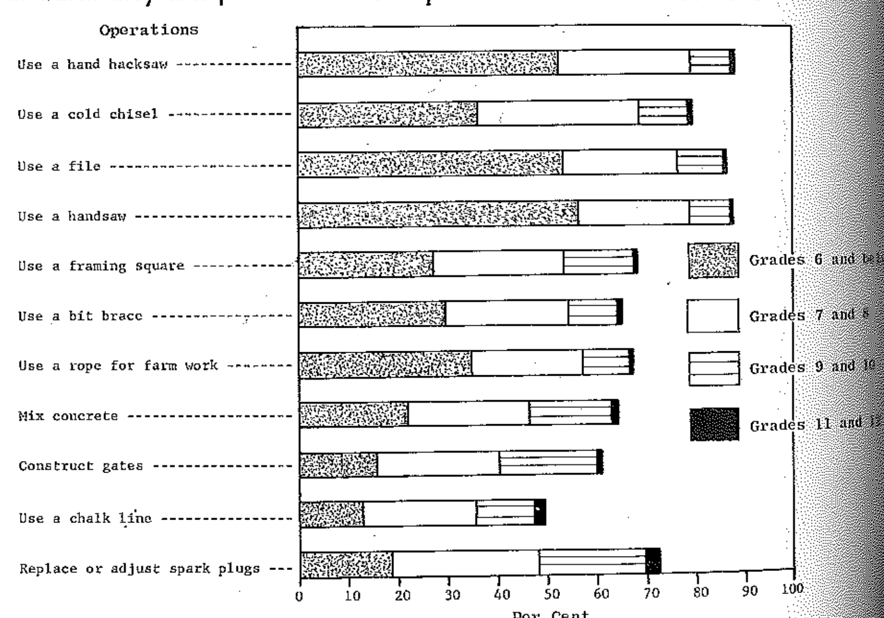
Percentage of vocational agriculture students who reported the school grade in which they were enrolled when they first operated, maintained, and repaired selected farm power and machinery items[a] N=983



[a]The left bar for each item represents operation while the center bar shows maintenance and the bottom one repair.

Figure 2

Percentages of production agriculture students who reported the school grade in which they first performed basic operations on the farm N=983



Summary

Right or wrong, many high school students appear to be forging ahead in the area of agricultural mechanics without their teachers' aid or indeed in spite of it. These students are beginning to perform agricultural mechanics activities long before related instruction

(Concluded on page [illegible])

INSTRUCTION IN FUNDAMENTALS OF ELECTRICITY

John T. Short
Instructor, Vocational Agriculture
Artesia, New Mexico

John T. Short

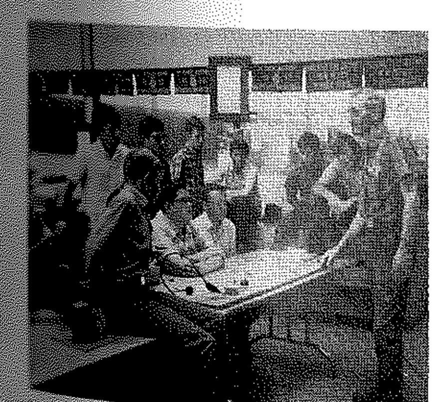
One of the most interesting jobs that can be given to vocational agriculture classes is often left untaught because of the limited skills and experience of instructors, costs of materials and supplies, and lack of planning on the part of the instructor.

It is the purpose of this article to outline the procedure for other vocational agriculture instructors, if they think it feasible, in teaching a practical and interesting lesson on fundamentals of electricity.

For the past ten years, this department has had the complete cooperation from the personnel in our local Public Service Company.

This Public Service Company has furnished two qualified, competent, and interested men, each contributing fourteen to sixteen hours of their time and talents in helping teach the lesson. Also, all supplies and equipment have been furnished at no cost to the school.

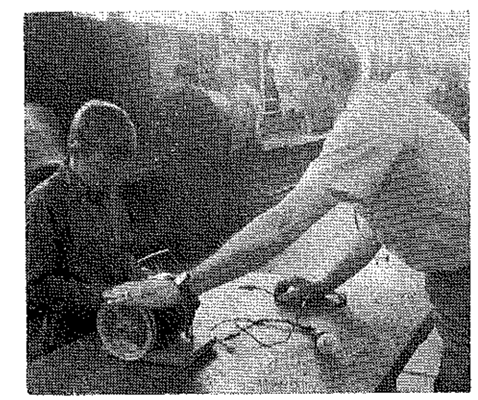
It is this writer's opinion that most instructors of vocational agriculture could, with planning, obtain the same results working with whatever power supplier is in their area. As a follow-up to this job, this department has had four members receive expense paid trips to the National FFA Convention in Kansas City, Missouri, because of knowledge and skills in electricity gained from the teaching of this lesson.



Resource electrician demonstrates the series and parallel circuits.

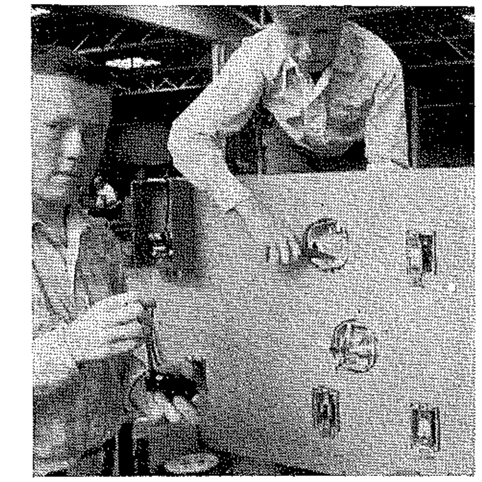
Materials, teaching aids, and items covered in the teaching of *Fundamentals of Electricity* include the following:

1. Showing of the 16MM Film, Reddy Kilowatt in the "Mighty Atom."
2. Overhead projector transparencies covering electrical terms.
3. Use of filmstrip — electrical terms and their meaning.
4. Field trip furnished by the local resource personnel to the Public Service Power Plant with a conducted tour of the plant giving the history and showing production and distribution of electricity.



Checking starter and running windings, and changing directions the motor runs.

5. Demonstrations given by resource personnel and vocational agriculture instructor covering the following:
   a. Series circuits
   b. Parallel circuits
   c. Safety features concerning electricity
   d. Affects of size and kind of wire on efficiency
   e. Affects of length of wire on efficiency
   f. Reading of meters
   g. Actual making of toy motors
   h. Wiring diagram tracing source of power
   i. Types of electrical motors



Wiring board, showing stripped board, breaker box, outlet, ceiling light, and two-way and three-way switches.

   j. Testing of motors with test light
   k. Changing direction of running of motors
   l. Problems and cost of electricity
6. Learn by doing:
   a. Each student makes a 10 foot extension cord.
   b. Each student makes a test light for testing windings.
   c. Each student wires completely a wiring board representing a barn or house including:
      1) Circuit breakers
      2) Duplex outlet
      3) Ceiling light with 2-way switch
      4) Ceiling light with 3-way switch
      5) Each student uses test light on motors, checking windings.
      6) Each student performs the procedure of reversing direction of electric motors.
      7) Each student is tested on knowledge received.

In the writer's opinion, this is a good example of using resource personnel and good teaching aids. Of the two hundred students receiving this instruction all showed interest and worked at the job. ◆◆◆

THE SMALL ENGINE STORY

Harry J. Hoerner
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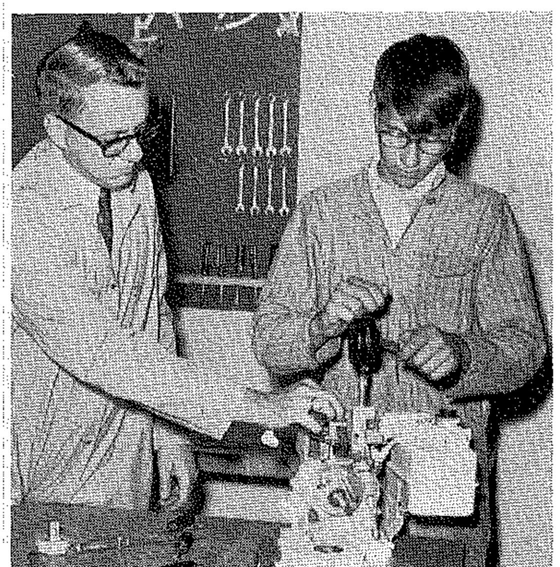
Harry J. Hoerner

Small engines instruction at the secondary and post-secondary levels is becoming a more popular and important part of mechanics oriented courses of study. Such instruction is directly applicable to entry level employment in small engine repair and related equipment occupations. This instruction may also be used as a first course in a series of specific power mechanics courses of study — tractor and farm implement, automotive and truck maintenance and repair.

Curriculum specialists indicate we are in the age of the comprehensive course approach, whereby students from a list of offerings, build their own personalized and total course of study. A course in small engines can be as short as three, six, or nine weeks (9 weeks is one-half semester), or as long as one semester. For the student who inquires, *"Is the general field of nut and bolt turning, using precision measuring instruments, interpreting repair manuals and parts books, and other activities performed by mechanics really for me?"*, a small engines course of short duration can provide the answer.

Since small engines, for example lawn mower engines, are miniaturized versions of larger engines, for example those in farm tractors, they provide the opportunity for *all* exploring students to "dive in," get their feet wet, hands dirty, and learn something useful and relevant. Using small engines in an exploratory course is less costly to the taxpayer and instruction is more efficient and realistic than when larger engines are used. Once an occupational interest and aptitude on the part of certain students has been established, large engine instruction at the technician level in farm power and implement repair, including diesel, LPG, power transfer, hydraulics, and operation practicum would be offered.



Tom Bollinger is shown "lapping-in" a valve in a laboratory engine under the supervision of Lewis C. Ayers, teacher of Agriculture at Ephrata High School, Ephrata, Pennsylvania.

What's Happening in Pennsylvania

The Department of Agricultural Education at The Pennsylvania State University has provided leadership in formulating course content and equipment recommendations for small engines instruction. This information is disseminated through the Department's in-service teacher education program conducted in 14 centers throughout the state. Two different, yet related, courses in small engines are being offered to Pennsylvania's teachers. These one-credit University courses have 13 to 16 hours of class time. The first course is *Small Gasoline Engines, Number One —Operation and Theory;* and, the second course is *Small Gasoline Engines, Number Two — Complete Overhaul.* Both courses will be explained.

Engine Operation

An in-service, off-campus course entitled, *Small Gasoline Engines, Number One—Operation and Theory,* has been conducted throughout Pennsylvania over the past five years. Thirteen of these courses have been taught by agricultural mechanics specialists to 238 enrollees and 13 auditers. About 70 percent were teachers of vocational agriculture, and the remainder were teachers of industrial arts, trades and industry, and science. Area vocational consultants, school administrators, agricultural extension service personnel, and lay persons with an interest in small engines have also attended these classes.

The course, *Small Gasoline Engines, Number One—Operation and Theory* includes:

1. Explanation of the role of power mechanics instruction as a course in the total instructional mechanics program for secondary, post-secondary, vocational-technical, and adult students. The emphasis to be allocated to small engine instruction and its relationship to the total mechanics program is discussed.

2. Detailed study, discussion, and demonstrations on three sub-systems of internal combustion engines—compression, ignition, and carburetion.

3. Complete disassembly and reassembly of University owned Briggs and Stratton, and Tecumseh engines. Eight engines are used for this phase of the instruction with two persons working on each engine. All hand tools (sockets, wrenches, pliers, etc.) and specialized tools (hones, valve lathe, micrometers, etc.) are furnished by the University for class use.

4. The publication, *Small Gasoline Engines Student Handbook* is used as the basic course guide. This book, recently revised, is published by the Department of Agricultural Education, The Pennsylvania State University.

5. A loose-leaf notebook containing literature and price lists from approximately 20 manufacturing concerns and suppliers is distributed to each class participant. Teachers may select and purchase equipment necessary for conducting their own classes. The first set of sheets in the notebook presents in detail all equipment, including engines, hand tools, and specialized equipment needed for a class of 16 members. Teachers are encouraged to write purchase requests specific to small engine instruction while they are taking the course.

6. A list of literature and visual aids supportive to instruction in small engines is provided to class members. Much of this literature is made available at cost to teachers in class.

Complete Overhaul

During the Spring of 1971 a new small engines course for in-service teachers was formulated, *Small Gasoline Engines, Number Two—Complete Overhaul.* It was first taught to 17 persons at Strattonville, Pennsylvania, during March and April of 1971. For enrollment in Course Number Two, we prefer teachers who have taken Course Number One or who at least have attempted to teach a unit in small engines.

The *Small Gasoline Engine, Number Two—Complete Overhaul* course is:

1. The *Small Gasoline Engines Student Handbook* and other literature for pre-course study are mailed out several weeks before the first class meeting to those planning enrollment. Teachers are asked to study and complete the exercises in the Student Handbook and complete practice specification sheets from a repair manual. The first exercise encourages teachers to review theory and operation; whereas, the second exercise conditions teachers to rapidly locate and interpret specification data and repair information from a repair manual.

2. At the first class meeting an introduction is presented to develop the idea that much of the learning obtained from a complete overhaul of a small gasoline engine is generalizable to larger engines, and that a high degree of transfer of learning takes place. The carburetion and compression systems of small single cylinder engines and multiple cylinder engines are similar except in physical configuration. However, the electrical system on small engines (magneto) may be more complex than large engines (battery-powered). It is reasoned that students who understand small engine systems can easily transfer this learning to larger engines. The real advantages of using small engines are: (a) low cost, (b) easier to work on, and (c) student learning efficiency. Since only one or two students are working on an engine, they are able to "dive in," get their hands dirty, and can psychologically claim the engine was "my engine." Had farm tractors, for example, been used to accomplish the same learning and skill activities, it would have taken a much larger investment, a considerably larger physical facility, or the teacher may have been forced to use a less effective method of instruction.

3. Following the introduction, the mechanics specialist (instructor) disassembles a Briggs and Stratton engine while the class members observe. Disassembly techniques are explained as the student notes the use of special tools and equipment (for example the use of coil-condenser tester). The student also completes a small gasoline engine analysis form taken from the Appendix of the Student Handbook previously mentioned. Concurrent with the engine disassembly procedure, class members are taught the use of measuring devices such as micrometers, dial indicators, Plasti-gage and manufacturer's standard reject gauges.

4. Class members are then instructed on the type of used engines (one for each two members) that they are to bring to the next session. We specify a Briggs and Stratton engine of 10 cubic inch displacement or less. If teachers bring a vertical shaft engine they must also provide a repair and starting stand. For engines without a cast iron flywheel, they must furnish a momentum flywheel to aid engine operation in lieu of a mower blade. Plans for constructing the repair and starting stand and the momentum flywheel are furnished by the University.

5. At the next session class members bring in their used engines and prepare for a complete engine overhaul. Before they can begin work on their engines, teachers are acquainted with the work stations where various operations will take place. For example, when a crankshaft and bearings are to be measured, class members take their engine parts to a measuring station and use the micrometer and telescopic gauges provided there. Other stations are for parts washing, valve repair, and cylinder honing. Another station is for the remaining specialized tools. Each engine work station is provided a set of University owned basic hand tools. Location of fire extinguishers, fire blankets, and first aid kits are also pointed out.

Concurrent with the disassembly and evaluation of the engines, a number of demonstrations are conducted for class members. They are as follows: removing a rotary lawn mower blade connector, removing a flywheel, valve repairing (guide replacement, valve seating, valve lathing, valve lapping, and tappet setting), and cylinder honing.

Class members are taught to use parts manuals. They fill out their first request for needed parts before the end of this class session. On the following day the instructor phones the requests to a central warehouse and new parts are available for the next class meeting the following week.

6. During the third session, class members continue evaluating and repairing their engines. Several timely demonstrations are conducted which are: breaker-plunger guide replacement, main bearing replacement, repairing "stripped" threads, and carburetor-governor reconditioning. Again class members turn in needed parts request forms, and are cautioned that this is their last opportunity to order parts.

7. The last session is primarily used by class members to reassemble and trial run their engines. The only instructor demonstrations given at this point are torquing techniques and carburetor adjusting.

Class members complete forms indicating their repairs activities, estimated value of engine before repair, parts cost and estimated value after repair. The engines repaired at the Strattonville, Pennsylvania, class showed that average cost of repairs (excluding labor) was $5.86, the average value per engine before repair was $17.00 and following repair was $36.10. One typical repair form on a 10 cubic-inch engine indicated the engine was not operating before brought to the class. Repair activities performed included filing the ignition breaker-points, cleaning armature legs and flywheel magnet, honing the cylinder, replacing piston rings,

(Continued on next page)

Marlin Bollinger (left) and Tom Bollinger (right) diagnose a small engine ignition system using a coil-condenser tester.

lathing and seating valves, replacing all gaskets and repairing breaker-plunger guide. The owner's repair bill was $9.30. He estimated that the engine was worth $10 before repair and $40 after repair. The engine operated smoothly and had full power.

8. A practical paper and pencil examination, short on theory and long on repair technique and the use of repair and parts manuals, is given for assignment of final grades. A major part of this examination is open-book.

Summary

I have explained what we are doing to professionally improve our vocational, practical arts and other teachers in their own ability to teach small engines. Teachers often tell us that this is the type of mechanics training they need—the type where they learn by doing. Most feel they are now able to attempt such a unit or course by themselves. Some of the same teachers tell us one of the biggest drawbacks to initiating a similar program in the home school is getting the board of education to allocate the $700 to $1500 it takes to conduct an instructional program in small engines in "a fine manner." Therefore, the well trained teacher of small engines must quickly become a well trained salesman if his course is to get off the ground. We at the Department of Agricultural Education do what we can in refortifying the teacher in this respect through consulting with key administrative personnel.

There is one final concept concerning small engines instruction we wish to make. It is that this instruction should be a well designed course of study. It is certainly far beyond the realm of permitting students to bring in greasy and junky lawn mowers and "tinker" with them for several weeks. We maintain that in these programs little or nothing is learned; and, students at best are being entertained. High quality small engines instruction takes a well prepared teacher who is most likely mechanically inclined, who can manage a shop effectively, and who can get the necessary capital outlay for equipment and supportive literature from the taxpayers before attempting his own course. Students who take part in small engines courses need high quality instruction. The in-service program in Pennsylvania is helping to meet this goal. ◆◆◆

SHOP SERVICE MANAGERS RESPOND TO THE EDUCATOR . . .

Earl S. Webb, Teacher Education
Texas A & M University
College Station, Texas

Earl S. Webb

In a recent study, conducted to determine the knowledge and skills needed by beginning farm machinery mechanics, many shop service managers from whom data were obtained took time to express their views about what they thought was important in establishing a program. These comments are worthy of serious consideration by program developers; in fact, the following statements, selected from among many, constitute what a specialized segment of industry said to educators.

"Pick boys who really want to be mechanics. Teach the basic things that a beginner should know. We need young men in the field of mechanics very, very badly. I tried to answer this (information form) as if I was starting from scratch with a beginner."

"Just because you teach mechanics in high school, even on a voluntary basis, is not enough to make a young man really want to be a mechanic. Tractors and farm machinery, particularly hydraulics, are changing fast; and someone will have to service them. But there will have to be enough interest created for a young man to choose mechanics for a living."

"A mechanic should have a number of basic skills; and with skills, technical knowledge will come naturally. But with technical knowledge, you will not naturally attain the skills. Here are a few things that I think a man must have before he can be a successful mechanic:

(1) He must be interested in mechanic work. He must know the hardships involved and be able to cope with them.

(2) After interest comes capability. He must be able to comprehend and develop skill of mechanics.

(3) He must be of good nature to mix well with customers."

"My first suggestion (in selecting trainees) would be to screen the young men thoroughly as to interest, ability, health, and character. Select the best and most modern tools and machines to work with. Select modern engines and machinery to work on for training. Try to have well-arranged shops with heat for winter and cooling and fresh air arrangement for summer. You should have facilities for cleaning parts and machines and for students to clean hands and tools and to change clothes. Try to select the best instructor possible — one who has a genuine interest in young men. He should know his business. He should, above all, be of good moral character — no bad tempers or whiskey drinkers or woman-chasers — because he will surely be a model for all the young men in his classes — good or bad. Give the instructor a small expense account so he can buy necessities for the shop without going before the school board."

"Safety is always the first thing a mechanic should learn. Even though a man may be a good mechanic, one accident may prove fatal. Safety is considered the first interest; next he must be interested in his job."

"Safety should be stressed at all times. Teach safety — proper handling of tools, stands, jacks, etc.; also fire hazards, grease on floors, parts, and tools lying around in walkways."

"Shop safety and clean parts is the beginning of the best mechanics."

"The use of tools is the mechanics bread and butter. Therefore, the first thing he must do is to learn to use his tools properly and quickly; otherwise he won't eat very well in this trade."

"If I can't beat the clock, I can't make a living in this (mechanics) trade."

"I judge a man's pride in his work by the way he keeps and takes care of his tools. If he (mechanic) knows what (tools) he has and where they are, with study and experience someday he may be called a mechanic."

"Instill the desire in the student to produce more than he is getting paid to produce so that he can advance. He should be inquisitive enough to determine what is causing a part's failure instead of just replacing a part and having it fail again. He will have to study the technical books at night for the equipment he expects to work on."

"The beginner needs to know what a specific (mechanics) unit is doing, why it is doing it, and how it is being done. When a man knows this, proficiency in doing repair work comes easier."

"The curriculum for farm machinery mechanics should be broken down into two parts. About 1/3 of the time should be spent in the classroom in related lecture and 2/3 in the shop in related instruction such as welding, engines, hydraulics, etc. It is important that the students learn to use modern test equipment, such as engine analyzers, hydraulic flow raters, distributor testers, valve refacers, diesel testers, and dynamometers. The basic theory and application is most important in elementary mechanics."

"I am under the impression that we could take a young man with a good technical background and teach him what he needs to know, while earning a salary, in a matter of months. If he spent all of his training in actual 'nuts and bolts,' it would take us a longer time to teach him what he should know — I would think it would take several years. We have two 14-year-olds working as apprentice mechanics now. We have one 14-year-old, one 15-year-old, and two 16-year-olds working as new equipment set-up men. We also use these youngsters as cotton picker mechanics, and they learn and develop skill quicker than the older men. After one season on these pickers, they are capable of making field service calls on their own."

"Many mechanics do not keep their work areas clean. They should take old parts to the scrap pile to keep them from getting mixed up with the new parts they plan to install in the unit they are repairing. Also, if these old parts are out of the way, it will give the mechanics more work room and save time in separating parts."

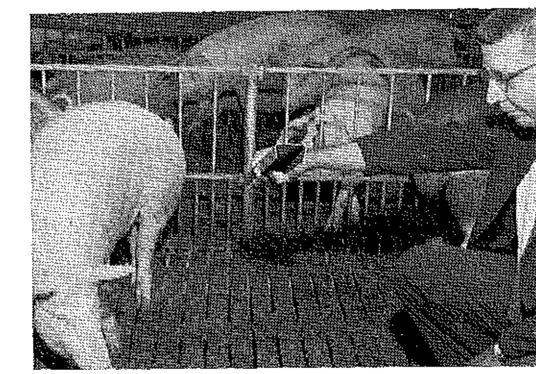
". . . I suggest the young mechanic learn to work clean, have his repair parts clean, and his tools and tool box or trays clean. He should always put tools back in their respective places when the job is finished. Never leave them scattered all over the floor. We all know that when a customer comes to the shop to have some work done, he looks at the mechanic; and if he sees that he is clean, his tools are clean, and his bench is clean, he says to himself, 'Now I know I am going to get a good job done here.' As a rule, he is. Another thing, the beginning mechanic should learn to do as the master mechanic tells him. He should be nice to him and it will be a pleasure for the master mechanic to work with the young mechanic. I suggest that is the best and quickest way to become a good mechanic."

Could these comments apply to all occupational training programs? If yes, then curriculum planners should consider attitudes, aptitudes, desire for success, pride in workmanship, work habits, and respect for tools and equipment in addition to skill development. Occupational education that fails to include the psychological aspects in the development of prospective employees ignores the major problem confronting industry today. ◆◆◆

(Lewis and Woodin—from page 170)

is provided by teachers of vocational agriculture. To make the educational process more efficient and effective, efforts must be exerted to make the two events — the time students perform an initial activity and the time related instruction is provided — congruent.

Various levels of congruency between the events under consideration exist and an appropriate level should be sought by the teacher. To obtain the best relationship between the agricultural mechanics instruction offered and the students' abilities, the units to be taught must be identified on the basis of the local farming situation, the students' occupational objectives, and the time the students initially perform the mechanical activities. Teachers must then determine when such instruction should be provided.



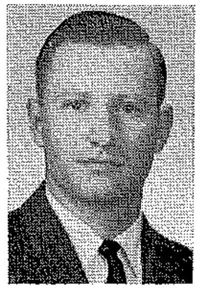
Slotted steel floors are an example of one of the new developments in agricultural mechanics which need to be recognized in curriculum adjustment. This picture shows a livestock research specialist displaying a U shaped steel slat which is in common use in livestock feeding operations.

To do this, teachers should collect local data similar to that summarized in Figures 1 and 2 and construct profiles for their students. Such profiles could then be used as a basis for timing and sequencing agricultural mechanics instruction which, in turn, would aid in developing a more efficient and effective educational process.

[1]Lewis, Wiley B., "Agricultural Mechanics as Performed on Ohio Farms in Comparison With Offerings in Vocational Agriculture" (unpublished Doctor's dissertation, The Ohio State University, 1970).

[2]Roberts, Roy W., "Evaluation of the Effectiveness of Instruction in Agricultural Mechanics for Vocational Agriculture Students in Arkansas Who Entered Non-farming Occupations" (Fayetteville, Arkansas: Department of Vocational Teacher Education, College of Education, University of Arkansas, July, 1965), pp. 36-37.

AGRICULTURAL MECHANICS FACILITIES IN MINNESOTA



Verne C. Spengler

Verne C. Spengler
Vocational Agriculture Instructor
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W. Forrest Bear

The agricultural mechanics facilities in Minnesota high schools were studied to determine the factors which influence the size and quality of the facilities provided.[1]

Financial factors studied included the Equalization Aid Review Committee, the E.A.R.C. value, and the local effort index. Teacher related factors were tenure, quarter hours credit in agricultural mechanics, and number of vocational agriculture teachers in the system. Total free floor space, free floor space per student and the high school enrollment in agriculture were also considered.

Financial Effort and Ability

Financial data for each school in the study were obtained from school records in the Research Section, State Department of Education. The indicator of a school district's financial assets as determined by the Equalization Aid Review Committee is the E.A.R.C. value per Resident Pupil Unit. This amount is the adjusted assessed valuation of taxable property in the school district divided by the number of resident pupil units in average daily attendance. It averaged $7,755 for the schools in the study.

The financial effort a school district exerts in relation to its ability is the local effort index by E.A.R.C. It is expressed in mills and is the total mill rate needed to meet all local costs. This mill rate becomes an index of local effort and may be used to compare the relative contributions of the local districts in support of educational programs. Local effort index averaged thirty-nine mills for schools in the study. Coefficients of correlation of these and other factors influencing agricultural mechanics facilities appear in Table I.

TABLE I
COEFFICIENTS OF CORRELATION OF FACTORS INFLUENCING AGRICULTURAL MECHANICS FACILITIES

	1	2	3	4	5	6	7	8
1. EARC Value	1.00						n=208	
2. Local Effort Index	–.65**	1.00						
3. Teacher Tenure	–.05	.04	1.00					
4. Quarter Hour Credits in Agricultural Mechanics	.01	–.03	.27**	1.00				
5. No. of Vo-Ag Teachers in the School System	–.07	.01	–.03	.20**	1.00			
6. Total Free Floor Space	–.09	–.01	.02	.18**	.23**	1.00		
7. Free Floor Space per Student	.09	.04	.07	.05	.01	.67**	1.00	
8. Total H.S. Vo-Ag Enrollment	–.14*	.03	.09	.12	.62**	.05	–.30**	1.00

*5% level of significance=.13
**1% level of significance=.17

No significant positive relationships were found between E.A.R.C. value, local effort index and the related factors which were thought to influence agricultural mechanics facilities. It appears that most schools build to meet minimum State Department of Education recommendations and thus financial conditions do not affect sizes of shops, construction features, or quantity quality of tools available.

Factors which were positively significant at the one per cent level include: (1) quarter hour credits of agricultural mechanics earned by the teacher in college and the number of teachers in the school; (2) quarter hour credits earned in agricultural mechanics and total free floor space in the shop; (3) number of agricultural teachers in the school and total free floor space.

College Credit in Agricultural Mechanics

The quarter hour credits of agricultural mechanics earned in college by the teacher had a definite effect upon the total number of tools in the agricultural mechanics shop. This is illustrated graphically in Figure 1.

When instructors' college quarter hours ranged from 0 to 14, thirty-five per cent of the schools had a small number of tools; twenty-six per cent had an average number of tools and fourteen per cent were well equipped.

However, when quarter hour credits reached the 21-50 level, twenty-one per cent of the schools had a small number of tools, twenty-nine per cent had an average number and fifty-two per cent were well equipped.

Conclusions

The financial ability or financial effort of a school district was not a significant factor for determining the agricultural mechanics facilities provided. This is reflected by the fact that only 15 per cent of the Minnesota schools reporting met the minimum

(Continued on page 191)

DETERMINING AGRICULTURAL MECHANICS SKILLS NEEDED BY FARMERS

Norman D. Skadburg
Vocational Agriculture Instructor
Williamsburg Community Schools
Williamsburg, Iowa

Norman D. Skadburg

In teaching vocational agriculture I have often wondered if I am teaching the skills or abilities that will benefit the student the most, especially in the area of farm and agricultural mechanics. Agricultural mechanics skills should aid the boy when he enters farming. By conducting a survey of farmers I felt I could find how valuable the farmers felt certain skills or abilities were in their farm operation.

I felt I could revamp my agricultural mechanics program when I tabulated the results of my survey. Some skills or abilities should be added to the program, other skills eliminated, and the time spent on others either lengthened or shortened.

A survey form consisting of agricultural mechanics skills in the areas of carpentry, welding and metals, concrete, gasoline engines, electricity and electric motors, and tractor and machinery power and management were mailed to farmers in the school district. The farmers were asked to indicate how valuable the 64 agricultural mechanics skills or abilities on the survey were in their farming operation. The classifications from which they could choose were as follows: very valuable, 4; valuable, 3; some value, 2; little value, 1; and no value, 0. All of the 64 skills in the survey could be taught in our agricultural mechanics laboratory in the Williamsburg Community Schools.

Using a measuring skill

The **mean value** for the skills in each agricultural mechanics area surveyed were calculated as follows: Tractor and Machinery Power and Mgt., **3.31**; Welding and Metals, **2.80**; Electricity and Electric Motors, **2.79**; Concrete, **2.72**; Gasoline Engines, **2.67**; and Carpentry, **2.52**.

All of the skills or abilities in the survey are rated according to their mean value. 4.00 means the **skill or** ability was considered very valuable by all the farmers surveyed. 0.00 means that all farmers considered the skill or ability to have no value. The mean values are listed below for all the skills surveyed.

3.50 - 4.00

1. Read and interpret operator's manuals for tractors and machinery.
2. Lubricate and service tractors.
3. Safely operate a tractor.
4. Maintenance and general repair of tractors.
5. Select, operate, adjust, and maintain planters.
6. Operate and maintain an electric arc welder.

3.00 - 3.49

1. Install and adjust a coil, condensor, points, and spark plugs.
2. Make common arc welds in four positions.
3. Understand the principles of hydralics.
4. Select arc welding electrodes.
5. Construct and repair buildings and equipment.
6. Select, operate, adjust, and maintain cultivators.
7. Select, operate, adjust, and maintain plows.
8. Selection of fuels, oils, and greases.
9. Select, operate, adjust, and maintain mowers.
10. Laying out a building foundation.
11. Cut with an electric arc welder.
12. Select, operate, adjust, and maintain balers.
13. Select, operate, adjust, and maintain corn pickers.
14. Understand the principles of the two and four cycle engines.
15. Lubricate, service, and maintain small gasoline engines.
16. Select, operate, adjust, and maintain disks.
17. Maintain and replace fuses, time delay, and overload devices.
18. Select, operate, adjust, and maintain grain drills.
19. Select, identify, and figure cost of lumber and building materials.
20. Select, use, install, and maintain electric switches.
21. Building forms for concrete.
22. Select, operate, adjust, and maintain manure spreaders.

2.50 - 2.99

1. Replace and repair inadequate wiring.
2. Select, operate, adjust, and maintain field choppers.
3. Make minor repairs, clean, and service electric motors.
4. Select, operate, adjust, and maintain elevators, augers, and conveyors.
5. Operate and maintain hand power tools.
6. Identify and select nails, screws, and other building hardware.
7. Select wire size for a circuit.
8. Operate and maintain a soldering iron.
9. Mixing, casting, finishing, and curing concrete.
10. Understand and wire series, parallel, and combination circuits.
11. Replace and repair inadequate wiring.
12. Braze and weld metal with oxyacetylene.
13. Lay out and cut braces and rafters using the framing square.
14. Bend, cut, file, drill, and square cold metal.
15. Cut and tap threads.
16. Attach and adjust gauges and regulators for gas welding.
17. Set up oxyacetylene welder, light and adjust flames.
18. Selection, application, and maintenance of roofing materials.
19. Operate a timing light.

2.00 - 2.49

1. Cut with oxyacetylene.
2. Shape, bend, and cut hot metal.
3. Select proper flux rods and tips for gas welding.
4. Use adjust, sharpen, and maintain hand woodworking tools.
5. Proper proportioning of ingredients for quality concrete.
6. Lay, reinforce, and waterproof concrete blocks.
7. Understand the operation of the watt-hour meter, voltmeter, and ammeter.
8. Repair and overhaul small gasoline engines.
9. Select, use, and store paint and paint brushes.
10. Overhaul tractor engines.
11. Operate and maintain large power tools.
12. Read a micrometer.

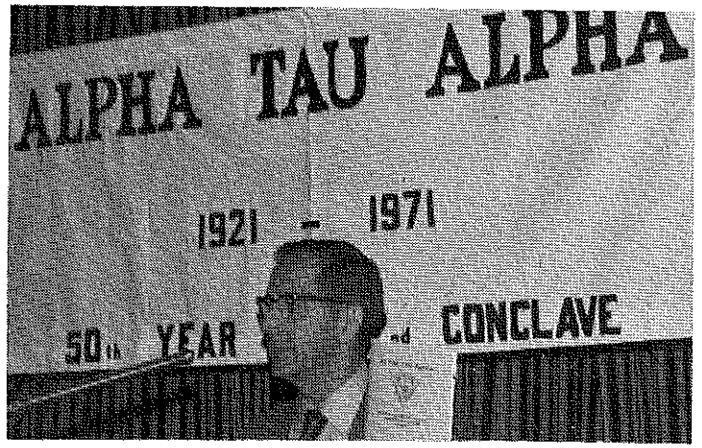
1.99 and Below

1. Select and use glues.

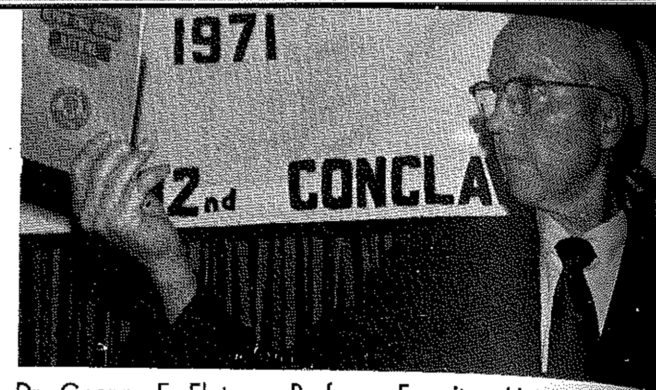
(Concluded on page 192)

Story in Pictures

ROBERT W. WALKER
University of Illinois



Dr. Norman K. Hoover, First Vice President, National A.T.A., presents to the assembly of delegates the Alpha Tau Alpha Official Manual. Dr. Hoover was chairman of the committee that revised the manual. (Photo by Harold Loy, Student, University of Illinois)



Dr. George F. Ekstrom, Professor Emeritus, University of Missouri and A.T.A. Historian delivered a speech at the conclave entitled, "The A.T.A., Then and Now." (Photo by Harold Loy, Student, University of Illinois)

Dan Lehmann, (left), National FFA President, Dr. Kenneth James, National A.T.A. President, and Richard Simer, Student, Illinois State University, chat together at the conclave. (Photo by Harold Loy, Student, University of Illinois)

(Left to right) Wilson W. Carnes, Editor, The National Future Farmer Magazine; Kenneth G. McMillan, Assistant to the President, Illinois Agricultural Association; Glen McDowell, President of N.V.A.T.A., receive honorary membership in the National Alpha Tau Alpha Fraternity. Dr. Kenneth James, National President of A.T.A. presents certificates of the national conclave held in Kansas City. (Photo by Harold Loy, Student, University of Illinois)

PROFESSIONAL IMPROVEMENTS IN BASIC MECHANICAL INSTRUCTIONAL COMPETENCIES

Vanik S. Eaddy
Teacher Education
Auburn University

Vanik S. Eaddy

The implementation of the provisions of Public Law 90-576 caused extensive assessment of the Alabama Vocational Agricultural Education Program. The mandate to provide vocational education to persons of all ages wherever they might live created severe problems in adjusting the numerous programs in isolated rural settings to fulfill these requirements. It was determined that Vocational Agriculture was the service most capable of meeting the occupational education requirements of the Agribusiness and Rural Industry in Alabama. The challenge was extended and accepted. A tremendous task of professional improvement became evident to qualify teachers of vocational agriculture for their strange new roles in basic vocational education. This new responsibility was assumed in addition to a previous commitment to serve vocational agribusiness.

Six occupational clusters were identified in the Alabama rural industrial sector, and instructional materials were developed by the Vocational Agricultural Service to accommodate teachers in the following agri-industry trades families: (1) Building Construction Trades; (2) Electrical Trades; (3) Masonry Trades; (4) Metal Working Trades; (5) Power Mechanics Trades; and (6) Wood Working Trades. A review of these occupational clusters revealed a need for basic mechanical instructional competencies, many of which were already possessed by vocational agricultural teachers as a result of their association with agricultural mechanics. It was also determined that many new competencies would be required in addition to a greater depth of understanding in the areas of familiarity.

A survey was conducted of 271 teachers of vocational agriculture to ascertain a measure of their perceived instructional competency to teach high school students in each of six occupational clusters. Tables I through VI represent the relative rankings of instructional competencies by percent response. For the purpose of this survey, the Basic Woodworking Trades were incorporated into Building Construction Trades and Drafting was listed separately. The rationale supporting this was the similarity of the building construction and wood-working skills required for job entry level employment. Instructional Drafting was considered

TABLE I
INSTRUCTIONAL COMPETENCIES OF ALABAMA VOCATIONAL AGRICULTURAL TEACHERS IN BUILDING CONSTRUCTION TRADES, RANKED BY PERCENT RESPONSE

INSTRUCTIONAL COMPETENCIES	RANK BY PERCENT RESPONSE
Care and Use of Hand Woodworking Tools	1
Care and Use of Power Woodworking Tools	2
Fastening Wood and Related Building Materials	3
Selecting Building Materials	4
Pipework and Simple Plumbing	5
Pre-Construction Estimates (Blue Print Readings and Bill of Materials)	6
Fundamentals and Principles of Concrete Work	7
Construction of Concrete Forms	8
Structural Carpentry (Framing)	9
Layout and Design of Electrical Systems	10
Layout and Design of Water Systems	11
Layout and Design of Sewage Systems	12
Interior Construction and Finishing	13
Drawing and Sketching	14
Roofing and Related Construction	15
Installation of Utilities	16
Masonry Construction	17

TABLE II
INSTRUCTIONAL COMPETENCIES OF ALABAMA VOCATIONAL AGRICULTURAL TEACHERS IN ELECTRICAL TRADES, RANKED BY PERCENT RESPONSE

INSTRUCTIONAL COMPETENCIES	RANK BY PERCENT RESPONSE
Grounding Procedures	1
Service Entrance Installation	2
Wiring Principles	3
Wire Sizes and Types	4
Circuit Breakers, Fuses and Circuits	5
Wiring Systems	6
Generation of Electricity	7
Measuring Instruments and Measurement of Electricity	8
Wiring of Heavy Appliances	9
Renovating Inadequate Systems	10
Finishing an Installation and Trouble Shooting	11
Mathematics of Electrical Trades	12
Electrical Codes	13
Sketching, Drawing, Blueprint Reading and Schematic Interpretations	14
Electric Motors	15

(Continued on next page)

TABLE III
INSTRUCTIONAL COMPETENCIES OF ALABAMA VOCATIONAL AGRICULTURAL TEACHERS IN DRAFTING TRADES, RANKED BY PERCENT RESPONSE

INSTRUCTIONAL COMPETENCIES	RANK BY PERCENT RESPONSE
Basic Instruments	1
Blueprint Reading	2
Orthographic and Isometric Projection	3
Technical Sketching	4
Architectural Drafting	5
Descriptive Geometry (Layout)	6
Government (Military) Specifications	7

TABLE IV
INSTRUCTIONAL COMPETENCIES OF ALABAMA VOCATIONAL AGRICULTURAL TEACHERS IN MASONRY TRADES, RANKED BY PERCENT RESPONSE

INSTRUCTIONAL COMPETENCIES	RANK BY PERCENT RESPONSE
Mixing Mortar and Related Materials	1
Tools and Equipment	2
Finishing and Paint Masonry Work	3
Types of Masonry Materials	4
Mathematics of Masonry Trades	5
Building Components	6
Characteristics of Masonry Materials	7
Blueprint Reading	8
Waterproofing	9
Laying Concrete Blocks	10
Laying Clay Tile	11
Laying Brick	12
Handling of Masonry Materials	13
Contractor's Responsibilities	14
Fireproofing	15

TABLE V
INSTRUCTIONAL COMPETENCIES OF ALABAMA VOCATIONAL AGRICULTURAL TEACHERS IN METALS TRADES, RANKED BY PERCENT RESPONSE (INCLUDING FERROUS, NON-FERROUS AND ALLOYS)

INSTRUCTIONAL COMPETENCIES	RANK BY PERCENT RESPONSE
Basic Uses of Metals	1
Origin and History of Metals	2
Characteristics of Metals	3
Identification of Metals	4
Manufacture of Metals	5
Heat Treatment of Metals	6
Machining Processes of Metals	7

TABLE VI
INSTRUCTIONAL COMPETENCIES OF ALABAMA VOCATIONAL AGRICULTURAL TEACHERS IN POWER MECHANICS TRADES, RANKED BY PERCENT RESPONSE

INSTRUCTIONAL COMPETENCIES	RANK BY PERCENT RESPONSE
Fuels and Principles of Combustion	1
Identification and Function of Engine Parts	2
Lubricants	3
Engine Operating Principles	4
Lubrication Systems	5
Fuel Systems	6
Ignition Systems	7
Electrical Accessories	8
Transmission of Power	9
Basic Machine Science	10
Measuring Devices and Measurements	11
Suspension Systems	12
Hydraulics and Pneumatics	13

separately because of its commonality to each of the basic vocational education clusters previously mentioned.

Tables I through VI may be read with the interpretation that instructional competencies within an occupational family were possessed in a greater magnitude beginning from the primary ranking to the highest numbered listings. For example, in Table I, Building Construction Trades, vocational agricultural teachers perceived themselves most competent in the "Care and Use of Hand Tools" and least capable in "Masonry Construction."

An analysis of the instructional competencies had by the teachers made possible the planning of a realistic and effective series of in-service professional development workshops and graduate credit courses. Workshops were held throughout Alabama with emphasis on concentrated technical development. These workshops ranged from two days to two weeks in length and were not offered for formal institutional credit. These were planned and held in cooperation with Alabama's Rural Industry; Universities, State Technical Institutes (Vocational - Technical Schools), and Area Vocational Schools.

Formal graduate level short courses were provided in intensive study periods of three to eight weeks, emphasizing technical competencies as well as professional development in the use of the newly acquired subject matter. The degree granting institutions participating in the workshops and graduate level development of teachers were Alabama A & M University, Auburn University and Tuskegee Institute.

The goal established was to have each teacher of vocational agriculture in Alabama to enroll in at least one in-service program every year. The summer of 1971 was the third year of this program and 98 per cent of all regularly employed teachers had participated in these in-service activities. These offerings will be continued on a regular basis until the majority of the teachers reach optimum competency level. It is anticipated that the professional improvement program will continue to be adjusted to meet the needs of teachers in the profession of preparing youth for continued career education development in post-secondary schools or entry level employment into Agribusiness and Rural Industries throughout Alabama. ◆◆◆

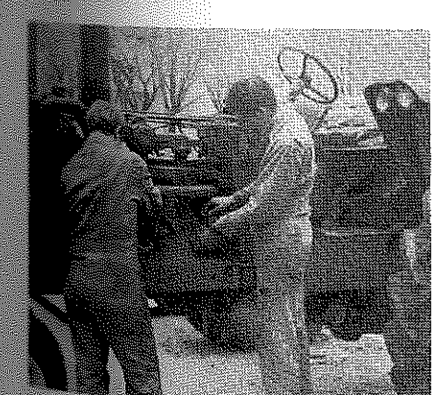
CURRICULUM REVISION IN— SENIOR HIGH SCHOOL AGRICULTURAL MECHANICS

Ron Schultz
Teacher of Vocational Agriculture
Alma, Kansas

Ron Schultz

Agriculture has always been subject to change. The most dramatic changes in technology and mechanization have occurred in the past 50 years and the rate appears to be accelerating in the race to completely substitute machines for hand labor. With this ever-increasing trend, shouldn't we as vocational agriculture teachers be concerned about equipping our student's knowledge and skill in mechanized agriculture?

This question came to me as I looked for a way to increase enrollment in my senior vocational agriculture class and offer more instruction in farm mechanics to meet the needs of those students. While reviewing the sizes of past graduating senior classes in agriculture, I found that during my tenure of three years, only twelve students at this level had come in contact with senior agriculture. With an average of four senior students per year, a change seemed to be in demand.



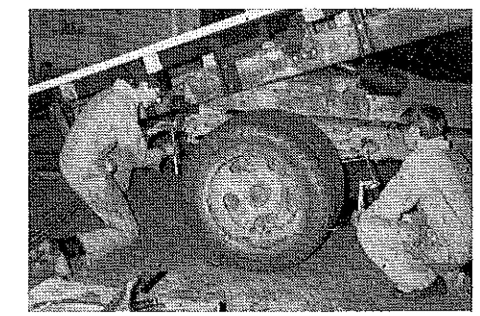
Actual experience in operation and maintenance of farm tractors is important in farm machinery instruction.

The Present Curriculum

The Vocational Agriculture program at Alma High School is a 1-1-1-2 pattern with a two-hour class at the senior level. This class is divided into a semester course concerning farm management and a semester course in off-farm agricultural occupations with students gaining cooperative experience in a local business. Because of the lack of acceptance of the off-farm agricultural occupations course in the community, the absence of a variety of good training centers in a small town, and difficulties in scheduling a two-hour class period, it was decided that this course should be revised and the class be broken into one-hour periods. With the help of the Principal, Superintendent, and Advisory Council, it was determined that more instruction in agricultural mechanics was needed. It was hoped that this new emphasis on agricultural mechanics will result in an increase in enrollment thereby serving more students in the community, and that instruction will relate more closely to the needs of students following graduation. In the past a high percentage of students have pursued occupations in farming and jobs involving mechanical skills.

New Courses

Because of the importance of production agriculture in the Flint Hills of Kansas, it was decided to retain a one-hour year course in farm management, and to add one semester courses in farm machinery operation and in small engine overhaul and maintenance. Content of the farm machinery course will include all of the major farm machines in this area. A major section of the course will deal with the operation, maintenance and repair of farm tractors with practical experience included. Advanced skills in welding cast iron, hardfacing and welding in the vertical position will be included. The study of machinery will involve plows, mowers, row-crop planters, combines, balers, field sprayers and grain drills. Students will be permitted to use machinery from the home farm as repair projects. The small engine overhaul course will be a complete study of operating principles of one-cylinder gasoline engines including general repair and overhaul.



Instruction in farm machinery should include the repair and maintenance of commonly used machinery such as the farm truck.

By offering courses of this nature at the senior level, I feel I am meeting the needs of my students and community by preparing them for agricultural mechanization. A thorough background in farm management and mechanization will prepare young men for farming and many other careers related to farming to meet the future needs of agriculture. ◆◆◆

MAKING AGRICULTURAL MECHANICS MEANINGFUL

J. Reed Thompson
Chilton County Vocational Director
Clanton, Alabama

J. Reed Thompson

Vocational teachers have many innovative and unique methods of introducing and motivating students to want to learn. The procedure outlined here proved to be very successful for me at Chilton County High School.

The first shop lesson includes basic drawing. This study is completed by giving the students a copy of a simple floor plan obtained from the Agricultural Extension Service. This plan is easily duplicated and has a bill of materials list which is divided into hardware, electrical, plumbing, lumber, concrete, and masonry. This plan and bill of materials is used in teaching electricity, carpentry, plumbing, and concrete and masonry.

In the study of electricity the lesson plan includes basic electricity and is concluded by a thorough study of house wiring. In the study of house wiring the floor plan given to students is used and a form listing the names of electrical needs from service entrance to complete wiring of the house is given to the students. The students look up their electrical supplies in the mail order catalog, listing kind, size, cost, etc. This list of electrical supplies is kept in each student's notebook.

The students next begin the study of basic woodworking. This includes figuring board feet of lumber, costs using local prices, how to cut door steps, lay out and cut rafters, roofing required, and lumber required to construct the house plan the student has been given. In figuring the lumber cost we start with the foundation and work to the rafters and decking. This information is filed in the student's notebook.

From basic woodworking, the class moves into a study of plumbing. After a study of basic plumbing, the class is divided into three groups. One group estimates the very lowest price materials, the second group estimates the medium price materials, and the third group uses the most expensive materials. This procedure points out that a person gets what he pays for. Again the mail order catalog is used by the students. At this time a well, including septic tank and field lines, is plotted a certain distance from the house. Adding the well and septic tank is important since most of these boys will be constructing homes in rural areas. This information is also filed in the student's notebook.

From plumbing the study moves into concrete and masonry. Again the basic fundamentals of concrete are studied. The course is completed by figuring the foundation and masonry work for the house plan.

After completing the study of these four areas and making up the bill of materials, the students put all these references together and make up an order for those materials that can be obtained from a mail order company. In this study the students learn how to make up an order, figure freight, sales tax and installment buying as compared to cash or bank loan.

These four areas are a full year's course. The course can, however, be stopped at any point to do other things. This method ties the program together and gives the students an overall view and study of workshop.

Teacher demonstrations and student jobs are performed in all areas. Several field trips are made to new home construction to observe digging and pouring footing, installing the septic tank, plumbing, wiring and complete construction of a home. It is necessary that we visit two or three home construction sites since it is not possible to cover the material as fast as a house may be constructed.

I feel the procedure described makes my shop teaching most effective. The many complimentary remarks by students and parents concerning this program support the fact that students must be motivated to learn.

As I go about the county I find former students in certain jobs in the home construction business. I feel this shop course helped them find their place in the world of work. ◆◆◆

BOOK REVIEWS

AGRIBUSINESS ELECTRICAL LESSON PLANS, Instructor's Manual by Erpelding, L. H. Jr.: The Interstate Publishers and Printers, 1971, 310 pages, $4.95.

and

AGRIBUSINESS ELECTRICAL LESSON PLANS, by Erpelding, L. H. Jr.: The Interstate Publishers and Printers, 1971, 414 pages, $3.95.

These two publications are reviewed together because you must have a copy of both before effective use can be made of the content.

This unit of material covers Electricity in three sections: Basic Electricity, Wiring and Specific Electrical Devices and Operation and Maintenance of Electric Motors. The student manual contains objectives, study questions and subject matter for student use. The instructor's manual contains objectives, motivational material, teaching tips, and references and transparency masters where applicable. The material is developed for a semester course, but can be used in other circumstances, since the design of the publication allows much flexibility. The books contain the information needed to teach Electricity in high schools and reference lists for a more in-depth study are presented. These books will assist the teacher in providing instruction in Electricity in high school agriculture curriculums.

Mr. Erpelding has a background of teaching experience in vocational and other relevant experience. This coupled with the assistance supplied by the Kansas power suppliers provides an excellent technical and practical background.

This unit can be used by the average high school student and the teacher can with selection make good use of the material with adult groups.

Robert T. Benson
Clemson University

NATIONAL AGRICULTURAL MECHANICS CONTEST — A Reality In The Making

Thomas A. Hoerner
Agricultural Engineering and
Agricultural Education
Iowa State University

This article is based on information collected by the author and the author's experience of four years' teaching experience in high school VoAg and ten years' teaching in Agricultural Engineering and Agricultural Education Departments.

Thomas A. Hoerner

A National Agricultural Mechanics Contest, believed by many as one of the long, overdue contest areas, is just over the horizon. In fact, if all goes as planned, the first National Contest will become a reality during the National FFA Convention in October, 1972. Although this contest has been discussed and talked about for many years and even proposed but turned down, it wasn't until a consultant committee composed of two high school VoAg instructors, two supervisors of Agricultural Education and four teacher trainers in Agricultural Mechanics that the wheels really began to roll. The committee first met at the National FFA Center near Washington on May 25, 1971, to begin work on a proposal for the National Contest. By late July the proposal was completed and submitted to the National FFA Board of Directors and National Officers. The proposal received unanimous approval by the board and officers with the go ahead to begin the contest by the fall of 1972 provided funds can be made available.

The eight-man Agricultural Mechanics Consultant Committee included: Seated, left to right: Mr. G. Joseph Gribouski, State 4-H Leader, Worcester, Massachusetts; Dr. Frank Anthony, Associate Professor, Pennsylvania State University; Dr. Douglas D. Bishop, Assistant Professor, Montana State University; Mr. James Pope, Executive Secretary, Maryland FFA Association, Gaithersburg, Maryland. Standing, left to right: Dr. James Durkee, Assistant Professor, University of Wyoming; Mr. Grover C. Miehe, Vocational Agribusiness Instructor, Monticello, Iowa; Dr. Thomas A. Hoerner, Associate Professor, Iowa State University; Mr. George L. White, District Supervisor, Vocational Agribusiness, Auburn, Alabama.

Contest Objectives

The committee had one major objective in mind during the planning stages, that of improving instruction in high school agricultural mechanics programs. In my judgment there can be no other basis for this or any other National Contest. The following secondary objectives were considered and had to have vital importance in planning the contest:

1. To identify the instructional areas in agricultural mechanics.
2. To identify meaningful and teachable instructional activities.
3. To develop in vocational agricultural students manipulative skills and abilities related to agricultural mechanics.
4. To develop in vocational agricultural students decision and management making abilities related to agricultural mechanics.
5. To provide an opportunity for students with high mechanical and manipulative abilities to receive recognition.
6. To increase public awareness of agricultural mechanics and its importance to the vocational agricultural program.
7. To stimulate improved communication between VoAg instructors, teacher educators, state supervisory staff and national leaders in vocational agriculture concerning teacher preparation, curriculum content and facility needs for instruction in agricultural mechanics.

The Contest

A brief description of the rules and activities being recommended for the

(Continued on next page)

National Contest are:

1. A team representing a state shall consist of three team members, the selection of the team shall be left to the discretion of the individual states.
2. Each contestant shall compete in two of the three instructional areas designated for the National Contest for each year.
3. If a state is represented by a team of three contestants, the team must compete in all three areas (each team member competing in two areas with the team covering all three instructional areas in the contest).
4. Phases of the contest—The contest shall consist of the following phases:
   a. Written Examination — This phase will consist of 25 multiple choice questions over each of the three instructional areas.
   b. Problem Solving — This phase will consist of identifying materials or solving problems related to the instructional areas. Ten problems will be provided in each of the three instructional areas.
   c. Mechanics Skills — This phase will consist of specified manulative activities in the three instructional areas.
   Note: A contestant must complete all three phases in each of the two selected instructional areas.
5. All personal safety equipment shall be the responsibility of the contestant, including *industrial quality* safety glasses or approved goggles.
6. All equipment, tools, manuals, supplies and other materials will be furnished for the contest.

Instructional Areas

The contest shall consist of three of the following five instructional areas each year selected on a rotational basis:

1. Agricultural Power and Machinery
2. Agricultural Structures and Environment
3. Soil and Water Management in Agriculture
4. Agricultural Electric Power and Processing
5. Agricultural Mechanics Skills

Twelve agricultural mechanics subject matter areas make up the five instructional areas. Listed below are the twelve subject matter areas and an indication as to which instructional areas each falls under.

1. Arc Welding (5)
2. Oxy-acetylene Welding & Cutting (5)
3. Hot & Cold Metals (5)
4. Plumbing & Pipe Fitting (5)
5. Carpentry Construction (2) and (5)
6. Fencing (2) and (5)
7. Concrete Construction (2) and (5)
8. Electricity (4)
9. Small Gasoline Engines (1)
10. Tractor Power (1)
11. Agricultural Machinery (1)
12. Soil and Water Management (3)

Contest Activities by Years

The following instructional area rotation by years will be followed in the contest:

1972—agricultural mechanics skills
agricultural electric power and processing
agricultural power and processing

1973—agricultural mechanics skills
soil and water management
agricultural power and machinery

1974—agricultural mechanics skills
agricultural electric power and processing
agricultural structures and environment

1975—agricultural mechanics skills
soil and water management
agricultural power and machinery

1976—agricultural mechanics skills
agricultural electric power and processing
agricultural structures and environment

For the agricultural mechanics skills instructional area the following subject matter rotation will be followed:

1972—arc welding and hot and cold metals
1973—oxy-acetylene welding and cutting, plumbing, and pipe fitting
1974—arc welding and fencing
1975—carpentry and concrete construction
1976—arc welding and hot and cold metals

Contest Scoring

The following is an outline of the contest scoring for each individual team member.

1. Written Examination — 25 questions in each of two instructional areas 50
2. Problem Solving — 10 problems in each of two instructional areas, 2.5 points per problem 50
3. Mechanics Skills — 3 activities in each of two instructional areas, 25 points per activity 150

Total 200

State Agricultural Mechanics Contest

Now that a National Contest has been approved, it would seem natural that the State Associations should make an attempt to align themselves with the National Contest. A number of states have been conducting very excellent state contests, most of which will require only minor modifications to align with the National Contest. States without a contest at present will most certainly want to begin planning for a state contest so that a team may be selected for the National Contest.

This past summer a contest patterned after the proposed National Contest was conducted in Iowa. If interested, I would be pleased to share rules and regulations of the Iowa contest with either the teacher trainer in charge of agricultural mechanics instruction or state supervisory staff.

Summary

The consultant committee deserves much credit for the excellent job in preparing the proposal for the National Contest. However, much work and cooperation will be needed before this contest becomes a reality the fall of 1972. The contest personnel have been selected, and they are busy making preparations for the first National Contest.

Agricultural Mechanics plays an integral part of most vocational agriculture instructional programs. I feel certain this proposed National Contest is a step in the right direction to aid local instructors, teacher trainers and state and national leaders in vocational agricultural education to focus the proper and much deserved attention on instruction in agricultural mechanics.

ED. NOTE: Word was received after this article was in press that approval has been obtained from the National FFA Foundation Board of Directors, U.S.O.E., and that Firestone Tire and Rubber Company will fund the Contest.

WHY SHOULD I BELONG?

Richard C. Weber

Why should I belong? So many times we hear this question put to officers and active members of our professional organizations.

A professional organization is no stronger than its members. Therefore in order to have a strong professional association, the membership must understand and support the organization.

In a statement to a group of educators on November 19, 1963 at the White House, the late President John F. Kennedy said, *"Things don't happen. They are made to happen. And in the field of education they are made to happen by you and your members."* On this occasion, the President stated clearly and forcefully the role of professional organizations in American society. Things that happen for vocational agricultural teachers, agricultural teacher trainers and supervisors are *made* to happen by these groups working through their professional organizations such as the NVATA, AATEA, NASAE and their state and local affiliates.

The tendency to form voluntary groups has been a noteworthy aspect of the history of American democracy and has given the nation some of its distinctive characteristics. Through groups Americans have developed the arts and sciences, established business and public enterprises, and fostered education and individual welfare. To develop a continent Americans have had to learn how to cooperate with one another. To operate successfully a government based on the wants and needs of the people has required that groups have the ability and willingness to organize for political action. Circumstances of life and political tradition alike require group action.

In the early days of our professional organizations we did not have the "Let George do it," attitude that we see surfacing today. These beginning members had a direct plan of action and specific professional and political goals to guide their endeavors; and everyone was involved. The programs were strong and much success came from these early efforts. Today, however, some of our potential and inactive membership have forgotten why these groups were organized in the first place and what their current goals are. They are content to let the leadership carry the load and not become active and personally involved. This kind of attitude is unfair to everyone concerned. It imposes upon the person who is actively participating because he has to handle more than his share of the work of the organization; and it is unfair to the person who is inactive because he reaps the benefits, secured by the efforts of the group, not fully realizing the sacrifices made by others in his behalf. If we are prone to sit on our bottoms and criticize the organization and its leaders and do not try to help better the organization by becoming involved, then I say we are getting out of it much more than is rightly deserved.

The NVATA State Officers Handbook aptly expresses what a person owes to his profession when it states that, **"Owing to one's profession implies more than just financial support.** It means supporting the officers and policies of the organization to the betterment of the instruction and the advancement of the program. It means going to meetings and giving freely of your time and ideas when you would rather stay home. It means being optimistic and holding faith in the future of Vocational Education in Agriculture. It means asking yourself, What can I do? rather than, What can I get out of the organization? It means keeping ones professional respect. It means that you believe in what you are doing and express this belief by being a really professional person. Owing to your profession means all of these things and above all the privilege of being able to practice your calling in a free society."

The benefits derived from the member's support of his organization may not always be apparent at first, but state and national vocational education associations have worked for and succeeded in raising the requirements for entrance into the profession. They have influenced curriculums and standards for equipment, and they have helped to develop our profession into one receiving the admiration and respect of the country at large. Our associations have worked untiringly to gain recognition for our programs as a part of the educational plan of the country, to improve methods of teaching, and to raise standards for teaching. These associations are rendering a creditable service to agriculture teachers, teacher trainers and supervisors. Even from a selfish viewpoint it is advisable for everyone in the profession to support them and do his part.

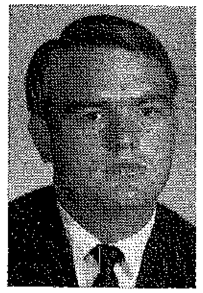
Why should I belong? Because

1. **I am a part of an on-going profession.**
2. **I owe something to the profession and my fellow educators.**
3. **I want to be a producer and not just a parasite or a consumer.**
4. **I am a man dedicated to the upbuilding of the community and the nation of which I am a part.**
5. **I can not do the job alone.**
6. **Improvement sociologically in American society comes largely from the unified efforts of like-minded people.**
7. **I want the satisfaction of knowing I have done my bit toward upbuilding the profession.**

Richard Weber is a Graduate Assistant and Ph.D. Candidate, Agricultural Education, Louisiana State University, and Past State President of the Louisiana Vocational Agriculture Teachers Association.

SIMULATION IN AGRICULTURE MECHANICS FOR SPECIAL NEEDS STUDENTS

R. Glenn Shoemake
Research Associate
Mississippi State University
State College, Mississippi



R. Glenn Shoemake

In the United States, a country thought of as having an abundance of food, material wealth, and freedom, we also find an abundance of poverty, uncultivated minds, undeveloped and/or underdeveloped talents. This has been a problem in the past generations and was recognized by the Congress in preparing the Vocational Education Act of 1963. The Act of 1963 spelled out the need for all people and groups to be equipped for the world of work, and stipulated that people with certain problems which keep them from succeeding in a traditional program should also be served. Subsequently, when Congress recognized that the major purposes of the Vocational Education Act of 1963 were not being met, they redirected the aims of vocational education with the 1968 Amendments. Under the amendments, vocational agriculture can assist with the education of special needs students.

The 1968 Amendments mandate, through the "car-marking" of funds, which groups are to be served and which services are to be provided. Services are to include related remedial instruction, guidance and counseling, instruction facilitating occupational choices, and instruction relating to the occupation or occupations for which students are being trained.

What is a disadvantaged person? This term can have a variety of meanings to different individuals. Each person could be disadvantaged as compared to some other person or some standard dictated by society. Thus, we must have criteria for determining whether or not one is disadvantaged. First, let us begin by stating that a disadvantaged person may have not assumed a productive role in society. Therefore, society may see him as a burden. Second, a disadvantaged person may be one who has had trouble in academic courses because of underdevelopment or under-achievement in the lower grade levels of school. Third, a disadvantaged person may be one who has a cultural or ethnic background which would tend to keep him out of the mainstream of society. Fourth, a disadvantaged person may be one who has social and economic limitations. Most vocational educators will agree that the term disadvantaged would apply to any person who, for one or more reasons, is not succeeding in a traditional educational program but is not considered physically or mentally handicapped. Characteristics that most disadvantaged persons appear to have might include: (1) lack of motivation, (2) insecurity, (3) lack of communication skills, especially reading and vocabulary, (4) lack of confidence in himself and in the school system, and (5) poor concentration. These are just a few of the many characteristics and problem areas that can be used to identify a person who is considered as being disadvantaged.

Where does the secondary vocational agriculture program fit into serving disadvantaged persons? For years the role of vocational agriculture, in many cases, has been to serve or to attempt to serve students who would fit into the disadvantaged classification. Many times vocational agriculture programs have been the last resort for these students. If a student fails in all else, he is frequently placed in a vocational agriculture class. Certainly this is not true of all programs, but it is true in perhaps far too many cases.

What can a teacher do about a situation such as the one described above? First, one can learn to identify the disadvantaged students in his class and then plan for classes to aid these students, or revise the present program to meet their needs. All teachers dealing with such students must be conscious of the fact that these people are not useless, but, that their talents have not been explored and/or developed. Thus, teachers must realize that any redirectives must be aimed at the needs of the students. Teachers must also recognize that these students are potential dropouts and could very well end up as part of our nation's unemployed and/or welfare recipients.

If disadvantaged students are to succeed in the world of work or work experience programs, their training must include experiences related to actual job situations. Therefore, special needs or disadvantaged students should have simulated experiences to correlate with work experience, or should be provided opportunities for learning skills before being exposed to actual work experience. Disadvantaged students are unable to comprehend the vastness of their role as productive citizens, and often do not realize what is expected of them in the world of work. With the help of simulation in the curricula, disadvantaged students may become able to achieve and to assume a role in industry and society.

Exactly what is meant by simulation of work experiences for disadvantaged students? Simulation is bringing students as close to an actual work situation as possible while they are still in school. This may be necessary in order for disadvantaged students to learn both related materials and skills in the occupational preparation. These students tend to learn more rapidly by doing. A textbook-type course may well be a deterrent to learning for a disadvantaged person.

Simulation has a place in almost all areas of vocational agriculture programs. Implementation of these programs will be limited only by the teachers' enthusiasm and creativity. Let us suppose that a teacher has several disadvantaged students in his school and would like to develop a class for them using simulation. First, he would take "stock" of the employment opportunities and his available facilities and resources. Suppose that the teacher found employment opportunities in the area of agricultural mechanics. If he is a teacher in Mississippi, his agricultural mechanics shop would be divided into eight different skill training areas specifically arranged to maximize utilization of space and instruction. These areas include: (1) building and structures, (2) electricity, (3) welding (arc and oxy-acetylene), (4) concrete and masonry, (5) plumbing, (6) metals, (7) tool fitting, (8) farm power machinery.

Once the class is organized, students are separated into small groups and placed into different skill training areas within the shop. For example, a class of eighteen students could be subdivided into three groups of six each. This is done to maximize both the facilities and learning experiences for the students and to individualize the instruction as much as possible. Now the first phase of simulation may occur. Detailed specific tasks are assigned to each student or pairs of students in the particular area where they are working. For example, a person working in the building and structures area might be given a job learning to use a framing square. This could be done by having the student square a board, mark rafters, or perform any number of jobs which would help develop his skills in this area. These tasks should be as closely related to on-the-job work experience as possible, but they must still be designed for the development of basic or primary skills. Such tasks are designed to develop the necessary job entry level skills rather than those for advancement.

After the students finish their assigned tasks and the teacher is satisfied with each student's level of competence in that area, the students then exchange work areas. This is to be continued until the teacher feels that the student can perform more complicated tasks or until it becomes apparent that a student is unable to function at a higher level in a given area. Once the teacher feels that the student can perform adequately, a work experience simulation project may begin.

For example, assuming that each student has been through each area and has gained sufficient skills for the endeavor or has demonstrated his inability to master certain skills, the teacher would enter the second simulation phase by having the class construct a small greenhouse. Within the shop the students are able to use the building and structures area to do such things as making and/or reading blueprints. Once this task has been completed, the students could work up and estimate materials, including amount and cost. Once these primary steps are completed, students put their developed skills to work again. This should be done so that the student can relate his primary experiences with the practical application in the second phase of the curriculum. Also, this would aid in developing the student's appreciation for remedial subjects.

The students should then use the basic skills gained in each work area by actually performing tasks such as laying out the building, measuring, using squares, and laying out and marking rafters. The next step is having the students assemble the structure. This teaches the students how to choose different kinds of nails, how to nail, how to recognize and construct different joints, and how to plumb and level. While the students are working and developing primary skills for work experience or job placement, good work habits can also be developed.

Once the building is framed out by the group in the building and structures area, another group can then be called upon to perform tasks related to their background materials or basic skills. Let us look at a group in electricity. What can this group do in such a project? First of all, they would have to plan the correct procedure for adequately wiring and for providing the necessary facilities for a greenhouse. They would select qualities and quantities of materials needed and estimate costs. The students could then install the distribution panel or switch boxes, install junction and outlet boxes, and begin the actual wiring of the greenhouse. While completing the wiring, such tasks could be performed as stripping wire, making various splices, and connecting wire in outlet boxes and switches. While performing these tasks, students will be applying the basic principles such as how to wire 110 volt circuits, how a switch actually functions, and numerous small jobs that cannot be shown but must be done by the students. These simulated experiences not only give the students a chance to learn by doing, but also, if the work is planned correctly, the students have gained successful experiences which are vital to building self-confidence in disadvantaged students.

Once the building has been framed, another work area can be called upon; the group in plumbing. What can they do? First of all, this group would have to do a great deal of thinking and planning specifications of a plumbing system, and possibly a disposal system for the greenhouse. This could be an experience that would utilize several kinds of pipe and would develop certain competences with pipe materials such as plastic, galvanized, and possibly copper. Again, jobs could be performed, directly relating to their basic skills, which would give them added confidence about their work before entering actual on-the-job situations. Other basic skills that could be enhanced would be the selection of pipe fittings, fixtures, and other plumbing supplies. Associated with this is determining the amounts and costs of pipe and supplies. Basic skills in measuring, marking, cutting, reaming, and threading galvanized pipe could be utilized. Assembling plastic pipe, flaring copper tubing for spray or mist systems could be worked into such an experience. While the students are still under the simulated work conditions, numerous tasks could be performed for their benefit.

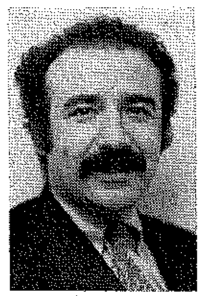
Also included in such a project would be the welding area. This area could be used in building racks or metal shelves that would not have to be replaced, or the inclusion of some small innovation over conventional styles that would give the student a feeling of accomplishment. In performing such a task both electric and oxy-acetylene units could be used. Basic skills in selecting electrodes, running beads, welding in different positions, and welding the different joints and materials could be used in arc welding. In addition, associated skills with the oxy-acetylene unit in cutting, brazing, and possibly fuse welding could be used to reinforce students' skills and confidence.

Once such a simulation project was completed, the teacher would then determine which students were suitable for actual work experience and which students should be recycled. By working with these students, learning their habits or life styles, and hopefully gain-

(Concluded on page 191)

EYE SAFETY IN THE CLASSROOM

Dennis Hirschfelder, Field Consultant
National Society for the Prevention of Blindness
New York, N. Y.



Dennis Hirschfelder

The quotes above are typical of eye accident cases, culled from newspaper clippings by the National Society for the Prevention of Blindness.

Evidence of the scope of the problem reveals itself in other recent reports:

- ★ Survey by The Ohio State University's Department of Agricultural Economics and Rural Sociology indicated 591 farm-related eye injuries occurred in Ohio during 1967.
- ★ The National Safety Council's Farm Department is currently sampling accident information from 30,000 farms representing a cross section of over 1,000,000 farms. Initial findings reveal that in Wisconsin alone between 400 and 500 agricultural workers suffer eye injuries each year.
- ★ A 1967 California Survey indicated 371 farm eye injuries from pesticides and other agricultural chemicals alone.
- ★ A study, "Eye Injuries, Safety Gear and Values in Iowa Farm Life," published in 1960 by Thomas McCorkle at the State University of Iowa disclosed that, "during any given year, one farmer in ten might be wounded in the eye seriously enough to require a doctor's attention."

In each of these reports, agricultural students were among those injured. The problem's magnitude becomes apparent when projected to the 10,000,000 farm residents of the United States! The tragedy of the situation is that, *unquestionably,* almost all such eye injuries could easily have been prevented. How? Through the wearing of appropriate safety eyewear — devices which have saved the sight of thousands of industrial workers, among others.

Eye damage requiring students to miss school for weeks or even months, or farmwork in the case of an adult, creates serious educational and economic losses. Blindness, needless to say, brings with it personal and family tragedy often of devastating proportions. Individuals working anywhere on a farm *must* learn to recognize situations which can cause eye damage and loss of sight; must know what type of safety eyewear should be worn; and must also make certain to have that particular equipment available in the workshop, on the tractor, or wherever it will be needed.

Clearly, the optimum time to create an awareness of the need for personal protective equipment is during the educational years. As agricultural educators, you hold the key to teaching the use of proper eye and face protective devices, and other safety gear. Students, being a captive audience, offer a target towards which safety education messages can be aimed directly and effectively. If one can instill sound safety habits in students, then the odds will favor their carrying these lessons on to the farm where they are unsupervised by any teachers.

Eye Protection Equipment

Since agricultural educators teach courses covering many aspects of farming — logic would point up the advantage in teaching the use of different types of safety eyewear, respirators, hearing protectors, and so on. Because of the variety of courses and subject matter included in agriculture curriculums, four general situations will be described along with the type of eye protective device recommended for each. It is hoped that teachers will integrate this information into appropriate courses, particularly those relating to Agricultural Mechanics and Agricultural Production.

1. *Farm Workshop* (including repair, construction and maintenance of farm structures) Hand tools, grinding wheels, power saws, lathes and drills should never be used without the protection of *at least* plastic cover goggles (which fit comfortably over prescription eyeglasses). Full face shields provide general protection, especially during light grinding, but a goggle provides better overall coverage; for example, when making repairs underneath farm machinery. Along with the regular clear goggles, each workshop should have burning and welding goggles available, in more than one shade of tint, with at least a #5 available.
2. *General Field Work*
   Well-fitting plastic cover goggles with *hooded vents* provide protection from flying dust and chaff, as well as from low-lying branches and brush which will be encountered during field work. Such goggles should be stored on tractors, and other farm machines, and in containers to protect and keep them clean. Special well-ventilated wire goggles to protect eyes from sharp edges of stalks during harvesting operations are also available.
3. *Application of Anhydrous Ammonia and other Liquid Fertilizers*
   Chemical-type cover goggles, with hooded vents, are the absolute minimum eye protection when involved with the transfer or application of liquid fertilizers, particularly anhydrous ammonia. Better protection for such work would be a full-face combination gas mask/goggle. The importance of this recommendation is pointed up by medical advice . . . that eyes sprayed with anhydrous ammonia *must* be flushed thoroughly with water . . . within 10 seconds. The longer the delay, the greater the odds favor blindness!
4. *Application of Pesticides and Insecticides*
   Here also, chemical-type goggles with hooded vents are an absolute minimum. A combination respirator/goggle would maximize protection.

- ***Suffered, a painful eye injury . . . wire flew off the auger . . . lodged in the retina.***
- ***Piece of steel . . . lodged in the eye . . . repairing a corn picker.***
- ***Received a puncture in the eyeball . . . tightening a wire on a fence at his farm.***
- ***Blinded . . . agricultural ammonia.***
- ***Boy blinded in one eye . . . piece of metal flew from grinding wheel . . . in school.***

Every agriculture student and farmer who needs visual correction should insist upon getting industrial quality safety spectacles from his optician or eye doctor. These corrective-protective eyeglasses are readily available with permanently attached or temporary side shields, and provide excellent overall protection for not only classroom and farm work, but for guarding against the eye hazards of everyday living.

School Eye Safety Laws

To date 30 states* have enacted laws requiring 100 percent use of industrial quality safety eyewear in school shops and labs.

These laws specify that eye and face protective equipment must meet, or exceed, all requirements of "American National Standard Practice for Occupational and Educational Eye and Face Protection, Z87.1 — 1968."** Your State Department of Education should be able to provide more detailed information about such laws, and about the American National Standards Institute (ANSI) document. Heat-treated glass or plastic lenses in ordinary streetwear frames do not meet this Z87 standard, and *must not* be considered as a substitute for industrial thickness safety lenses . . . in industrial safety frames. Recently the Food and Drug Administration, HEW, issued a ruling that after December 31, 1971, all eyeglasses and sunglasses will be required to have "Impact-resistant" lenses. However, frames currently available for use with streetwear grade protective lenses do not comply with Z87 requirements for protective eyewear to be used in school labs and shops.

With the passage of school eye safety laws in 30 states, the question of teacher and administrator responsibility — and liability — has come sharply to the fore. Complete compliance with such laws provides educators with the best protection of all! Conversely, lack of compliance amplifies dangers for teachers, as well as for students. A most important point was made in the publication "Safety Practices in Agriculture Education," published in 1966 by the Florida Department of Education; "The possibility of a teacher becoming involved in a legal action resulting from a school-related pupil injury is greater today than in any other period in history," which makes insistance upon using protective gear a must. In 1971, for example, a $500,000 suit was filed in California (which has a school eye safety law) on behalf of a boy who suffered an eye injury during a metal working class. More recently a $1 million legal action was filed against a teacher in Massachusetts (which also has a law) on behalf of a student who lost an eye in a laboratory mishap. It becomes crystal clear that every teacher, particularly in those states having school eye safety laws, should strictly enforce the wearing of eye and face protection by everyone in (or visiting) shop classrooms and labs, as well as during field demonstrations. In industry the penalty for failure to wear appropriate eyewear includes suspension, even dismissal. Similarly strong penalties are necessary for student violators of safety rules . . . and laws!

Summary Information and Recommendations on School Eye Safety

1) 30 states require 100 percent eye safety coverage by law . . . for all shop and lab students . . . their teachers . . . and visitors. Industrial quality safety eyewear is specified.
2) Student eye damage and loss of sight cases take on special significance when attributed to failure to implement a state school eye safety law.
   When students make full-period use of industrial quality safety eyewear they protect not only their eyesight . . . but their teachers from tort liability actions.
3) Industrial quality safety eyewear must meet or exceed all (not some, but *ALL*) the requirements of the "eye safety bible" — the "American National Standard Practice for Occupational and Educational Eye and Face Protection. Z87.1-1968."
4) Flimsy, inexpensive "visitors' specs" DON'T meet the ANSI Z87 standard . . . and are NOT approved for full-time use by shop and lab students . . . or their teachers. "Visitors' specs" are only suitable for just what their name implies; temporary use by visitors.
5) Sharing safety eyewear among students is impractical, uneconomical, and unsanitary. An eye protective device is a personal item . . . like a toothbrush . . . which even members of a family wouldn't think of sharing. All safety eyewear should be sanitized regularly. Information and sanitizing materials are available from manufacturers and suppliers of protective eyewear.
6) Contact lenses must not be worn by anyone working with agricultural chemicals, fertilizers, pesticides, or insecticides. It is doubtful they should be allowed in labs and shops at all.
7) The best way to insure maximum protection for students . . . for yourself: Specify in bid requests that quotations are desired on *only* ANSI Z87 protectors. RE-

(Continued on next page)

QUIRE ALL SUCCESSFUL BIDDERS TO FURNISH ON THEIR BUSINESS LETTERHEAD A STATEMENT CERTIFYING THAT (EXCEPT FOR "VISITORS' SPECS") ALL EYE AND FACE PROTECTORS TO BE SUPPLIED MEET OR EXCEED ALL ANSI Z87 SPECIFICATIONS. Such a letter will provide potent legal support . . . should safety eyewear fail under questionable circumstances (following this recommendation will scare off purveyors of "cheapie" half-safe "eye protectors").

8) "Advertise" eye safety — using signs and posters, such as 100% EYE PROTECTION AREA — THIS MEANS YOU. Safety posters and other warning notices should be utilized — and changed — throughout the school year.

In conclusion, I would like to quote a statement — made five years ago in this very publication — by two agricultural educators. Their advice holds as true now as it did then:

"In short, the problem of accidents including the possible loss of eyesight is one that constantly confronts each vocational agriculture instructor. The teacher is the central figure in educating students to practice safe working habits. He also is the one who must bear the brunt of criticism should an accident occur. Students watch and imitate the action of you, the teacher. Therefore, it is up to you to set a good example for your students by not only requiring the wearing of safety glasses, but also by wearing them yourself while working in the agricultural mechanics laboratory." . . . A LOOK AT SAFETY THROUGH SAFETY GLASSES . . . Thomas A. Hoerner, Teacher Education, Pennsylvania State University and Donald L. Ahrens, Agricultural Engineering, Iowa State University . . . The Agricultural Education—June 1966. ◆

* Alabama — Arizona — Arkansas — California — Colorado — Connecticut — Delaware — Florida — Illinois — Indiana — Iowa — Kansas — Louisiana — Maryland — Massachusetts — Minnesota — New Jersey — New York — North Carolina — Ohio — Oklahoma — Pennsylvania — Rhode Island — South Carolina — Tennessee — Texas — Utah — Virginia — Washington — Wyoming.

**Available, for $5.25 prepaid from American National Standard Institute, 1430 Broadway, New York, New York 10018.

AGRICULTURE EDUCATION — A Starvation Prevention Plan

Grover C. Burkett
Elementary School Principal
Bone Gap, Illinois

Grover C. Burkett

Are you interested in seeing your children and grandchildren go to bed hungry and even dying of starvation? Assuming that the answer to this is negative let us do some positive thinking about what has been done and what can be done to prevent food shortage in America and the world.

In 1914 the Cooperative Extension was started by an Act of Congress. The Smith-Hughes Act of 1917 started vocational agriculture in the public schools. The Congress either was very intelligent or very well advised because they realized two important areas which would effect the effectiveness of Agriculture Education. One is that you "learn by doing." This was realized in the provision that a project was required for at least six months of the year. Agriculture education leaders and instructors realized the importance of learning by doing by having year-around farming programs instead of the six months minimum requirements. The second area was that in most geographical areas the summer is the important growing season. The Smith-Hughes Act provided that agriculture instructors be employed on a twelve month basis with no more than thirty days vacation.

When Congress passed the Amendments of 1968 they eliminated the provisions of the Smith-Hughes Act except for the appropriations. One can assume that either Congress is less intelligent or they are being improperly advised about vocational education in agriculture. It would appear that they were advised by those who are against Agriculture Education which means that they are voting for future starvation. When the pollution problems are solved we will have a new problem—starvation.

New programs in education have been started in the past ten years. Special programs for the gifted, disadvantaged, and handicapped are serving a very important role in our society. New areas in vocational education provided in the Vocational Act of 1963 are also important to our society. However, it appears that in some instances these programs are being added as substitutes for agriculture instead of in addition to agriculture.

New ideas should be considered in determining the role of the agriculture education programs in local communities. To illustrate how economical agriculture education is let us consider the following problem. In the very near future one farmer will produce enough food and fiber for fifty people. In ten years he will probably support one hundred people.

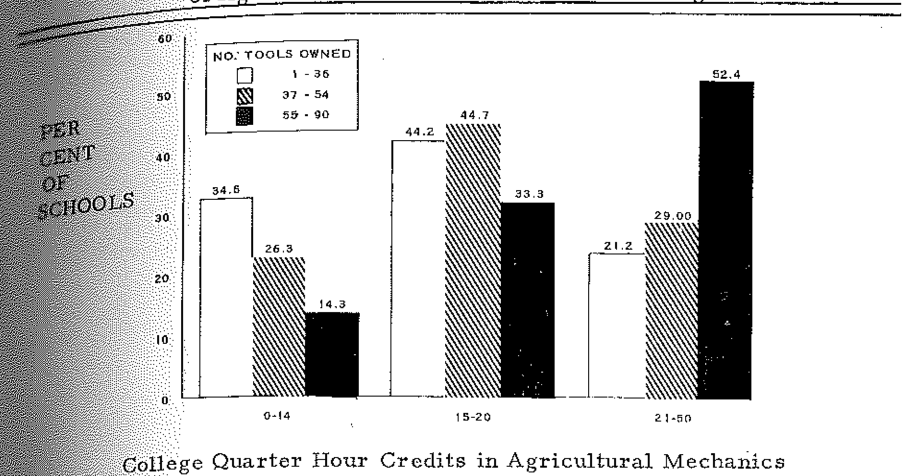
Since the average farmers' productive life is at least forty years he will be providing about 40,000 meals for each person. This would be 2,000,000 meals for fifty people over a period of forty years. If each agriculture teacher prepared only two farmers a year and his salary was 15,000 dollars per year, the cost per meal would be less than one cent.

Recent research indicates that for each new farmer there are three opportunities in off-farm agriculture occupations. This indicates that six could be prepared for agriculture occupations other than farming. The opportunities for college graduates in agriculture number about 25,000 per year. If each agriculture teacher prepared four students for the four year college program the need for college trained agriculture graduates could be filled.

In addition to the economic consideration one should consider the important influence upon the nation the FFA has played. Are you going to vote for Agriculture Education or Starvation? Let us move to restore the Smith-Hughes provisions to future vocational educations acts. This will prevent those in vocational education from chopping off the two most important phases of the agriculture education program. ◆◆◆

(Spengler and Bear—from page 176)

Figure 1
Number of Tools Available Related to Quarter Hour Credits of Agricultural Mechanics Earned in College



U.S. Office of Education recommendation of 150 square feet of free floor space per student in the largest class.

Assumptions based on other data studied indicates the teacher is probably the most important factor influencing the agricultural mechanics program. Teachers with the greater number of credits of agricultural mechanics purchased more tools, and taught more weeks of agricultural mechanics than did the other teachers. These teachers had also influenced size of facilities constructed which is reflected in total free floor space or else they have moved to the school with better facilities. Data collected could not prove either point, however.

It is the opinion of the researchers that the teachers' interest, initiative and successful programs have had the greatest influence on agricultural mechanics facilities provided by the school districts, but proof is not conclusive based on this study. ◆◆◆

[1]Spengler, Verne C., Agricultural Mechanics Tools and Facilities in Minnesota High Schools, Colloquim Paper, M.A. Degree, University of Minnesota, St. Paul, Minnesota, 1968.

(Shoemaker—from page 187)

ing the students' respect, the teacher would be able to accomplish this task best. This, in turn, would hopefully reduce the number of dropouts and increase chances of employment.

This is only one example of what a class of disadvantaged students could do in an agricultural mechanics class utilizing simulation for pre-on-the-job skill development. Simulation could easily mean the difference between these students' developing into a "boon" to society rather than a "bust."

In summary, with an arrangement of varied work areas, simulated experiences, and teacher supervision, students may be able to comprehend the vastness of a cluster of related occupations as well as to develop the basic skills needed to cope with the world of work. While performing these skills, students can be taught correct work habits which may provide the successful experiences needed by the students. In undertaking simulation projects students may develop a sense of accomplishment which builds self-confidence. After all, isn't this a major goal for teachers of disadvantaged students? ◆

Basic skills and arrangement of shop areas taken from the publication, "Agricultural Mechanics Instruction in Secondary Schools," by G. M. Walker and G. G. Powell.

This student wears proper eye protection as he prepares for the transfer of an ammonia fertilizer. Photo Courtesy of the Fertilizer Institute.

The **44th National FFA Convention** was impressive, with over 13,000 members and leaders participating. The vesper service, efficient business meetings, prominent speakers, and descriptions of goals reached by national FFA winners provided a stimulating experience for each FFA'er who attended. The atmosphere surrounding the activities and displays at this national event will always serve to build "esprit de corps" within local chapter members, as well as help raise the sights of chapter and members.

The first National Citation in the FFA Building Our American Communities (BOAC) program went to Berrien High School FFA Chapter, Nashville, Georgia. This new chapter action program structures the community service phase of vocational education in agriculture.

(Eustace—from page 168)
mechanics work. Following are brief outlines of the recommended program beyond the freshman level:

A. Sophomore Agricultural Mechanics Program

1. Agricultural mechanics safety
   In addition to teaching safety in conjunction with agriculture, mechanics safety practices should be prominently posted in the shop near the machine or tools to which they apply.
2. Arc welding
   a. double V butt weld
   b. small V butt weld
   c. butt weld—thin metals
   d. selecting electrodes for farm welding
   e. distortion control
   f. pike T fillet weld
   g. bronze welding with carbon arc
   h. heating with carbon arc
   i. welding with nickel alloy and stainless steel rods
   j. build or repair a farm labor-saving item
3. Farm electricity
   a. what is electricity? how is it used?
   b. safety practices in working with electricity
   c. electric circuits on the farm—installation, care, and maintenance
   d. electric motors—care and maintenance
4. Principles and theories of internal combustion engines
   a. principles of internal combustion engine
   b. valves and their maintenance
   c. cylinders, pistons, rings
   d. principles of carburetion
   e. principles of ignition
   f. bearings—different types, clearance requirements and adjustments
   g. repair small engine using appropriate maintenance manual
5. Farm carpentry construction projects
   a. farm building frame construction

B. Junior Agricultural Mechanics Program

1. Farm power and machinery
   a. tractor operation and daily care
   b. tractor fuels and lubricants
   c. tractor transmissions—maintenance
   d. tractor hydraulic systems—how they work, maintenance necessary
   f. overall maintenance schedule
      (1) cooling system
      (2) oil change
      (3) air cleaners
      (4) tire care
      (5) bearing adjustments
   g. basic equipment and repairs including waterpumps, clutches, brakes, alignments, power shaft
   h. individual projects
      inspection and maintenance of a fairly modern farm tractor

C. Senior Agricultural Mechanics Program

1. Soil and water conservation
   a. use of the farm level
   b. laying out a terrace
   c. protecting a waterway
   d. strip cropping
2. Mechanomics—the economics of custom work versus farmer-owned machinery and farm power
3. Water distribution
   a. planning the farm water system
   b. measuring, cutting, threading pipe
   c. care and repair of faucets, valves, sprinklers, etc.
   d. field trip to see a farm home water system in need of maintenance, and to recommend changes and repairs needed
4. Arc or acetylene welding
   a. hard surfacing
   b. welding special metals
5. Farm machinery
   Perform maintenance, adjustment, and minor repairs on one of following:
   a. combine
   b. hay baler
   c. drill or planter
   d. manure spreader
   e. ensilage cutter
   f. mowing machine
   g. field sprayer calibration
   h. farm tractor
   i. hydraulics (pumps and valves)
   j. electricity, generators, and starters
   k. transmissions

The 1963 federal act and the 1968 amendments charged vocational agriculture with training for related occupations as well as production agriculture. In many States agricultural mechanics have been among the most popular offerings. We have been experimenting with semester and nine-week specialized farm mechanics courses for students who want only the mechanics part of vocational agriculture. Multiple-teacher departments are necessary if we are going to deliver the entire load. ◆◆◆

Themes For Future Issues

March — Competencies for Careers in Agriculture
April — Serving the Out-of-School Group
May — Innovation in Agricultural Education
June — Teaching Methods
July — Planning the State and Local Program
August — Evaluation
September — A Guidance Role
October — In-Service Education
November — Agricultural Education in Transition
December — Post-Secondary Education

(Skadburg—from page 177)
The survey indicated farmers feel that skills and abilities in the tractor and machinery area are the most valuable to them. This is definitely an area where they can tie in a dollar and cent return on their time invested. They find all the areas valuable, but they rate the carpentry area the lowest.

I feel that these results may be somewhat deceiving. For example, if a farmer has a welder he realizes the value of welding and ranks it higher than does a non-welder. The farmers ranked reading a micrometer low, but many have never used one and they don't realize its value. The farmers ranked the use of glues the lowest, and I feel this is a valuable area that the farmers would find more valuable if education were offered in this area. When a skill is ranked low it may be because of a lack of knowledge in this area. When a skill is ranked high it is usually used widely, and that is why it is considered valuable by the farmer.

I feel skills and abilities are very important, but the boys must be exposed to many areas so they will know what's available in all phases of agricultural mechanics. A letter from a farmer helped point out that it is impossible to make the boys experts in these different areas, but that the boys should be made aware of the possibilities in all areas.

The survey points out to me what skills are considered valuable by those in farming. I am in teaching to educate boys the best I know how, and I feel this survey will aid me in reaching this goal. ◆◆◆

AGRICULTURAL EDUCATION

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MANAGEMENT
ADULT EDUCATION
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Featuring —
THE FARM MANAGEME