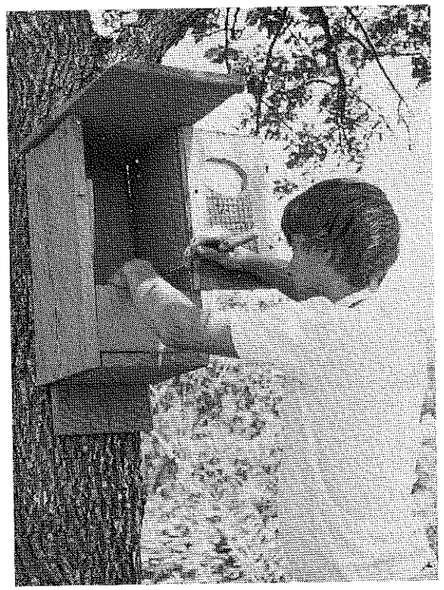
STORIES IN PICTURES

by Jasper S. Lee

VO-AG STUDENTS OBSERVE CLEANING OF ENGINE — Students at McDuffie High School (South Carolina) observe another student using a steam cleaner on an engine. High Durham, agriculture teacher, is shown explaining the demonstration. (Photo from J. Alex Hash, Department of Agricultural Education, Clemson University)

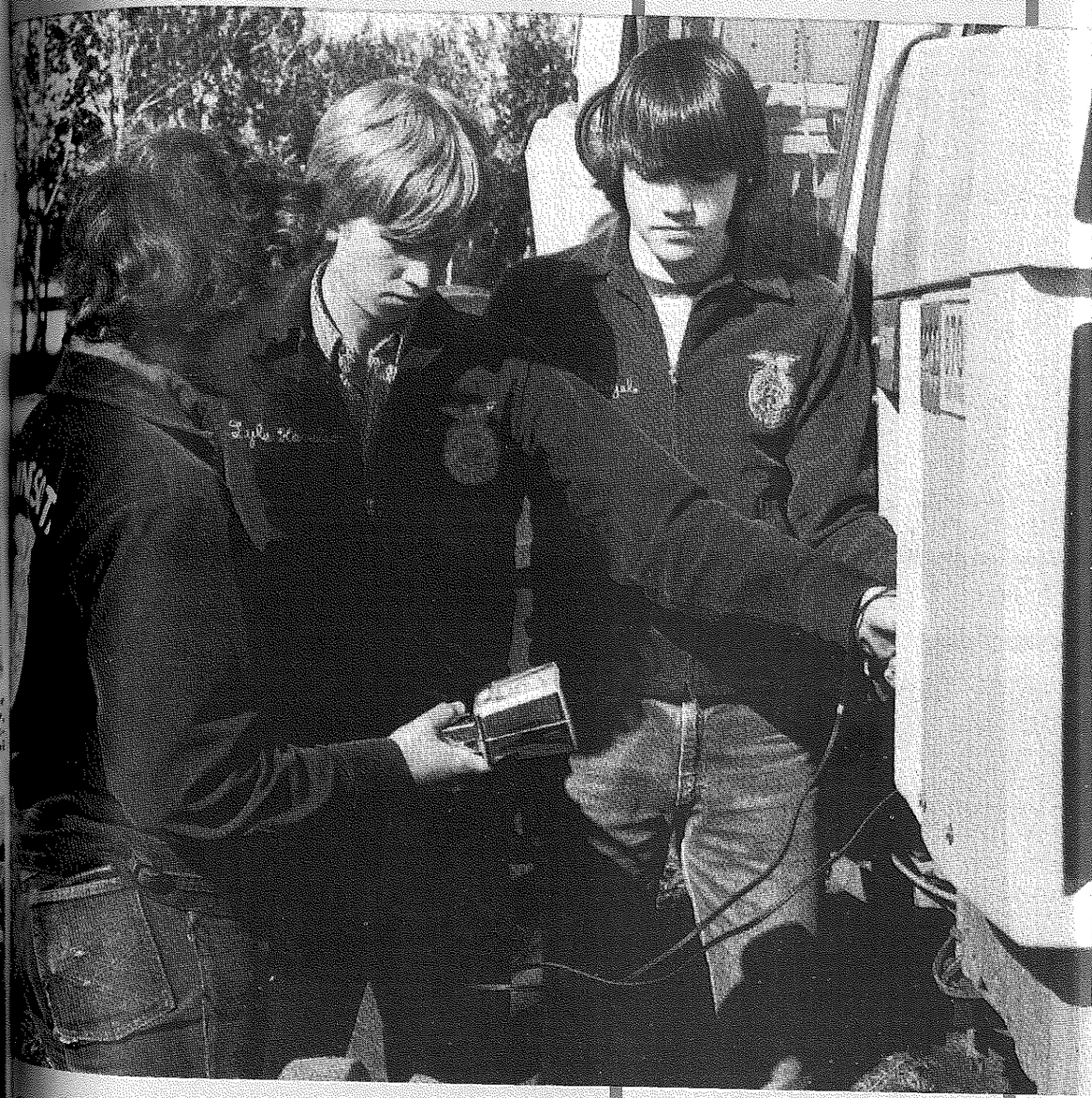


INSTALLATION OF DUCK NEST — Ray Spangler (Ewing, Nebraska) is shown installing a specially constructed nest for wood ducks released by the Ewing FFA Chapter. (Photo from Dennis Cetak, Agriculture Instructor, Ewing, Nebraska)

WORKSHOP ON BEEF CARCASS EVALUATION — Howard Miller (left front), Professor of Animal Science at Mississippi State University, is shown instructing agriculture teachers during a recent in-service workshop on beef carcass evaluation. (Photo from Jimmy McCully, Mississippi State University)

LAND LABORATORY CATTLE PROJECT — Students at Grant, Michigan, are shown receiving hands-on experience in feeding cattle on the land laboratory operated as a part of the vocational agriculture program. (Photo from Frank Bobbitt, Michigan State University, and Grant Fettig, Grant, Michigan)

AGRICULTURAL EDUCATION



Theme—AGRICULTURAL MECHANICS

EDPRESS

AGRICULTURAL EDUCATION

December 1975 Volume 48 Number 6

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THEME — AGRICULTURAL MECHANICS

Minnesota's Farm Mechanics Contest winners are shown checking the dwell on a tractor. The team is from the Hawley, Minnesota, FFA Chapter. (Photo from Forrest Bear and John Hest, Minnesota.)

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GUEST EDITORIAL

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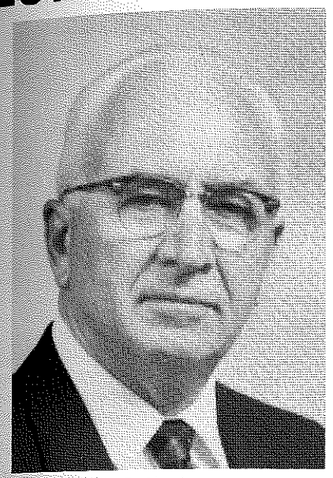

G. E. Henderson

The Problem Approach—Is It Outdated?

G. E. Henderson
Former Executive Director
AAVIM, Athens, Georgia

I have worked with teaching outlines for 24 years in the preparation of engineering materials for use by agricultural educators. I am completely sold on the problem-approach method of outlining for teaching applied information if the concept is broadened. This is what this article is about. Here are the conditions that have led to that conclusion, along with the proposed changes.

In my former position of providing informational service, first regionally and later nationally, it was important that both parties—the teacher educators and the agricultural engineers—be satisfied with how the information was presented.

Consequently, our first major problem was to establish how teaching materials should be organized. On this important point, the teacher educators and agricultural engineers were in almost complete disagreement. The *agricultural engineers* maintained that if scientific principles are taught properly, a student should be able to apply these principles whenever and wherever there is occasion to use them. Their concept of outlining is what is often called the "academic approach."

In general, the academic approach follows three basic steps:

1. Explain a basic scientific principle.
2. Support it mathematically, chemically, or otherwise.
3. Illustrate its use.

Teacher educators insisted that for vocational instruction, the information needed to be in more of an applied form. They strongly supported the "problem approach" for outlining instructional materials. They pointed out that with this method a teacher does not have to reorganize the information for classroom teaching.

Among the different states, teacher educators seem to be in general agreement that there are two aspects to the problem-approach method of outlining:

— The operative aspect (hands-on)
— The managerial aspect (decisions)

Beyond this point, terminology varies widely among educators. And, to some extent, the breakdown of headings under those two aspects tend to vary. To eliminate this confusion, we found the following breakdown for the two aspects to be adequate and quite usable:

I. *OPERATIVE ASPECT*

A. *Task* (problem area)
First Operation
1. (step-by-step procedures)
2.

Second Operation
1.
2.

B. *Task*
First Operation
(etc.)

I. *MANAGERIAL ASPECT*

A. *Decision*
First Factor
(Discussion)

Second Factor
(Discussion)

B. *Decision*
First Factor
(etc.)

Notice that a "task," under the Operative Aspect, is of equal weight in the outline to that of a "decision" under the Managerial Aspect. Also, an "operation" under the Task is equal in outline weight to a "factor" under the Decision. This means that if you have a Managerial Job with several factors under it, but one needs to be an operation in order to arrive at a decision, all can have the same heading weight.

Here is an example of how it works. Suppose you are preparing a teaching outline on Planning Farm Water Systems and you include the *decision* "What Water Source to Use." Among the factors you would automatically list for consideration would be (1) the quality of water available from each source, (2) the amount of water available from each source, (3) freedom from pollution, (4) freedom from turbidity, etc. All of these are necessary factors to consider in reaching the decision. But the factor dealing with the *quantity of water available* may require that actual measurements be made to arrive at the facts for consideration. This then becomes an operative aspect of the problem. The reason: under farm conditions there is usually no evidence at

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hand as to the amount of water available from any one source without first measuring it. This involves step-by-step procedures. The net result is a managerial decision based on facts related to several factors and information derived from one actual operation.

The freedom to mix headings of equal weight between the two aspects, as the example showed, does much to simplify the use of the problem approach to outlining whether for teaching or writing. It also makes the subject more understandable.

But, if we stop with just that much adjustment in our thinking to the problem-approach method of outlining, there is still one serious void. The scientific principles the agricultural engineers talked about do not organize into it readily.

In discussing this matter with teacher educators, they said to keep the science discussion to a minimum, but, if scientific principles are necessary, to just work them in as related information. But the principles involved in agricultural engineering subjects are often much more extensive than that. Then, too, our cooperating states were selecting some subjects that were almost totally based on physical principles, ones such as *Understanding Electricity and Electrical Terms* or *Understanding Horsepower*. These did not organize under either the operative or the managerial aspects of a problem.

For many years this organizational void gave us trouble. After studying the situation for a while, we discovered that there is an answer. In addition to the Operative Aspect and the Managerial Aspect to problem-approach outlining, why not have a third—"Understanding Aspect?"

Following is our concept of how the "Understanding Aspect" is organized and an example of its use:

	(example)
I. *"UNDERSTANDING ASPECT"*	I. *UNDERSTANDING HYDRAULIC CONTROL SYSTEMS*
A. *Application*	A. *How a Single-Acting Hydraulic System Works*
First Basic Principle, Design or Method	*Pascal's Law*
Second Basic Principle	*How a Piston and Cylinder Works*
Design or Method	(etc.)
(etc.)	
B. *Application*	B. *How a Double-Acting Hydraulic System Works*
(etc.)	(etc.)

Many educators disagree strongly with calling the Understanding outline an "aspect" because it is not in accordance with some educational philosophy. Yet, it is the only way we have found to systematically fit scientific principles, designs and methods into the problem-approach method of outlining for teaching and writing. Since the "Understanding Aspect" is in question, I am indicating it in quotes.

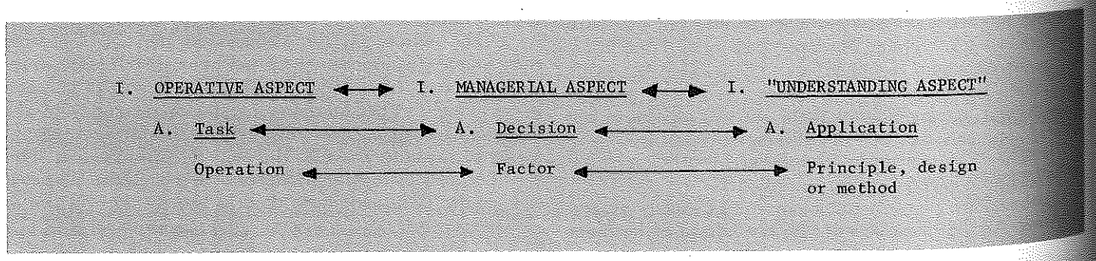
Almost any sizeable subject cannot be outlined exclusively under any one of the three outline headings. Rather, it is developed as basically one type with support from the other two. An example is our publication, *Planning for an Individual Water System*. Basically, it is a decision type (managerial) publication. But, it includes some operations such as the one mentioned earlier, determining how much water a well will deliver, which influences the decision. This involves a definite set of operative procedures. Then, there are principles involved, such as how different types of pumps develop pumping action, and how different types of water-conditioning units work. For the publications to be complete and understandable, all three of these outline procedures had to be blended.

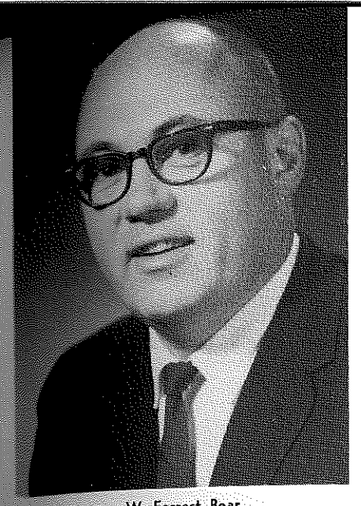
Recognizing the three basic outlines and the provisions for blending them together, means we now have (1) a blending "system" for maintaining balance in developing a teaching outline, and (2) a means for handling scientific principles. The interchange of blending of headings works as it did with the operative and managerial aspects, and as shown at the bottom of this page.

Judging from our experience thus far, there is no question in my mind but what we now have available the *most effective method* of presenting applied information that has been developed to date.

Let's recognize one *unfavorable aspect* of problem-approach outlining. These outlines have their own self-destruct capabilities built into them. Here is why. To do the outlining job properly, the outliner must be intimately acquainted with his subject, his research must be exacting and complete and he must adjust to the idea that the job is very time consuming if done properly. To some this is too much.

This probably explains why educators who endorse this system of outlining sometimes depart from it—partially or totally—when preparing their own materials, and why administrators cannot understand the amount of time needed to prepare effective teaching outlines and publications. ◆◆





W. Forrest Bear

OSHA and You

W. Forrest Bear
Teacher Education
University of Minnesota

Editor's Note: Professor Bear solicited, by topic, nearly all the articles in this issue and provided most of the pictures.

HISTORY

If you think OSHA is a town on the iron range in northern Minnesota you're in trouble. OSHA is in Minnesota but twenty-two other states have approved OSHA plans and approximately seventeen other states have plans pending approval.

The birth of OSHA was December 29, 1970, when the ninety-first U.S. Congress passed Public Law 91-596, the Williams-Steiger *O*ccupational *S*afety and *H*ealth *A*ct of 1970 (OSHA). The purpose of the act was to assure as far as possible every working man and woman in the Nation a safe and healthful working environment and to preserve our human resources.

OSHA desires to accomplish this goal by encouraging all employers and employees to reduce hazards in the work place, to start and/or improve safety and health programs. Under the law, there will be mandatory job safety and health standards authorized, and the responsibilities of both employer and employees will be defined. The word "shall" will be used to describe participation and compliance with regulations, which indicates the intent for mandatory compliance. It is further desired that each state will have its own OSHA plan, which will be equal to or more stringent than the Federal program. The Federal program does not provide coverage for public sector employees but the state program will cover these groups. The state shall also have an effective administration and enforcement program with reporting procedures for job injuries, illnesses, and fatalities.

WHO IS COVERED?

It states that both the employer and the employee are covered. The term employer is defined as a person engaged in a business affecting commerce who has employees but does not include the United States or any state or political subdivision of a state.

The employee works for the employer who is in a business which affects commerce. Thus, the employer shall furnish a place of employment free from recognized hazards and the *employee shall comply* with the safety and health standards, rules and regulations.

OSHA encompasses other standards (national consensus) which are to protect the employee and provide standards for the employer. Specifically, the National Fire Code, National Electrical Code, American Society of Mechanical Engineers (pressure vessels), the American National Standard Institute (machine guarding and safety glasses), and the Department of Transportation (compressed gas cylinders) standards as adopted are enforcable by OSHA. Standards which apply to specific industries are called *vertical standards.*

(Continued on next page)

Standards which apply to all industries are called *horizontal standards* and these are applicable to schools. If the employer has been meeting all of these standards, OSHA may not be a problem.

YOU AND THE SCHOOL

You are an employee of a school district, therefore, the employer shall provide for your working conditions. The students in your classes are not employees but are definitely covered by the previous groups which are classified as the National Consensus standards. The teacher definitely has a liability responsibility for the student.

The latest regulations entitled General Industry Safety and Health Regulations list sixteen subparts that refer to conditions found in work places.

There are four other OSHA standards related specifically to maritime standards that would not pertain to the agricultural mechanics laboratory. Construction standards, #1926, would be significant for the post-secondary and center-vocational schools where construction trades are being taught.

For exact details, purchase a copy of the Federal Register to review the standards. As a warning flag, the agricultural mechanics instructor should consider these subparts as he organizes his OSHA investigations. I'm emphasizing the instructor's OSHA inspection, because if he waits for the OSHA compliance officer, it could be too late to investigate but the proper time for penalty payment.

Subpart D Walking-Working Surfaces

The agricultural mechanics facility with overhead storage above the classroom, office, restroom and/or adjacent storerooms will be concerned with stairway dimensions, hand railings, balcony railings and toeboards. OSHA also has regulations on fixed and portable ladders.

Subpart E Means of Egress

Means of egress is defined as a continuous and unobstructed way of exit travel from any point in a building. The frequency of exit and directional signs could be a factor in all buildings, but generally not in the agricultural mechanics facility. Ramp and passageway sizes are also covered. Housekeeping should be checked to determine if access is readily available.

Subpart G, H, M and Q

Subpart G is on Occupational Health and Environmental Control and addresses air contaminates such as chemicals, asbestos, abrasive blasting, noise exposure with levels and radiation. The noise level would probably be the most pertinent but it is doubtful if the level or exposure time would approach a hazard for the instructor and definitely not for regular students. Subpart H on hazardous materials deals with compressed gases, and OSHA specifies that all related compressed gas association regulations must be followed. Acetylene and oxygen manufacture, storage and transportation are covered under this subpart with the design of the cylinders being defined in Subpart M. The oxy-acetylene welding, cutting and brazing as related to agricultural mechanics is defined in Subpart Q. Arc welding is also covered in Subpart Q which makes it quite applicable to the agricultural mechanics laboratory.

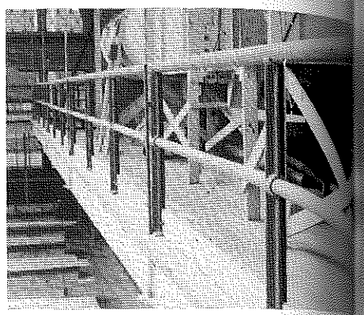
Subpart I and J

Personal protective equipment includes items for the eyes, head, face, extremities, respiratory devices, clothing, and other protective barriers and shields. Minnesota has an eye protection law as does many other states and this law should be of great concern to the teacher. Respirators would find less application but safety toe footwear and helmets need to be worn in construction, horticultural and forestry classes. General environmental controls which deal with housekeeping are defined in Subpart J. Schools have complied with regulations for toilets, food handling facilities, water and waste disposal for years. Compliance of the laws covering safety instruction signs probably has not been followed to the letter-of-the-law.

Subpart K, L, O, P, and S

Medical services and first aid are covered by Subpart K. Each school is to have an organized plan for handling medical problems by the school medical staff or by the local commercial medical staff and/or law enforcing facilities. Fire protection for Subpart L has been applicable to the school environment for years as enforced by insurance regulations.

Machinery and machine guarding is defined in Subpart O. Grinding wheel specifications are covered under this section which defines the dimensions permissible per size of wheels and the surface feet per minute. The use of push sticks and blocks around wood and metal tools are also of concern. General guarding of all machine cutting tools or edges, belts, gears, wheels, pulleys, and similar points where a person could be injured is listed and must be checked.



Balconies and open storage areas must have railings at least 36-42" high, and an intermediate rail and a kickboard at least 4" off the floor. Railing must be able to withstand 200 lbs. pressure. Pipe size can be no smaller than 1½" OD or 1¼" ID.

Hand and portable powered tools and other hand held equipment are covered in Subpart P. The abrasive wheels for portable equipment are also covered in Subpart P as are the safety guards for all electric and air-powered hand tools. The regulations for compressed air for cleaning specifies a maximum of 30 psi and special attention must be directed to the type of nozzle. Hydraulic and safety jacks and lawn mowers are also covered by Subpart P. Whether you have a regular agricultural mechanics or a horticultural program, this subpart should receive your attention.

Subpart S is electrical and it embraces the National Electrical Code, NEC. The NEC has four articles and roughly 35 sections which OSHA has adopted and will enforce. The subparts thought to be the most pertinent have been listed, but ignorance is not an acceptable plea to OSHA; therefore the entire OSHA Federal Register of the latest edition should be reviewed. The June 1974 Register Part 1910-OSHA-2206 is available for $3.85 from the Supt. of Documents.

(Concluded on page 129)

John Wright

A Positive Approach to Instruction in Agricultural Mechanics

John Wright
Ag Mechanics Teacher
Worthington, Minnesota

In teaching Agricultural Mechanics the questions which one is confronted with generally revolve around what to teach, when to teach it, how to teach, and what materials to use.

What and How to Teach

The issue of what to teach is mainly based on the community needs and what you and others who have studied this matter deem important to include in the curriculum. You may be limited by your facilities, by the time and personnel you can devote to agricultural mechanics, and you may also be limited by your own lack of expertise or ability to teach the many areas in agricultural mechanics.

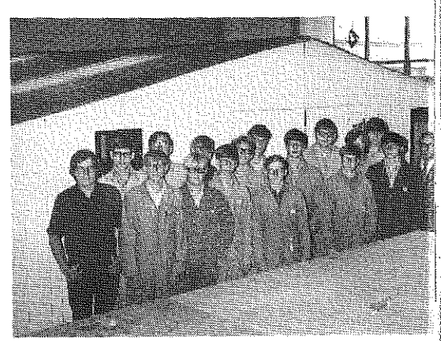
The teacher can sell his program to the students by organizing courses that are palatable, practical, and necessary. The subject in itself is so dynamic and interesting, I really feel that instilling enthusiasm is no problem. Even students with little insight see the value of being able to construct with metal, wood, concrete, and plastics. Being able to safely and efficiently operate and adjust machinery is a naturally self-selling subject. Small engine mechanics, with the great volume and diversity of small engines out today is a subject that sells itself. Tractor maintenance, tune-up, and overhaul follows the same pattern. Having a $15,000 tractor without knowing how it runs and how to keep it in good running order defies good sense. Hydraulics, surveying, and electricity are the most difficult areas in which to excite initial interest. If the teacher can prepare his courses with a very practical and hands-on concept and add a little theory after the students are into it, the students generally get very enthusiastic about these areas, too.

Materials and Equipment to Use

In preparing yourself for teaching, you should attend summer school, short courses, and commercial offerings in the various areas. I have also found many tradesmen are very willing to share their knowledge with me if I only set aside a few hours to put in with them. Obtaining equipment and materials may be a problem, but much of the equipment and materials can be secured easily if you let your wishes be known. We have gotten many valuable pieces of equipment from tractor and implement companies. Small engines are available from stores and individuals, and large engines are relatively easy to secure.

In our small engine program, we have six school-owned Briggs and Stratton, six Lawn Boy and six Jacobson engines. We use these in teaching one quarter about small engines. The format is: briefing on engine theory and maintenance, test-run, meticulous tear-down as part of an overhaul inspection report, reassembly, and re-run. We demonstrate the use of special small engine tools, coil and condensor testing and learn necessary skills. The second quarter of small engines is taught by contract, and we have eight major accomplishments to complete including the tune-up or overhaul of three more engines, chain saw and boat engine tear-down and study, tool and facility organization, and others. We try to limit class size to 16 students.

Our school owns eight large engines that we have mounted on stands as a basis for our large engine tune-up and overhaul study. We also have measurement, ignition, brake, air conditioning, and hydraulics and electricity mock-ups and mounts that we use—all made in our agriculture shop.



A pull-together hog house is a building project that we can make in two sections and move out through our 12' x 16' door. This was constructed for one of the boys in our class. In the foreground is a large sectioned platform for the Nobles County Fair Board.

Welding and hot and cold metal are important units. We are blessed with six electric and six gas welding stations, and we also have a MIG and TIG welder and a gas forge that add much to our instruction.

Our carpentry and building work involves the construction of saw horses, tool panels, and similar projects for which the students purchase the materials. Our building construction is based on buildings constructed for class members, farmers, individuals from town or lumber companies, so we don't

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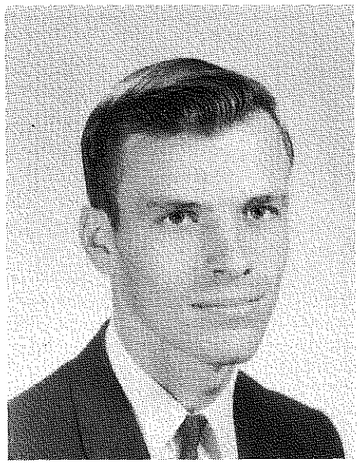
Improved Ag Mechanics Instruction through Modular Design

Richard A. Rawson
Ag Teacher
Jamestown, New York



Richard Rawson

Students vote for modules the senior year.

Relevance and student participation are major keys to any successful program. At the Hewes Occupational Center in Ashville, New York, we have found both of these essential ingredients in adopting the Modular Design developed by the Bureau of Agricultural Education of the New York State Education Department. Each module is taught for 30 hours (15 class days) and includes a set of performance objective sheets which are handed to each student at the beginning of each module. Once the teacher *and* the student have these objectives, both are in a better position to reach their goals. The student knows he has only 15 days to learn the theory of the module and to try to accomplish all of the module objectives he can. If the module ends and the student still has not completed all of the objectives he can still work on his skill development during the shop time of the following module until he completes the objectives of the first module while also working on the next set of objectives for the second module already begun. This flexibility and student responsibility limits horseplay and other undesirable behavior found when students are in a shop without specific assigned projects to be done or perhaps due to a lack of sufficient numbers of equipment such as valve grinders.

The teacher is forced into better planning and more effective teaching by the module time limit. If you have only 15 days to teach the theory and demonstrate the "how-to" portion of a module such as Engine Top Overhaul, you must give it the best shot possible; this means preparing hand-out sheets with the objectives, as well as other informational sheets and teaching materials like used engine heads before the module starts so that none of the 15 days are lost. Students need to have all the necessary items available if they are to develop and practice specific skills such as valve and seat grinding. Because there is only one valve grinder and two valve seat grinders available in our shop, a bottle-neck could occur if students were not able to work on practicing skills in previous modules.

Students receive a daily work grade for the time spent in the shop, and a classroom grade is given for any tests or homework. These two grades are averaged at the end of each module. The shop average is assigned a weight of 60 percent for each module, the classroom average is weighted 25 percent and then 0, 5, 10, or 15 points are added by the instructor, based on the student's habits and attitude. Each module grade is composed of these three elements. We feel justified in placing a heavy emphasis on habits and attitudes because these are often the primary reasons why young people fail to get and hold jobs.

During the last two months of school, the members of the junior class are given module title sheets on which they vote for the modules they wish to take during their senior year. We select the twelve most requested modules and teach these the following year. During the summer, the instructor visits all incoming agricultural mechanization students at their homes to explain the program and to allow the students to select the 12 modules of their choice. We do require our students to take certain basic modules to insure that all students have the basic knowledge and skills necessary before more advanced skills can be attempted. We then tabulate the results of the student selections and teach the twelve most requested modules. The home visits allow for career guidance, getting to know the student and his goals, as well as explaining the purposes of the Agricultural Mechanization program to both the student and his parents. The importance of home visits has long been recognized by Vo-Ag teachers, but is becoming increasingly harder to justify in area centers where time and travel expense is much greater since as many as 10 or more local school districts may be sending students to the center.

On-the-job work experience is an invaluable part of our instructional program. Our students can become eligible for supervised work experience placement in local businesses within their field during the second half of the senior year. Placement is made in businesses selected for their facilities and willingness to *train* students. Students are selected for placement based on their skill development, attendance record, habits and attitude as well as their desire for such placement. The teacher has a responsibility to both his students and to the employer. If the placement for work experience is to be successful over many years, the teacher must know his student's capabilities in technical areas and also their habits and attitudes which may affect their placement. Perspective employers will come to respect the teacher and his evaluation of his students as long as he is honest and sincere in his dealings. Several of our students placed in businesses during the school year were immediately hired full-time upon graduation.

Evaluation of the student placed in

(Concluded on next page)

CONTINUED IMPROVED AG MECHANICS . . .

work experience is achieved by a single page form filled out by the employer each week and either discussed with the teacher when he visits the employer at the end of each week or the form is sent to the teacher at the school if it is not feasible for the teacher to make weekly visits to the business. The most important thing is that the teacher keeps in close contact with the employer and the student while the student is placed. Employers who feel the teacher "dumps" his students on the business and then does not follow up on them regularly will seldom agree to take part the next year, and should not be blamed if they give only limited training to students placed in this manner. On-the-job work experience programs will only work as well as the teacher makes them work. If employers, students, parents, administrators, and the teacher all agree on what should happen during the on-the-job supervised work experience program success is almost insured.

In summary, Agricultural Mechanization teaching under the new Modular Design has been well worth the extra time required to put the program into operation. Students like the short-term intensive mini-course idea; we as teachers are more efficient in our teaching and we feel more effective because of the improved planning required. Use of a separate grade for habits and attitudes helps stress their importance to success in school and carries over into the job. Students like the idea of having a vote in what areas they study within the course outline set by the Craft Committee for our course. Parents get to know the program better through the home visits before their child enters the program.

Agricultural Mechanization is and should be fun for all the people involved especially the teacher as he builds self-confidence in his students and in their ability to perform mechanical work which will be relevant to their success regardless of their future occupations. After all, almost everyone has an automobile, lawnmower, snowthrower, chainsaw, snowmobile, motorcycle or outboard motor even if they don't have a farm tractor. ◆◆◆

CONTINUED OSHA AND YOU

OSHA APPROVED

Sales literature may state that an item has been OSHA approved. That is misleading because OSHA does not have an approval board to test and approve products. A company can evaluate its product and determine whether it meets the latest standards. The statement could read "this guard meets the latest ANSI National Consensus and OSHA Standards," or signify that it conforms to OSHA Standards. OSHA never approves any products; its function is regulatory.

ACTION ACTIVITIES

Organize a safety committee for your instructional area. Members should be knowledgeable and perform inspections on a scheduled and unscheduled basis. Use a good checklist for inspections. Summarize these reports and use as a basis for action with the administration. "Cleanliness is next to Godliness," will impress a compliance officer when he inspects an area. Have an organized cleanup program with a shop foreman for each class, and assign a safety engineer for each class.

OSHA is not static. There will probably always be changes in the OSHA standards, each school shop has a different set of conditions and the compliance officers will have individual differences as they interpret the Act. You will have the responsibility for compliance, and if you are making an honest effort to keep your "house in order," OSHA will be a friend and not a foe. ◆◆◆

CONTINUED A POSITIVE APPROACH . . .

ever have to involve ourselves in the selling business. Our lumber inventory and storage problems are minimized by this procedure also. We always have the buildings "bought" before we ever construct them.

Masonry and concrete work utilizes block laying, batter board layout, precast hog troughs, patio and drip blocks, and testing concrete ingredients for quality. We usually have an opportunity to run a slab for the Fair Board, a feeding floor for some boy, or a sidewalk for some in-town friend of the vo-ag department. It's easy to find someone who wants something done for nothing.

Machinery classes usually involve equipment to set-up or recondition and new equipment from implement dealers, boys in the class, or area farmers that we may study. We try to avail ourselves to commercial exhibits, new machinery demonstrations and displays, and in-the-field labs. Our FFA farm affords us some good opportunities here.

Our surveying equipment includes six sets—each including a level, rod, hatchet (for turning points), hand level, Abney level, 100′ tape, a set of pins and a tile probe. We run about ten field problems including measuring distances, differential leveling, grassed waterway, tile line, terracing and surface ditch drainage layout, excavations, angle layout, and plotting a grid. If time permits, we lay out a dam.

When to teach? Ah yes, to teach ag mechanics and still be able to use the shop for the FFA Crops Show, the FFA Slave Auction, open house for the Parent-Member Banquet offers a bit of cooperative doing. Also to provide the agriculture shop for the veterans' training program and hopefully to accommodate the band man as a place for ensemble presentations at contest time. It can be done but it does involve planning ahead. We really use our shop! Usually our carpentry work is done in the fall so the sawdust is not a problem during large engine work. Machinery instruction takes place in the fall and spring as does our surveying. The other areas can be offered anytime. ◆◆◆

Electricity in Agriculture—An Educational Rather than a Shocking Experience

Thomas A. Hoerner
Agr. Engr. & Ag Ed Departments
Iowa State University

How do you decide what instructional units to include in your agricultural mechanics program? Are your decisions based on equipment and materials in your department and on your background or experiences or are your instructional units based on community needs and priorities of investment and needs of people employed in agriculture and agribusiness?

If you use the latter method, that of priorities of investment and needs of people employed in agriculture, then one of the top three or four important units of instruction will be Electricity in Agriculture.

The purpose of this article is to discuss what I believe should be included in a unit of electricity in the high school agricultural mechanics program.

The high school instructor tells me he does not include electricity in his program for a number of reasons. To name a few he says: (1) I am not educationally prepared to teach electricity, (2) We do not have the equipment, tools and materials in our present ag mechanics lab, (3) Our references on electricity are badly out of date or practically nonexistent and (4) I'm not sure what activities and student laboratory exercises to include in a complete electricity unit.

Let's try to provide some alternative solutions to these questions and discuss how this unit might be added to your ag mechanics program.

First, what about teacher preparation? Yes, I agree a course in electricity is not always part of the college preparatory program. This being the case, then I believe it is my role as a teacher educator in agricultural mechanics to organize and conduct an in-service education program on this topic area. This past summer in Iowa, we started an in-service program for the preparation and upgrading of high school instructors to teach electricity.

Shown in Photo 1 are four instructors completing wiring exercises on a fold-up wiring practices board. The following wiring exercises and circuits can be wired:

1. Wiring the service entrance panel
2. Outside switched light
3. Three and four-way switches to a ceiling light
4. A 240-volt range outlet
5. A 120-volt grounded duplex outlet through conduit
6. A 120-volt, split wired (one side switched) grounded duplex outlet

It is recommended to have this type or a similar panel for students in groups of three or four to complete the various circuits.

The activity of completing wiring exercises is an important part of the electricity unit; however, in my judgment the total unit begins in the classroom so let's backup and look at the total unit in an educationally sound sequence.

CLASSROOM INSTRUCTION

The following lesson topics should be covered in the classroom phase of this unit:

1. Understanding Electricity and Electrical Terms
2. Measurement of Electricity
3. Determining Amount and Cost of Electricity
4. Maintaining the Light and Wiring System
5. Equipment and Personal Safety in Electric Wiring

Classroom exercises including study and discussion questions and problems should be made available for student use. Classroom exercises for this unit were developed around two AAVIM booklets, "Understanding Electricity and Electrical Terms" and "Maintaining the Light and Wiring System." In my judgment these booklets are excellent for high school students. They are

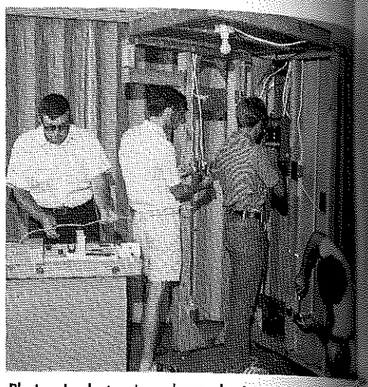


Photo 1. Instructors learn basic wiring principles by completing wiring exercises on a fold-up wiring practices board.

at the correct reading level, well-illustrated to follow a good learning sequence. A number of excellent teacher-students demonstrations are shown throughout these booklets. In addition, a set of transparency masters is available for each of the booklets. These are excellent to aid the instructor for classroom discussion.

REQUIRED ACTIVITIES

The required activity phase should be either following or integrated with the classroom phase. It should relate to classroom discussion topics and include hands-on exercises in which the students are directly involved with materials and equipment related to electrical wiring. Two basic types of activities are recommended:

Power Supply Laboratory — The power supply lab involves the student with the voltmeter, ammeter, ohmmeter, wattmeter and kilowatt-hour meter. Prepared laboratory exercises aid the student in connecting these meters to various loads and in making the various measurements. This labora-

(Continued on next page)

tory ties directly with classroom discussion on basic electrical principles and terms, measurement of electricity and computing costs of electricity.

Wiring Practices Laboratory — The wiring practices laboratory leads the student into the practical phases of wiring. We are recommending the use of a simple and compact yet complete wiring panel as illustrated in Photo 2. A number of basic wiring exercises can be completed on this panel:

1. Switched lamp
2. Grounded duplex outlets
3. Three and four-way switches to a lamp
4. Grounded duplex outlets with one switched
5. Split wired grounded duplex outlet with one side switched

As noted in Photo 2, the basic panel includes a 120-volt service entrance safety switch, three 2″ x 4″ switch boxes and one 3″ octagon box. The service entrance panel is energized by a 14-3 rubber-covered cord through a 15-amp grounded outlet.

Laboratory exercises as illustrated in Figure 1 should be provided for the students to complete the various wiring exercises.

A set of basic electrical tools should be available to complete the wiring exercises. The set includes:

1. Wire strippers
2. Cable ripper
3. Lineman's pliers
4. Diagonal pliers
5. Long chain nose side cutting pliers
6. Screwdrivers, large and small

APPROVED ACTIVITIES

The approved activity phase follows the classroom and required activity phase. During this phase the student is allowed to work on an activity of his or her choosing. The activity should relate to some phase of electricity, in particular, electrical wiring. The following are suggested approved activities:

1. Complete a home electrical safety survey.
2. Construct an extension cord.
3. Plan a wiring system for a farm building or house.
4. Wire a small building.
5. Add a duplex outlet or lighting circuit to an existing circuit.
6. Collect data and compute an electrical bill for a 30-day period.
7. Construct a project for the home farm involving electricity.
8. Locate the electrical load center for a farmstead.

As noted, some of these activities would need to be completed on the

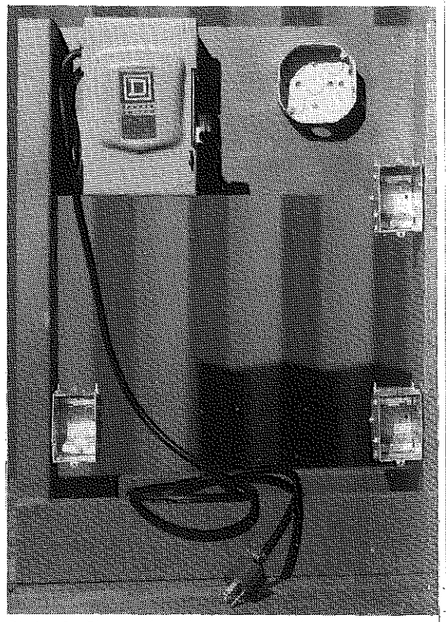


Photo 2. The student learns practical wiring through the completion of wiring exercises on this compact wiring practices panel.

home farm or agribusiness work station. In this case it is the responsibility of you, the instructor, to follow-up and supervise the activity. Keep in mind ag mechanics activities don't have to be completed in the school ag mechanics laboratory but might be more logically taught on the home farm or agribusiness work station.

SUMMARY

The electricity unit discussed in this article does not include electric motors or electrical controls. I believe electricity in agriculture is a separate unit and electric motors and controls should follow the basic electricity unit. They too are very important to agriculture and should be included in the complete and up-to-date agricultural mechanics program.

To summarize, electricity in agriculture should be an important part of your ag mechanics instructional program. The total unit should include: (1) *Classroom Activities,* covering basic electrical principles and terms, measurement of electricity and maintaining the light and wiring system, (2) *Re-*

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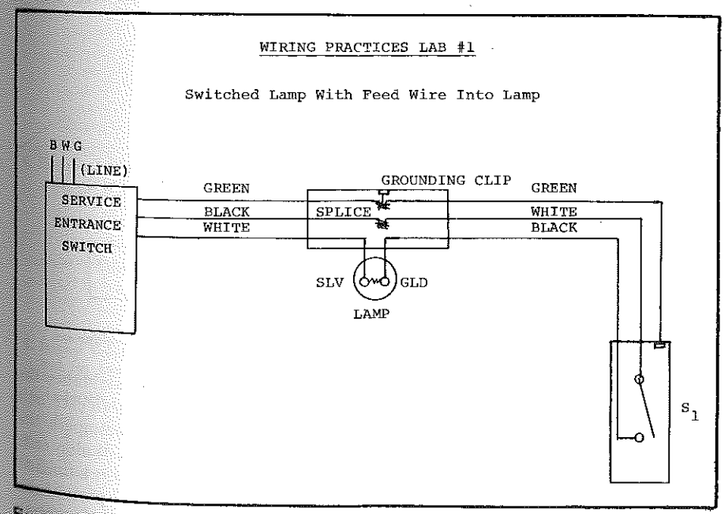


Figure 1. Wiring schematics aid the student in completing laboratory exercises on the wiring practices panel.

Clinton Jacobs

The Job Operation Sheet for Instruction in Agricultural Mechanics

C. O. Jacobs
Teacher Education
University of Arizona

In the vast array of software material which is now available for instruction/training in Agricultural Mechanics, the one instrument which has withstood the test of time for directing the learning process for skill development is the Job Operation Sheet. Unfortunately, there is little standardization among educators either in terminology used to identify the component parts of a job operation sheet or the format which will effectively present to the student/trainee the skills to be developed.

Job operation sheets have been developed by incorporating the merits of the job sheet and the operation sheet used in trade and industrial education during its formative years. By definition, a job is a piece of work, the completion of a task. A job is complete when the product or process is accomplished. An *operation* identifies the major activities within the job. The success of completing a job therefore depends upon the ability of the individual to employ the skills involved in the various operations.

Time is a critical element in scheduling classes of vocational agriculture. A wise selection of what to teach must be made, and methods of instruction must be streamlined to secure the maximum amount of learning. This is particularly true of abilities in Agricultural Mechanics. For the teacher, the job operation sheet serves as an outline for a student-oriented programmed type learning device. When prepared by the teacher, it represents his concern and input for having analyzed the job for the skills to be developed by the student. It also represents his effort to establish a logical set of operations in a sequence which will take the learner through the skill development process in a step-by-step manner. As a teaching device, the job operation sheet applies the Primacy Principle of Learning—that of learning the correct way, first. For the student, the job operation sheet serves as a device for recalling what has been taught, thereby reinforcing his confidence as opposed to reverting to the trial and error process for skill development. Unfortunately, a job operation sheet is a written communication instrument. Reading and comprehension ability of the student will influence the effectiveness of the device when used as the sole teaching tool. Certainly, the job operation sheet must be reinforced with other teaching techniques.

The procedure for developing a job operation sheet involves the construction of an outline of activities which will take the learner through the processes of accomplishing the job in a logical and efficient manner. For pre-employment education, the jobs to be performed by the student should be selected to include those skills which are common to a number of related occupations. Each job to be performed by students has a number of operations which are an integral part of the task. The sequence of listing the operations in the outline must be consistent with practices and procedures as performed by a skilled person. The flow chart, Fig. 1, suggests the concept of analyzing skill development activities for constructing Job Operation Sheets.

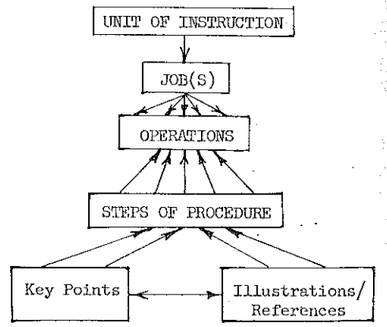


Figure 1. Flow Chart of Job Operation Sheet Development.

As illustrated, the *Unit of Instruction* establishes the base for organizing the instructional thrust. Within each unit are the *Jobs* which have been selected to accomplish the skill development processes for student growth. Within each job are a number of operations necessary to attain a finished product. The skills to be developed are integral parts of the operations. Therefore, it follows that to perform an opera-

(Continued on next page)

THE JOB OPERATION SHEET . . .

tion in a most logical manner, an outline of *Steps of Procedure* give order and direction to the skill development process with the student applying the least trial and error method of approach. Generally, each step in the procedure requires that the student observe special safety precautions or direct special attention to a particular specification or detail that may make or break the operation. Thus, *Key Points* are listed for those steps of procedure where deemed appropriate. When specifications, sketches, illustrations, or detailed references will be helpful to the student, they are listed as *Illustrations/Reference*. The example listed in Exhibit 1 illustrates the format of a Job Operation Sheet

EXHIBIT I

UNIT OF INSTRUCTION: Farm Tractor Maintenance
JOB NO. 6: Servicing Engine Spark Plugs
OBJECTIVES:
1. To remove and inspect the firing chamber of a farm tractor's spark plugs for heat range and operating condition.
2. To properly service and install the spark plugs of a farm tractor using standard practices.

Tools:
Plug holding block
Parts cleaning bar
Spark plug gap
Wire brush
Cleaning tool
Point file
Thread chaser
Deep socket 13/16"
Tee handle 3/8" drive
Torque wrench

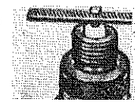
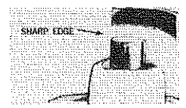
Materials:
Solvent
Compressed air
Anti-seize compound
New gasket for plug

Reference:
1. Inspection Chart (conditions)
2. Operators' Manual

Steps of Procedure	Key Points	Illustration/ Reference
A. REMOVING PLUGS		
1. Remove ignition cable from plugs.	a. Pull on boot only, never on wire.	
2. Turn plugs off seat — one turn	a. Use deep socket b. Counter clockwise c. Avoid cocking socket	
3. Blow dirt from seat	a. Use compressed air	
4. Place in holder	a. Firing chamber up	
B. INSPECTING PLUGS		
5. Inspect firing chamber end for heat range	a. Record in following table b. Use inspection chart	Ref. No. 1

Cylinder No. — Heat Range and Operating Conditions

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Steps of Procedure	Key Points	Illustration/ Reference
C. CLEANING PLUGS		
6. Degrease insulator and shell of plugs	a. Wash in solvent b. Dry with compressed air	
7. Remove gaskets when possible		
8. Clean threads of plugs	a. Use only hand wire brush	
9. Inspect shell and insulator	a. Check for cracks or damaged threads	
10. Clean firing chamber and insulator	a. Scrape with cleaning tool b. Caution — avoid damage to insulator	
D. SETTING ELECTRODE GAP		
11. Bend ground electrode outward to open gap	a. Use gap setting tool	
12. File center electrode square	a. Use point file b. Remove rounded edges	
13. Set gap to specifications	a. Check operators' manual only b. Use wire gage	
14. Have instructor inspect your work	a. Use score card below	
E. INSTALLING PLUGS		
15. Clean threads in head	a. Use thread chaser	
16. Install new gaskets (when removed)		
17. Add anti-seize compound to plug threads		
18. Insert and torque each plug	a. Check specs of engine manufacturer	
19. Attach ignition cables	a. Correct firing order	
20. Have instructor check your work		

EVALUATING

	POINTS Possible	Earned
1. Heat range identified	10	
2. Degreased	10	
3. Threads cleaned	10	
4. Firing chamber cleaned	10	
5. Electrode filed	20	
6. Gap set	20	
7. Thread in head chased	5	
8. Ignition wire installed properly	15	
TOTAL	100	

designed to direct Job No. 6, *Servicing Engine Spark Plugs*. Note that the job has been broken down into five operations, namely: A. Removing Plugs; B. Inspecting Plugs; C. Cleaning Plugs; D. Setting Electrode Gap, and F. Installing Plugs. Following each operation are the steps of procedure neces-

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Agricultural Mechanics—Theory and Application

Charlie J. Jones
and
Loyd J. Guidry
East Texas State University

In our society, industry often takes the lead in making changes. It is granted that these changes made in industry are often profit oriented, but society as a whole profits as well from the discoveries of new products and more efficient use of labor and capital. Within the world of education however, this does not always seem to be the case. Educators often find themselves so busy with their teaching that they have little time to reflect and formulate new techniques for teaching which insure a more educated graduate.

It seems that changes in education come about only when society demands the change. The opposite actually should be true: education should make the changes and filter them back into society. Educators should be quicker to realize that students' needs are not being met. Necessary changes in education should be implemented much sooner and should be generated by forward-looking educational institutions. Performance as a basis for formulating educational objectives has been too slow in coming. Educators generally stand embarrassed because it was industrial leaders who brought about the change through their complaints that graduates were not able to perform, sometimes even simple on-the-job tasks. Neither can the educators within the field of agricultural mechanization be excused from this responsibility. Agricultural mechanization is one field where evaluation by performance is inherent; if graduates cannot perform in the field, then this is a strong indictment of this very vital program.

In recent years many educators have expressed a great deal of enthusiasm about hands-on experiences. Hands-on experience is nothing new in the field of agriculture because the passing of the Smith-Hughes Act of 1917 which included supervised programs, home visits, student follow-ups and other programs affording students an opportunity for hands-on experience. Moreover, within the general academic area of agriculture, the field of agricultural mechanics has always been a discipline demanding the development of manual skills and competencies. As early as 1970 the agricultural educators of the Southern Region met at Virginia Polytechnic Institute for a five-day workshop to develop performance-based objectives related generally to agricultural education and specifically to agricultural mechanization. Since that initial meeting, the teachers of agricultural mechanization within the Southern Region have met further to develop specific skills related to those primary objectives developed in the 1970 Virginia meeting.

It is one thing to develop a regional organization of teachers where little actual competition for students is concerned, and yet another thing to develop a state-wide organization in those states where several teacher-education institutions exist. In these states it is very important that an effort be made to allow the agricultural mechanization curriculum to develop in a manner permitting the institutions to complement each other rather than compete. This is particularly true with the community college programs when students transfer into the advanced programs to be applied toward the baccalaureate degree. Agricultural educators must be more broad minded in examining their programs. In the State of Texas, for example, professors of agricultural mechanics have formed a state-wide organization which holds meetings to establish central objectives in the basic agricultural mechanics curriculum. Skill priorities have been developed which should be basic in any agricultural mechanics course regardless of how or where it may be taught. A central, basic program must be accepted and implemented in the mechanized agriculture curriculum because graduates today are too flexible and mobile to be trained to serve only one small segment of our society. As a corollary to this, common sense tells the teacher that in order to fulfill performance-based objectives, education must be broader than mere theory. It goes without saying that theory is basic, and one must have the competencies to understand and apply theory. Application, however, is more comprehensive than theory.

In the area of power mechanics one immediately recognizes the need to go beyond theory. While it already has been granted that theory is basic, in order to be able to completely recondition a tractor or other power implement, theory must be extended into the laboratory and be given the opportunity to be tested and proved. Once theory has been taught, a giant step remains to be taken in the application of the skill. In examining the area of structures and conveniences, for example, theory is easily taught in a comfortable classroom with minimum equipment. The application of this theory, however, immediately requires more equipment, space, capital outlay and many other variables. Physical labor is also required in the application of the theory. In fact, there seems to be no easy way to get a finished concrete slab without much physical labor. Only after the slab has been finished can the teacher say that his students have had a complete experience in concrete work in relation to the theory of constructing a slab.

Another example in the structures and conveniences area is brought to mind: a small building can be constructed with ease in theory. Once that theory is taken into the lab, however, it then becomes application, and application equates with both capital ex-

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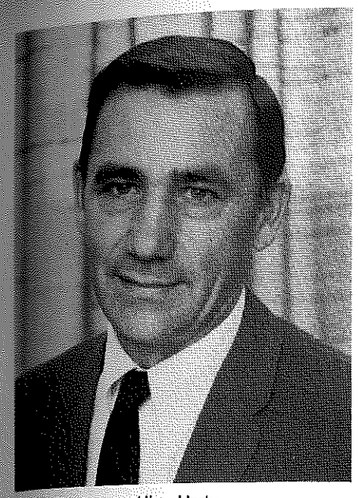


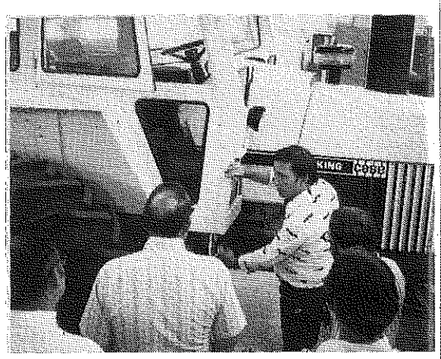
Allen Linster

Multi-State Workshop in Ag Mechanics

Allen Linster
Supervision
Madison, Wisconsin

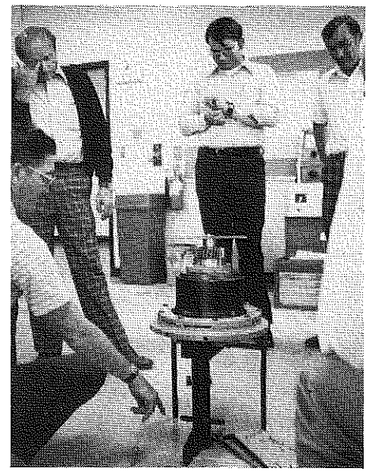
Instructors and administrators of post-secondary schools providing training programs for agriculture mechanics and technicians have expressed a need for in-service training in the technical skills required by the industry. Instructors need to be updated on the rapidly changing technology in farm machinery and farm power. They need to be provided with an opportunity to meet state and local certification requirements. A number of problems become evident to those responsible for meeting the ag mechanic instructor's continued education needs. In Wisconsin, one of these problems is the small number of agriculture mechanic instructors in the vocational-technical institutes. Another is that most of the instructors have extensive work experience but vary in their training in educational methods. A third is the limited teacher training institution offerings of technical training to meet the unique needs of these instructors.

Richard Duffy, Assistant Director of Instructional Services at Southwest Wisconsin Technical Institute, Fennimore, suggested that the agriculture industry service training staff might provide a means of fulfilling their technical training and certification needs. Ronald Anderson, District Director of Southwest Technical Institute offered the school's facilities and staff support if I could arrange an in-service workshop for this group. During our discussions, it was brought out that we might be able to obtain sufficient enrollments by inviting instructors from other states. The school's location at Fennimore was ideal for this because of its proximity to Iowa and Minnesota. In the spring of 1974, I met with Mr. Bob Jones, Service Manager, John Deere Company, Minneapolis, and we worked out a curriculum for a four-day workshop. The workshop was held in August of 1974. The Service Department of the John Deere Company provided instructional staff, teaching aids, and other educational materials. Three instructors from their service department conducted the workshop which included sessions on repair, maintenance, and operation of diesel engines and injector pumps. Invitations were extended to instructors from Minnesota's Technical Schools. Five of the 18 instructors in attendance were from Minnesota.



Post-secondary agriculture mechanics instructors are receiving instruction on adjustment of tractor air-conditioning systems at a three-state workshop.

Instructors' comments indicated that this type of training could meet their needs and with some changes, suggested by those taking part, another workshop was to be scheduled for 1975. The J. I. Case Company was contacted and a three-day workshop was planned and conducted August 5-7. It was decided to hold it again at the Southwest Wisconsin Technical Institute at Fennimore and to invite the instructors from Iowa and Minnesota. Technical training areas included in the workshop were: Power Shift, 8 hours; Hydraulics, 8 hours; Air Conditioning, 4 hours; and Shop Management, 4 hours. Twenty-three instructors participated —twelve from Wisconsin, seven from Iowa, two from Minnesota and one each from Maryland and Utah. Southwest Wisconsin Technical Institute was an excellent site because of its central location in the three-state area and the available shop, laboratory, and classroom space. Camping facilities are



Ken Reimers of the J. I. Case service staff is explaining the tear down and rebuilding procedures for the Case 1070 powershift.

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VICE PRESIDENT FOR AG MECHANIZATION

LeRoy G. Nichols
President of ATANY

LeRoy G. Nichols (right) is presenting a Certificate of Appreciation to Mr. James Culkar, Zone Manager of Northeast District of Ford Tractor Division for his part in our specialized area session at the 1975 Annual ATANY Professional Improvement Conference.

In the spring of 1968, the Vice-President of the New York Agricultural Teachers' Association asked a leading teacher in the area of agricultural mechanization to chair a committee to develop a Tractor-Engine Trouble-shooting contest for the annual State Fair program.

It was just the beginning because the increasing number of specialized programs in the State were growing at a very rapid rate, so changes became necessary in the structure of our Association. The President, with other members of the Executive Committee, spent many hours developing the new structure and the necessary constitutional and by-law changes which had to be approved by the members at the annual meeting in the last week of June 1971. The Association voted approval, and then the individual to fill the vice-presidency for the four specialized areas were nominated by the teachers in those areas of instruction.

I, having been asked and appointed to many committees, had become well recognized as a leader in this particular field and area of specialization. The group nominated three candidates and the voting resulted in my becoming the Vice-President for Agricultural Mechanization.

The duties as indicated in the By-Laws for the Vice-Presidents were: to act as chairman of the specialized field of instruction, recruit membership in the State and National association from the specialized field of instruction, develop two-way channels of information through the various media, assume the duties of the president in his absence, and serve as delegate to NVATA Regional and National as well as AVA by designation of the Executive Committee.

I found it possible to be involved with the coordination of service school invitations received from the service managers of the major manufacturers. Whenever the manufacturers set up their dealer service training schools or clinics, they wrote a personal letter to me inviting the teachers of Agricultural Mechanization and provided me a copy of the dealer announcement which I reproduced and set to the 44 other teachers in our specialization.

These services were provided without charge to the teacher except for his transportation, meals and room, which in some cases were paid by his school. The teacher's involvement in such programs offered improvement possibilities just through the association with men in the field, observing not only the subject being taught, but also the method and references used. The hands-on activities used by these professionals have opened many an eye to improvement of the teacher and his program.

I have personally been able to return home with reference materials and teaching aids that have five times the worth of the cost of my attendance at the school.

It has been very satisfying to me to have been involved in the preparation, writing, try-out, and evaluation of the Modular Design Curriculum here in New York State. This program has developed excellent teaching guides, materials etc. because it involves the teacher education staff at Cornell University who taught the instructors of the specialized areas the proper method of writing, and the instructors with trade experience were able to prepare Modules of Instruction that were based on the real work.

The bureau of Agricultural Education in Albany has requested assistance and counsel through me as Vice-President for Agricultural Mechanization. Assistance has been not only for the Modular Curriculum Project but also in determining in-service needs of the teachers, plus assisting in the planning of the in-service training courses. Having instructors from industry teach these courses has improved the teachers understanding and bolstered their confidence.

Activities at the New York State Fair Contests have been another responsibility of the Vice-President for Agricultural Mechanization. Contacting the major manufacturers to arrange for tractors used in both the tractor engine trouble-shooting contest as well as the tractor operators contest is just one responsibility. I coordinate the State regional contestants into the State Final contest, and work with judges, dealers etc.

The Annual Professional Improvement Conference has been made more relevant to the teachers in the field of Agricultural Mechanics through the efforts of the Vice-President for Agricultural Mechanization. The regional representatives, designated by the Vice-President, meet with the teachers of their specialization prior to a meeting with the V-P and they gather information regarding the needs and desires of the individual teachers. These are written up into a priority listing and the special area sessions are developed around available resources, location, etc. at the Conference. The program is announced prior to the last three weeks of school so that where necessary the

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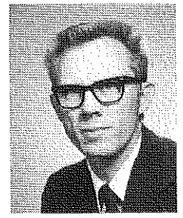
Determine the Need for In-Service Training in Agricultural Mechanics

William C. West
Vocational Agriculture Teacher
Pine Grove, West Virginia
and
Layle D. Lawrence
Teacher Education
West Virginia University

William C. West



Layle Lawrence

Agricultural instruction, to be of maximum benefit to students, must be taught by instructors who are well trained and who remain abreast of new developments. To determine needs and desires of vocational agriculture teachers for in-service training in agricultural mechanics areas, a study[1] was recently conducted in West Virginia. An integral part of the study dealt with teachers' preferences regarding length, time, and location of summer in-service workshops designed to meet expressed needs. Information was obtained through questionnaires mailed to the 100 vocational agriculture teachers of the State. Data from 82 usable returned questionnaires were analyzed.

Teachers were asked to indicate their need for additional training in 42 skills listed under the eight major categories of agricultural mechanics work. Skills in which training needs were considered greatest were primarily in agricultural power and electrification.

Recipients of the questionnaire were requested to rank the eight agricultural mechanics areas as to priority preferences, i.e., which area should be offered first, second, third, etc., in in-service workshops. A summary of these data is presented in Table 1. Only binary percentages are included in the summary, indicating total percentages of teachers expressing priority for training in the top four categories within each major area. Although need for additional skill training in agricultural machinery was perceived as somewhat less than for power or electrification, teachers gave top priority to in-service workshops in the area of machinery.

Nearly half the teachers responding indicated a definite desire to attend in-service workshops designed to upgrade skills in agricultural mechanics. Another 47 percent would attend if circumstances allowed. Only three teachers, all near retirement, said they would not participate.

Sixty-five percent of the respondents expressed a preference for workshops to be held at local high schools within their own vocational agriculture districts. The remainder preferred workshops on one of the two college campuses. Nearly 64 percent attached importance to the offering of college credit for workshop attendance.

A distinct majority of teachers preferred that workshops be held during the month of July. August was the second choice. Workshops a week in duration appeared to be the most suitable, with few expressing interest in longer periods of training.

Statistical analysis indicated little relationships between expressed needs and pre-service courses taken, previous in-service work, or teaching experience. The analysis did, however, indicate a significant lessening of perceived needs in agricultural power skills and welding when teachers had taken the courses "Agricultural Engines" and "Welding and Heat Transfer" as undergraduates.

Table 1
Ranking of Agricultural Mechanics Areas by In-service Training Priorities

Rank	Area	Binary Percentage
1	Agricultural Machinery	76.8
2	Agricultural Power	64.7
3	Shop Skills	58.6
4	Structures and Environment	47.7
5	Electrification	47.5
6	Agricultural Mechanics Methods	44.9
7	Soil and Water Management	41.5
8	Processing, Handling, and Storage	13.4

The following recommendations were made, based on analysis of data obtained, as a means of improving the vocational agriculture teacher's skill in agricultural mechanics:

1. Students enrolled in agricultural education should take the courses "Agricultural Engines" and "Welding and Heat Transfer" plus an additional nine hours in agricultural mechanics training.
2. One week in-service workshops in agricultural mechanics should be held in local vocational agriculture district high schools during the month of July. College credit should be offered for participation.
3. Workshops should be planned to develop skills in priority areas of greatest perceived needs.
4. In-service training should be practical in nature, and teaching materials used in workshops should be made available for teachers' use in local programs.

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1. William C. West. "The Need for Agricultural Mechanics Workshops as Perceived by West Virginia Vocational Agriculture Teachers." Unpublished Masters Thesis, West Virginia University, 1975.

CONTINUED *MULTI-STATE WORKSHOP . . .*

nearby which allowed some instructors to combine vacation with the workshop.

Instructors' comments indicate that this provided them with the necessary information and experiences to keep up-to-date with changes in the industry. All in attendance said that the areas covered were very pertinent to their needs. Another strength indicated by the participants was that they were able to spend a great deal of time in troubleshooting and testing on "live" equipment. They felt the hands-on experience was necessary to supplement the theory received. The opportunity to share experiences with instructors from other states and schools was another benefit that was often expressed.

Other areas exist where this type of joint state effort and cooperation with industry could be carried on. Some of these are: farm buildings, diesel fuel injection, harvesting equipment, electrical systems, shop management, equipment demonstration and agriculture instructional skills in general.

Even our limited experience with these workshops points out the opportunities and advantages of cooperative activities between states to provide continuing education for unique and/or small groups of instructors. It should also be understood that this meets only part of their needs for additional training. This must be supplemented with local and state in-service programs as well as continued use of the offerings provided through the teacher training institutions.

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CONTINUED *VICE PRESIDENT FOR . . .*

teacher is able to obtain school board approval to attend.

Representatives from industry demonstrate, present new methods and/or materials, equipment, and participate in forums along with new and experienced teachers. Selecting and arranging for individuals to participate has been the sole responsibility of the Vice-President for Agricultural Mechanization. The willingness of industry participants to accept the invitation is because of the good relations and close contact that a V-P for the area of specialization develops through prior trade experience and recognition by State Education Department representatives as coordinators or counselors. It is also very important that a teacher selected by his special instructional area teachers have the support of his own school administration and board of education. He must also have a personal desire to be of service to his fellow teachers, his students and to his profession and field of specialization.

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CONTINUED *THE JOB OPERATION SHEET . . .*

sary to complete each operation. *Key Points* provide the note of special attention which the student should observe to complete the step while the *Illustration/Reference* provides visual assistance or direction for further attention to details.

The *Evaluation* form is essential for both teacher and student since it accomplished the parameters for measuring the attainment of the competency to be involved and identifies the factors for assessing quality of the finished product. Whether the form is a part of, or apart from, the job operation sheet is a personal choice of the teacher.

In summary, job operation sheets are student oriented; they are designed to serve as a recall device. For the teacher, they are an instrument to assist in directing the learning activities of his instructional program in an organized manner. When prepared by the teacher, they provide a positive method of conducting a job analysis for skill development activities. The format provides a method whereby student teachers are able to develop, on paper, an outline for a teaching demonstration which will be specific to his needs.

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CONTINUED *AGRICULTURAL MECHANICS . . .*

pense and labor expense. The transition here from theory to application is incorpated in the many skills taught in the completion of a small building from the blueprint to the finished building.

It is very interesting for students to read about and to learn the theory of welding. When the bend test is applied however, it is not theory which is measured but application of welding skills which are measured. The weld will either pass or fail, depending upon whether the student has been able to move from theory to application of skills.

We speak often of the student and it is indeed that student who is the final product of our educational process. The student must possess a marketable skill and be able to contribute a measurable input into society. This marketable skill will have been best developed through an interaction of the theory taught and proven through application.

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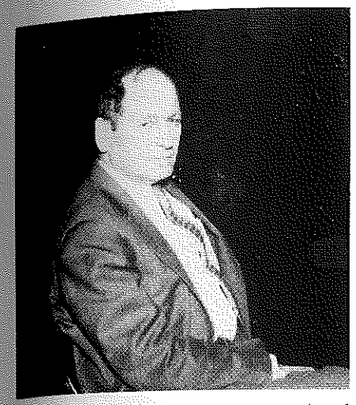
Leader in Agricultural Education:

GEORGE P. DEYOE

1901-1961

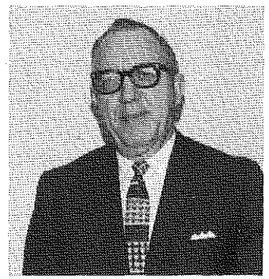
by
*Paul Hemp**



Dr. George P. Deyoe was a national leader in Agricultural Education during the period, 1934-1961. He pioneered in the development of practical approaches to teaching using the supervised farming program as a basis for instruction. George Deyoe was both an agriculturist and an educational leader. His writings included books on swine production and general agriculture as well as professional education books on farming programs and teaching methods. He was a strong advocate of the cross-sectional approach to course planning and encouraged teachers to use farming program problems as the core of their instruction. As early as 1937, he encouraged teachers to bring livestock judging contests up-to-date with the science of livestock selection. George Deyoe was a practitioner as well as a theoretician in agricultural education. His book, *Living on a Little Land*, describes many of the agricultural activities practiced on the three-acre plot where he had established his home.

Born on March 31, 1901, George Deyoe grew up on a farm near Mason City, Iowa. His undergraduate work was done at Iowa State University. He received the master's degree from the University of Chicago and the doctor's degree from Teachers' College, Columbia University. He served as a high school teacher of agriculture at Belle Plaine and Vinton, Iowa from 1923-27 before moving to Platteville, Wisconsin where he became a teacher of agriculture, science, and education at the State Teachers' College. Between 1937 and 1947, Dr. Deyoe served as a member of the staff in Agricultural Education at Michigan State University. In 1947, he joined the staff in the Division of Agricultural Education at the University of Illinois and worked in this capacity until his untimely death in 1961.

Dr. Deyoe was a very prolific writer. His best known books were, *Farming Programs in Vocational Agriculture, Agriculture in Our Lives, Living on a Little Land, Raising Swine* (with Krider, *Raising Livestock* (with Peters), and *Getting Acquainted with Agriculture* (with Ullrich). He was a frequent contributor to *The Agricultural Education Magazine* and the *American Vocational Journal,* and served on the editing-managing board for both of these periodicals. His most popular writing topics were on measurement of student learning, contests and awards, farming programs, and course planning. He was one of the first teacher educators to develop instructional guides and source units for teacher use. His writings appeared in *Science Education, The Phi Delta Kappan, Hoard's Dairyman, Curriculum Journal, Progressive Education, Michigan Vocational Outlook* and *Better Farming Methods,* as well as *The Agricultural Education Magazine,* and *The American Vocational Journal.* Dr. Deyoe also wrote articles on agriculture and agricultural education for *The World Book Encyclopedia; The American Peoples Encyclopedia Yearbook; Yearbook, National Society for the Study of Education;* and the *Encyclopedia of Educational Research.*



Paul Hemp

*Paul E. Hemp is Chairman of the Division of Agricultural Education at the University of Illinois.

Dr. Deyoe advised many doctoral students who are now widely scattered throughout the world. He was a special adviser to foreign students and out-of-state students. His classes were always conducted on a practical basis. He usually scheduled one or more field trips for each course and made extensive use of audio-visual aids. Photography was one of Dr. Deyoe's special hobbies. Most of the photographs used in his books and other writings were ones that he had personally taken.

In Illinois, Dr. Deyoe worked closely with teachers to help them develop functional course outlines which were closely related to supervised practice. He pioneered in the use of course building forms which helped teachers plan an orderly sequence of problem areas for their high school classes. During the early 1950's, he participated in a series of workshops on family finance and money management. For several summers, teachers of agriculture enrolled in these workshops and developed new instructional materials for adult education programs. Dr. Deyoe functioned well in the field. He had a special way of working with teachers in a Field Studies course which he taught for several years. He always visited each class member at his school and made farm visits with the teacher in order to understand the everyday problems of agricultural educators at the local level.

Dr. Deyoe's research was action-oriented research. The research which he conducted in Illinois covered topics such as the use of school land, practices used by teachers to initiate and expand farming programs, new developments in agriculture and their implications for teaching, and a study of in-service education programs in the

(Concluded on page 141)

A Home Skills Course for College and High School

Harry J. Hoerner
Associate Professor
Department of Agriculture
Western Illinois University

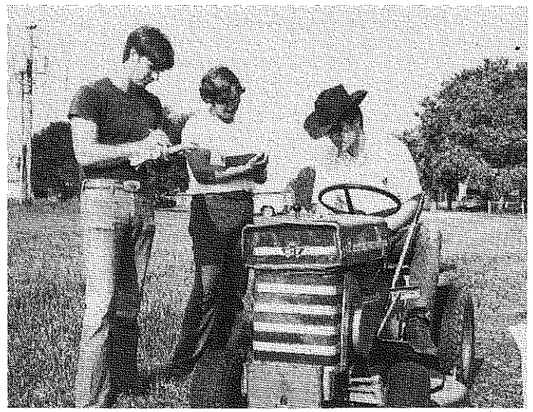
and

Glenn B. Sims
Assistant Instructor
Agricultural Industries Dept.
Southern Illinois University

Over the past 15 years many changes have taken place in career oriented agricultural educational programs. The new emphasis has affected all programs in vocational education. Most new courses developed in recent years have been directed to a greater degree of specialization. However, school officials have also made numerous attempts to offer courses that may serve a greater number of the student body who are not seeking specific career goals in a particular vocational education program, and who will not necessarily take all courses offered by one career program department. Rather, students may have an opportunity to elect courses that they believe will be beneficial in helping them achieve a more rounded education.

This new emphasis is being adopted at the collegiate level in at least one university. The agricultural mechanization staff at Southern Illinois University has been teaching an elective mechanics course that is more general, less in-depth specialization, and designed to serve a larger segment of the university's student body. The authors believe that this type of course can readily be adapted into vocational agriculture and other career programs at all grade levels from junior high through adult education.

A course entitled "Skills in Home Maintenance and Repair" was developed by agricultural mechanization personnel at Southern Illinois University in 1973. The course was organized because of an expressed concern by the University's School of Agriculture administration for courses that would support studies in a "country living" option for various majors in the school. Courses other than the skills in home maintenance and repair were also developed in animal and pet care, gardening, and small farm and suburban financial management.



Students in the Home Skills course are checking out a garden tractor.

The skills in the home maintenance and repair course quickly adopted a short name of "Home Skills." The intent of this course was to offer an elective course that would be beneficial to students who had little or no structured shop education background. Two departments within the School of Agriculture encourage their majors to take the "Home Skills" course: Plant and Soil Science, and Forestry. Both departments had a large number of students who were urban reared and had limited prior shop experience. These same students could not or did not want to take the traditional courses offered by agricultural mechanization in farm power and machinery, agricultural electricity, soil and water engineering, and shop construction and maintenance courses.

The "Home Skills" course initially attracted agricultural majors. Today, more non-agricultural majors than agriculture majors elect to take the course because university students in general are looking for practical courses to obtain a well-rounded education. Multiple sections offered by agricultural mechanization always filled because of the popularity of this type of course. Students believed the contents of the "Home Skills" course would be helpful later in life.

The course, as it is today, does not include all of the units or activities originally planned. A few areas or activities were deleted and others added, largely because of student feed-back. The course format still changes in part from term to term. The various units that have been taught over the last three years are as follows:

1) Electricity—wiring board exercises

(Concluded on next page)

CONTINUED ## A HOME SKILLS COURSE . . .

2) Electricity—simulated house wiring
3) Lawn, garden, and recreational equipment maintenance
4) Lawn and garden equipment operation
5) Automotive tune-up
6) Roof framing—rafter and brace layout
7) Roofing—application of roof covering materials
8) Plumbing
9) Concrete construction
10) Laying concrete masonry units
11) Power tools usage
12) Tool fitting
13) Wall papering
14) Window glazing
15) Painting

The above activities have some common characteristics—(1) short instructional time of 2 to 4 hours; (2) instruction is by hands-on or the doing process, normally proceeded by teacher demonstrations of the activity procedure; and, (3) use of tools and equipment that normally would be found in a well equipped home shop.

The various activities lend themselves to a wide array of teaching techniques. Simulation instruction is often used as one approach. For example, an 8′ x 8′ simulated roof is covered by students who lay three-tab asphaltic shingles.

In some areas, such as automotive tune-up, it is impractical for each student to be performing the task because of lack of laboratory space and specialized equipment. Therefore, one car is brought into the laboratory and the instructor demonstrates the procedure of tune-up and the use of manuals for finding specifications.

Sometimes students work in small groups. Students, working in pairs, construct a four-side plumbing unit using four common types of piping material and their fittings.

Another type of instructional approach is used in the lawn and garden equipment operation. In this laboratory, students are required to operate equipment such as chain saws, rototillers, large farm tractors, trimmer-edgers, hedge shears, and various lawn mowing equipment. Students also complete laboratory sheets on the various types of drive systems and engines using operators' manuals on hand for the equipment. Students answer questions about the equipment by use of the manuals, inspection of the machines, and actual operation.

Some parts of the "Home Skills" course cannot be taught by the laboratory type of instruction. They are taught through lecture-discussion and outside assignment techniques. Students are given an opportunity to learn how to make plans for new facilities and remodeling; for example, garage construction and planning the home shop. Skills such as bills of materials, ordering construction supplies and making understandable drawings are taught in this manner. Students are continually urged to develop lists of tools that they might someday desire to own in order to carry out home and farm projects later in life. These types of activities tend to tie together the entire course content.

The general ideas encompassed in this type of course can be carried over to many programs in vocational education. The "Home Skills" course at the high school level could be a supportive course to agricultural career programs in ornamental horticulture, agricultural resources, and possibly agribusiness sales and service. Likewise, this course could benefit students majoring in non-agriculture programs such as home economics and office and business education. Mechanics is not the only area where such a course could be beneficial. Courses of a general nature could be developed to serve a wide array of students. The real test of the success for any such course is how well the needs of students are being served. ◆◆◆

CONTINUED ## ELECTRICITY IN AGRICULTURE . . .

quired Activities, covering connection of electrical meters and basic wiring exercises and (3) *Approved Activities,* giving the student an opportunity to complete a selected activity related to electricity.

Tools, equipment and excellent educational materials are available for teaching this unit at the high school level. As a teacher educator, I have the responsibility to you, the vo-ag instructor, to help prepare and update you on this unit. You then have the responsibility to your students to provide them a sound, educational program in the area of electricity in agriculture. ◆◆◆

CONTINUED ## LEADER IN AG ED

Central Region. One characteristic which was evident in practically all of Dr. Deyoe's research was its applicability to local programs. His research was definitely designed and conducted for the practitioner in the field.

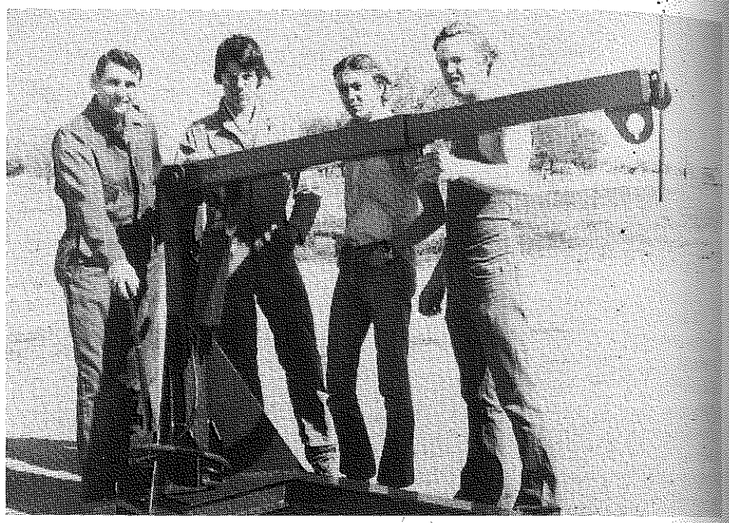
Any review of the contributions of George Deyoe would not be complete unless it included reference to him as a person. He was a great teacher because he was a compassionate human being who was dedicated to a life of service. He did not seek fame or fortune or credit for his work. If modesty, honesty and concern for fellow men are human virtues, then George Deyoe was an exceedingly virtuous man.

It is difficult to measure the influence which any professional person has on his fellow workers and on the teaching profession, but Dr. Deyoe's contribution was of major importance to agricultural educators everywhere. His philosophy is written in the literature as a matter of record for those who read and study the contributions of the past. ◆◆◆

Ag Mechanics —

Meeting Psychological Needs

Guy Deeds, Jr.
Agricultural Mechanics Instructor
Pritchett, Colorado



Students at Pritchett H.S. and their teacher, Mr. Deeds, are visibly proud of the hydraulic lift that they have just completed. The students developed many skills in the fields of metal, welding, hydraulics and finishing; and at the same time produced a very useful project.

Agricultural mechanics has always been an integral part of the vocational agriculture program. It has long been recognized that production students need to develop the skills of building, repairing, maintaining and operating their farm machinery and equipment. However, as the production field has become more and more difficult to enter and an increasing number of program graduates have turned to agriculture related fields, agriculture mechanics has become an even broader and important component of the total program.

At Pritchett High School where only about 10 percent of the vocational graduates return to the farm, I have been placing a great deal of emphasis on agriculture mechanics and spending about 50 percent of my time in the shop. I teach all of my production, judging, FFA, parliamentary procedure, etc. the first semester and spend the second semester in the shop. I find that this procedure works much better than going back and forth from the classroom to the shop during the entire year because the students can concentrate entirely on the subject that is being offered at the specific time.

Many vocational agriculture teachers feel that the shop should be used only for the building or repairing of the student's supervised agriculture program equipment, but I feel that the shop is the best place to train a student for a vocation in an agriculture related field. Almost all of the skills that are learned in the shop can be used in about any vocational field that the student chooses.

Experience has taught me that my approach to a successful learning experience for my students is geared to the development and utilization of a philosophy. On this, I base my entire vocational agriculture program.

Every human being has certain self needs that must be satisfied in order to reinforce that person's sense of well being. These basic needs are:

(1) Love and affection.

(2) Feeling of belonging to a family, group, school, church, or community.

(3) A sense of accomplishment and recognition.

A successful teacher must motivate his students by using these basic needs to develop interests and establish goals. This is especially true in classes like agricultural mechanics.

Each student must feel loved. I feel this is essential in developing rapport with the student. He must feel that the teacher really cares about him and is sincerely interested in him as an important being. This kind of love and concern leads to a respect and understanding between the teacher and the student and builds a trust and understanding between them.

The teacher must engender a spirit of pride in the agriculture mechanics program so that the student can readily identify himself as a vital part of everything that goes on. He then begins to feel he belongs to a program that is his and recognizes himself as a very important part of the whole scheme. Once this feeling is developed, the student will begin to recognize his own worth and value to the group, and more importantly, his place in it.

The agriculture mechanics program should be based on a series of reasonable and realistic goals and develop the natural desires of the student. These goals form the basis for the student to experience continual success and to eventually gain confidence. This instills the idea that can produce and achieve successfully in the total program.

The follow-up for this achievement is a recognition for his accomplishment A series of award programs, a chance to show his accomplishments on a local, state, regional, and national level and get recognition for his efforts. All this will reinforce the student's desire to do more. The student will also see his classmates gain meaningful recognition and this will spur him to greater goals.

The total student effort in the program, coupled with the sense of accomplishment from within himself, emphatically shows that this knowledge will develop into a desirable and salable product. When he eventually presents himself to the real world of work, *he is prepared!* ◆◆◆

BOOK REVIEWS

SMALL ENGINES, VOL. 2—MAINTENANCE AND REPAIR, by J. Howard Turner. Athens, Georgia: American Association for Vocational Instructional Materials, 1974, Third Edition, 202 pp., $8.95

This book is one of two volumes on how to operate and do simple maintenance jobs on small gasoline engines. Volume II of this reference contains nine chapters and goes into major maintenance and repair of small gasoline engines. It explains the operating principles and repair of different units such as starters, ignition systems, valves governors, fuel systems, cylinders and piston-and-rod assemblies, crankshaft assemblies, lubrication mechanisms, and camshaft assemblies. It also explains how to tell when such units are not working properly and how to repair them. The principles and procedures are given for each unit in such a sequence that it is not necessary for the student to completely disassemble the engine before starting to work on it.

The text is well organized, well written and contains excellent and colorful illustrations, schematic drawings, and cut-away views of representative engine components. *Small Engines* should be a very useful reference at the specialized-secondary level or post secondary training level where instruction is offered in agricultural power and machinery. The reference is designed to bring the student to a level of competency at the service entrance level of the maintenance and repair of small gasoline engines. No other reference is needed except parts and service manuals for the specific engines on which the student is working.

The author, J. Howard Turner, is the Editor of the American Association for Vocational Instructional Materials (AAVIM) and seems well informed and certainly knows how to present agricultural mechanics material acceptable to general student use.

Keith E. Mattox
University of Arizona
Tucson, Arizona

UNDERSTANDING ELECTRICITY AND ELECTRICAL TERMS, Revised by J. Howard Turner, American Association for Vocational Instructional Materials, 1974, 48 pages, $3.95.

This book is easy to understand and could be used to help junior high, as well as high school, students understand the basics of electricity. The book is divided into five sections which deal with electrical energy and how it works, common electrical terms and their relationships, determining the amount of electrical energy used, computing the cost of using electricity, and determining the load and service-entrance requirements. There is an abundance of pictures and tables to help develop the content and make it easier for the reader to understand, especially the reader who has difficulty understanding electricty at all.

This book would be a good one to use in getting students started in the study of electricity.

Lee Freeman
East Prairie High School
East Prairie, Missouri

DATES AND EVENTS

Southern Agricultural Education Conference
Buena Vista Hotel, Biloxi, Miss.
April 5-8, 1976

Southern Research Conference in Agricultural Education
Louisiana State University
July 27-29, 1976

DECEMBER 1975

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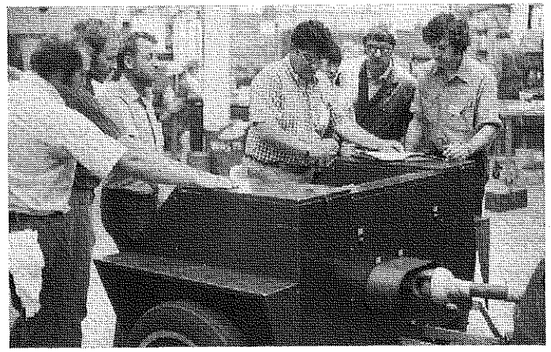
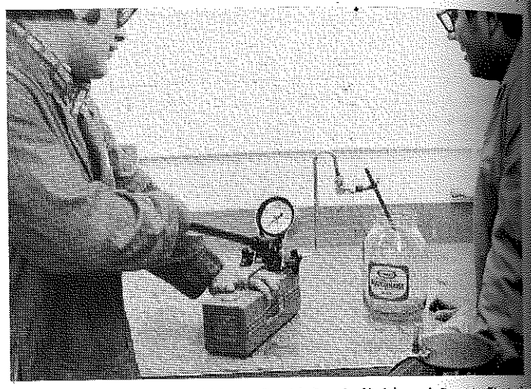


IN-SERVICE AGRICULTURAL MECHANICS EDUCATION — Gary McVey, University of Minnesota, Crookston, is shown demonstrating a dynamometer to a group of teachers at a tractor service and maintenance workshop in Willmar, Minnesota. (Photo from Forrest Bear, University of Minnesota)

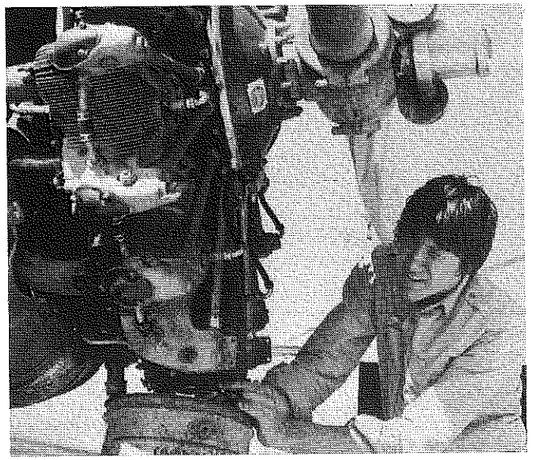
MARYLAND AG MECHANICS WINNERS — Elmer Cooper (right), advisor of the North Harford (Maryland) FFA Chapter, and W. Lamar Harris (left), chairman of the Agricultural Engineering Department at the University of Maryland, are shown with members of the winning team in the Maryland Agricultural Mechanics Contest. The team is from the North Harford FFA Chapter. (Photo from University of Maryland)

STORIES IN PICTURES

by Jasper S. Lee

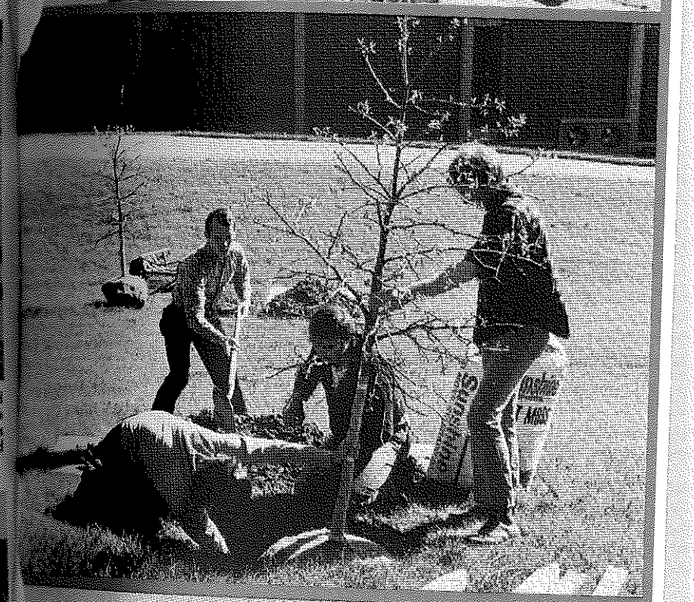


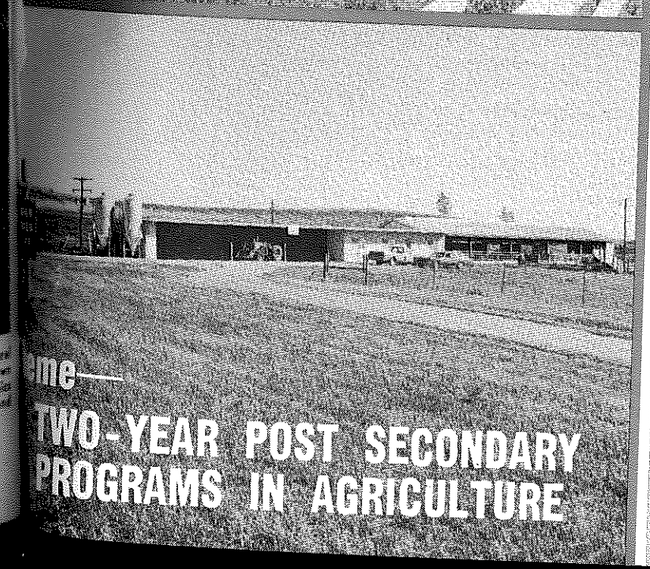
DIESEL INJECTOR TESTING — David Resch (left) and Dennis Finstad are shown testing a diesel injector in the laboratory of a diesel service and maintenance class at the University of Minnesota. This testing permits checking opening pressure, spray pattern, chatter characteristics, and return leakage. (Photo from Forrest Bear, University of Minnesota)



SUMMER INTERNSHIP IN AGRICULTURAL AVIATION — A student from the University of Minnesota at Crookston is shown performing maintenance on an "Ag Wagon" as part of a 12-week summer internship in agricultural aviation. (Photo from Forrest Bear, University of Minnesota)

CONSTRUCTING A HYDRAULIC LIFT — Members of the agricultural mechanics class and Hawley (Minnesota) FFA Chapter are shown constructing a hydraulic lift as part of their agricultural mechanics instruction. (Photo from Forrest Bear, University of Minnesota, and John Hest, Hawley, Minnesota)





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