STORIES IN PICTURES

by Joe Sabol

DOING TO LEARN: These cute registered dairy cows represent part of the Supervised Occupational Experience program of Tony Wilson, Southern Regional Hermitage, La. Tony is a member of the Mt. Hermitage FFA Chapter, Mt. Hermitage, Louisiana.

HANDS ON! Margaret Riffen, Norncol, North Salinas High School, Salinas, CA, demonstrates the proper techniques of training operations for her students. This student in added to the school greenhouse to conduct part of his occupational experience program. (Photo courtesy of Joe Sabol, Cal Poly, San Luis Obispo, California.)

SOE IN AGRICULTURAL MECHANICS: This equipment trailer built by Chris Cobb, Sierra High School, is part of his Occupational Experience program in custom farm machinery work. It is an extension of the students. (Photo courtesy of Joe Sabol, Cal Poly, San Luis Obispo, CA.)

SOE IN CAMPUS: The school grounds provide Floyd York and his two horticulture students with a unique opportunity for them to develop their greenhouses for their greenhouse program. The arrangement below the students, Mr. York, and the Zachary High School, Zachary, Louisiana. (Photo courtesy of Dr. Jim Abraham, Louisiana State University.)

INCENTIVES FOR OCCUPATIONAL EXPERIENCE PROGRAMS: The rewards for a beginning occupational experience program are obvious to this Louisiana young farmer and his students. They move with pride in seeing and sharing quality citizenship. (Photo courtesy of Dr. Jim Abraham, Louisiana State University.)

AGRICULTURAL EDUCATION

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Theme—Agricultural Mechanics—Developing Important Skills

FEATURED—
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TRACTOR MAINTENANCE IN-SERVICE WORKSHOPS
SMALL ENGINE DYNAMOMETER FUMES EXHAUST SYSTEM
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GRANDFATHER'S COLLECTION
AG MECHANICS—ARE WE USING IT EFFECTIVELY?

FROM YOUR EDITOR

James P. Key

MOTIVATING TOOL

Ag mechanics is probably one of the best tools for motivating students and getting them involved. Many students seem to want to "go to the shop" where they can work with their hands for a change. The shop seems to also hold unusual challenges for most students to improve their ag mechanics skills and make even more complex projects. The question is, however, do we adequately use the motivating power of "the shop" and ag mechanics skills to teach that wide variety of skills required by modern farmers and ranchers or agriculturists?

QUESTIONS

Do we adequately organize and plan the program so our students learn skills in all five areas recommended rather than concentrating on our favorite areas? Do we adequately balance the teaching of skills with the construction of projects utilizing those skills? Do we adequately prepare our students to think and act safely, before and after they go to shop? Do we avoid the trap of "going to the shop" when we are not adequately prepared to teach in the classroom (or shop)? Do we get the best out of our students when we are working with someone that is a student in our office and not adequately supervise those students working in the shop? Do we neglect to take time to organize the students into worker groups with a rotating leader to take some of the supervising responsibility?

ANSWERS

I am sure we could all answer no to some of those questions some of the time. I am sure also, we know how much more effective we could be if we answered yes to those questions and the others we could ask which would improve our agricultural mechanics instruction. Taken together those questions might seem overwhelming, but if we answer yes to one at a time there are none of us who could not develop an outstanding ag mechanics program.

STEARPER LOOK

If you liked the sharper look of the Agricultural Education Magazine which began with the March 1979 issue, thanks to our friends at Lawwood Press who supplied us with slicker finished paper for that and subsequent issues. Thanks—Ed.

COMING ISSUES COMING

JUNE — Summer Opportunities — Supervision — Planning Service Education, Conferences, Repairs, Other Activities

INTERNATIONAL AGRICULTURAL EDUCATION — Filling the World's Breadbasket

AUGUST — The Overworked Ag Teacher — Determining Priorities

SEPTEMBER — A New School Year — Opportunities Unlimited

OCTOBER — Our Grassroots Community Relations — Parents, Advisory Committee, Administration, Legislators

NOVEMBER — Adult Education in Agriculture — An Extension of Our Yo-Ag Program

DECEMBER — Vocational Occupations — Learning to Be Unify

BOOK REVIEW


Agricultural mechanics encompasses many varied skills in several areas. Modern Agriculture Mechanics brings these skills into focus as a whole. Each chapter is an independent unit. This book guides the reader to the opportunity to fit the variety of situations to any practical operation. Each of the sixteen chapters is complemented with illustrations which fit each situation well. Safety for each unit is stressed in the beginning of each chapter. Recommended readings follow each unit and education, which is appending to the instructor. Table-time practice is given in chapter one on the metric system. This section contains a brief history of the metric system and three pages of metric conversion tables. Chapter one covers drawing, measuring, and planning. This information offers the reader a definite edge for success in some of the other units. Chapter two helps the plan and coordinate the home service center. Tool-fitting is covered in chapter three. Chapter four is on metals. It is a cooler but thorough chapter. Chapters five and six are hot and cold metal work. Art and gun welding are covered in chapters seven and eight. Chapter nine is about soldering which includes about metal information. Chapters ten, eleven, and twelve are woodworking. The areas covered are carpentry, woodworking with hand and power tools, sheet metalwork, and woodworking. Chapter thirteen covers painting and finishing. Chapter fourteen covers plumbing, masonry, and electricity. The last three chapters, plumbing, masonry, and electricity, offer information practical for everyone. The author, T. J. Wakeman, is a retired Professor of Agricultural Education at Virginia Polytechnic Institute and State University.

MODERN AGRICULTURAL MECHANICS can be directed to high school, junior college, and senior college students, as well as teachers. The book is well written and easy to understand. Teachers of agriculture and floriculture will find Modern Agricultural Mechanics a useful reference text.

David Fugate

Webster County Vocational Center

MAY 1979

THE AGRICULTURAL EDUCATION MAGAZINE

PROJECT CONSTRUCTION—STILL A VIABLE METHOD

Carl L. Reynolds

by Carl L. Reynolds

Teacher Education University of Wyoming

The project construction method has long been recognized as a widely accepted method for teaching agricultural mechanics skills to vo-ag students. Projects served a useful purpose on the farm or ranch and provided a practical learning activity for the student as well. In recent times, however, the project method has become more difficult to maintain in the instructional program. Some changes have created problems that seem almost insurmountable and in some instances have caused teachers of agriculture to incorporate other methods of instruction for the teaching of agricultural mechanics skills. Teachers in many cases have elected to use the "lunch approach" in which students learn to perform skills on small practice pieces or equipment.

Is the project construction method still a viable teaching tool that we should be using today? A look at the merits of the project method, the problems associated with project construction, and ways of reducing the problems associated with incorporating the project method in the instructional program may provide the insight needed in answering this question.

MERITS

A major reason why the project method has been utilized so heavily is that it brings into action a large number of the principles which have long been recognized as effective components of the learning process. Several of the more important principles are:

1. Student self-motivation is developed.
2. Goals are established by the student.
3. The process of task breakdown into logical steps is learned.
4. Proper work habits are developed.
5. Individualized instruction is enhanced.
6. The value of proper planning is developed.
7. Skills are acquired in the work environment.
8. Problem solving skills are practiced.
9. Self-discipline is developed.
10. Students develop teamwork.
11. Skills in evaluating quality of workmanship are acquired.
12. Project construction closely simulates job situations for future occupations.

PROBLEMS AND CONCERNS

Several problems and concerns have caused the teacher of agriculture more difficulty in implementing the project method successfully. One, more urban students enroll in vocational agricultural program courses, making it more difficult to help those students plan useful projects. Two, the increasing cost of materials makes it difficult for students with limited resources to plan projects they desire to construct. Three, highly specialized technical programs make project construction a difficult method for teachers to manage in terms of time and resources.

Fourth, modern facilities planning often does not provide adequate equipment. Project construction requires a larger floor space per student and often larger equipment than would otherwise be required. Fifth, responsibility for a parent's expensive tractor or combine is often more of a liability than a teaching aid. This disadvantage is critical to the student and the instructor. Also, construction of projects designed for one-time use, such as steel livestock trailers, presents a high level of liability to the teacher if a mechanical failure causes a serious accident. Sixth, the sophistication level of most farm machinery and equipment can require a technolog that goes beyond the capability of the facilities or the teacher's expertise. Seventh, the trend toward vocational centers in which the student may be receiving his vocational agriculture instruction a considerable distance from home may cause additional problems in involving students' parents in the planning of projects, obtaining materials, and providing for the additional transportation involved.

IDEAS FOR CONSIDERATION

Project construction is such an effective method for instruction in agricultural mechanics that every effort should be made to continue its use in the vocational agriculture program. Some of the following suggestions may help overcome some of the problems incurred in utilizing the project construction method:

1. Maintain a file of project plans; plans of commonly used materials. These may be ideas of former students as well as commercially available plans.
2. Make into city yards, barns, and buildings, such as implement dealers, farm equipment showrooms, small retail establishments, recycling centers, and repair-type projects the vo-ag department can do for them.
3. Incorporate construction-type projects into community service activities, such as picnic tables and barbeque stands. These may be ideas of students as well as completed products for sale.
4. Develop a plan with the school to facilitate large quantity purchases of commonly used materials such as lumber and steel used for rods to students.
5. Consolidate materials purchases for students' projects to obtain quantity discounts.
6. Plan for group projects that incorporate projects of several students, such as tractor tune-ups, custom combine adjustments, and sprayer conversions.

(Concluded on page 263)
SKILLS, SKILLS, or SKILLS?

by

Thomas A. Hoenner

Iowa State University

What agricultural mechanics should a vocational agriculture student be able to perform upon completing four years of vocational agriculture and agricultural mechanics? What level of competence should he or she possess? In what units of instruction in the program should these skills be taught? What agricultural mechanics projects include the skills that should be taught to high school students?

Are there some of the questions that you are facing when you begin to plan your agricultural mechanics instructional program? If you have a planned instructional program I'm certain your answer is yes. If you answered no, then you really don't have a problem, or at least you haven't recognized a problem. These are common questions asked by many instructors as they begin to plan an agricultural mechanics instructional program. These questions first arise when you begin to think through the objectives of your instructional unit or what you want your students to be able to know and do when they complete the unit. If your main objective is to have each student complete a project during an 8-week unit in carpentry then you really don't have a problem and possibly you don't have a complete or effective instructional program. Every student has a different project, and whether they learned or developed any skills is purely coincidental. However, if your objective is to have all students be able to safely operate woodworking power tools then you do have a problem in that you must plan meaningful and effective activities and projects in order to teach the skills necessary to safely operate woodworking power tools.

The objective of this article is to discuss the importance of planning, organizing and teaching agricultural mechanics skills. In addition, it will discuss a concept where, in my judgment, skills can or should be developed or included in the agricultural mechanics instructional program. Last, I will discuss some specific skills for specific units.

The complete agricultural mechanics instructional program consists of three phases of instruction, these being:

1. CLASSROOM INSTRUCTION - The phase of instruction where basic concepts, principles and understandings are taught. This phase includes the study of the subject matter, classroom exercises and student activities such as surveys, problem sheets, field trips, use of operator's manuals and numerous other learning activities. Many specific skills and abilities are taught during this phase of instruction, which for most units should be approximately one-third of the total instructional time. (Note Figure 1 for an example classroom exercise on the parts and functions of the corn planter. Skills and abilities can be taught through classroom activities. Specific skills and abilities such as the ability to identify the parts and functions of the corn planter are two example abilities that could be taught with the classroom exercise illustrated.

2. REQUIRED ACTIVITIES - The required activity phase follows, or is integrated into the classroom phase. A required activity testing specific skills might be defined as "an activity involving no more than 2-3 individual skills or abilities, preferably one, over a short duration of time and related directly to the classroom instruction." Required activities should:
   a) be demonstrated by the instructor,
   b) be presented on a worksheet or one-page plan form and
   c) be evaluated and used for final evaluation of the course.
   (Concluded on the next page)

CONTINUED SKILLS, SKILLS, SKILLS

Required activities generally result in the construction of some type of project such as a concrete float or cold chisel or an operation such as reading a micrometer, adjusting the cylinder speed of a combine or using the battery hydrometer to determine specific gravity of a battery as shown in Figure 2. These are all teachable and important skills or abilities that might well meet the objectives or skills you desire to teach in a specific unit. However, remember a required activity could be a paper type activity such as a survey of small engines at home or computing the cost of electricity for 30 days on the home farm. Again these are important skills or abilities to include in your instructional plan. The required phase of instruction should cover approximately one-third of the total time for most units.

3. APPROVED ACTIVITIES - The approved activity phase of the instructional program logically follows the required phase. An approved activity might be defined as "an activity, selected by the student, of larger scope, involving numerous skills and abilities, following the required phase and allowing for more indepth skill development." The word "approved" is the key to this phase of instruction in that the instructor and parent approve the activity selected by the student. Approved should be based on a number of factors such as: student ability, skills to be learned or more fully developed, the agricultural mechanics facility, tools and equipment available, scope or time to complete and instructor experience and background. This is an important phase and should be included in every instructional unit. It should follow the classroom and required activity phase; however, realistically this phase could come at another time of the year or it might be carried out on the home farm or in the SOE Work Experience Center. One example, if your unit is small gasoline engines, during the approved phase the student should work on a project or activity related to small gasoline engines, such as getting a lawnmower ready for storage, mounting an engine on a piece of equipment or overhauling a small gasoline engine. An example approved activity for the agricultural carpentry unit is shown in Figure 3. Imagine all the basic skills that can be taught through the construction of this loading chute. The approved activity phase of instruction should involve approximately one-third of the total time for the unit.

SUMMARY

From this discussion it should be apparent that skills can and should be taught in all phases of the instructional program. Meaningful and effective projects or activities that include the skills desired for the student to learn should be planned into the total program. Too many programs have projects as the end rather than as a means to the end. The real challenge in developing any instructional program is to be able to first determine the important skills and abilities that the student should learn during the unit, next plan projects or activities that include the teaching of these skills and last carry out the instructional plan. Are you concerned about the skills and abilities that your students will possess upon completing your agricultural mechanics courses? If so, you will probably plan, organize and teach effective and meaningful agricultural mechanics units that include marketable skills and abilities.
KEYS TO SUCCESSFUL TRACTOR MAINTENANCE UNITS

by William A. Dover

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Southern Illinois University at Carbondale

Do you ever feel frustrated when you teach tractor maintenance to a high school agriculture class? You introduce the unit, develop some interest and enthusiasm for it and encourage the class to bring tractors to the shop so they can “learn by doing.” The tractors start coming in, and with their arrivals your frustrations begin.

FRUSTRATIONS

The tractors range in age from rather new to quite old. Some are gasoline, some diesel. Some have a magneto; some a coil, condenser, and distributor. Two, three, four and six cylinder engines. It’s hard to keep track of the specifics, the parts, and the differences between the various makes and models of tractors. If you’re fortunate, the manufacturers are cooperative and send you bulletins and manuals. But, in most cases, you’re left with the problem of goodwill alone.

2. The teacher does not have time to individually instruct each student as the class member pursues their respective independent learning activities. Yes, because the need for the tractors varies so much, group instruction in anticipation of all possible problems to be encountered is inappropriate and excessively time consuming.

3. The instructor worries that he may not know the answers to all the questions which the students will ask concerning specifications, recommendations, procedures, etc.

SOLUTION - LEAFLETS

One solution to these problems is a series of leaflets to be used as “hand-outs” to supplement classroom instruction, discussion, and to stimulate use of the operator's manual as the basic informational resource for tractor maintenance. The content and purpose of these leaflets will be discussed, followed by some suggestions for using them.

1. The first of these leaflets (Figure 1) helps to define and describe the types of the planned activities and to establish guidelines as to what is expected of the student. The student can also use this leaflet as a basis for discussing with parents the purpose of the request to take a tractor to the school shop.

The teacher should modify the suggested content, perhaps by phrasing it in a way that makes it more applicable to your specific class. For example, the classroom enrollment and shop space may prevent each student from having a tractor in the shop. Perhaps 2 or 3 member crews will have to be permitted or encouraged. Local school conditions and policies may also determine or influence what the students will find and what the students are expected to do. (Examples: Lubricants, oil, solvents, rags, tools, etc.) Facility and equipment limitations may preclude some maintenance operations at school (such as testing, for example) which would be possible at another school.

2. The remaining leaflets serve as student guides to self-instruction by using the operator's manual. Figure 2 shows an example covering the areas: Lubrication - Crankcase; Transmission; Differential and Hydraulics (Area 1). The other leaflets each relate to one of the other areas listed at the bottom of the leaflet shown in Figure 1. Again, these forms should be developed by the instructor to fit the anticipated demands of the class.

LEAFLET GUIDES

As represented by Figure 2, the purpose of these latter leaflets is to teach students to utilize the operator's manual as a reference for tractor maintenance. Rather than the instructor telling the students to “get an operator's manual and guide” it is suggested that the student's work be such that he demonstrates initiative and some independent thought and effort. The student's work should be the final product. The student should do the work and not have it done for him by the teacher. The student is limited to the specific pages of the operator's manual which are suggested for this exercise. The instructor may adjust the content and the projects to fit the interests of the class, but should provide the students with the necessary guidance to carry out the tasks.

THE USE OF THE LEAFLETS

The use of the leaflets provides for a smooth transition from classroom instruction to shop activity. The teacher can introduce each area and discuss it in general terms, explain and demonstrate the technical aspects of the tasks, guide study groups, or individual students, etc., and demonstrate or explain some typical procedures. The appropriate leaflet is then distributed. Using it and the operator's manual, each student reads the specific information (procedure, recommendation, specifications) for his tractor, and, after these maintenance requirements are known, proceeds to the shop to perform them.

Included in the discussion of the use of the guide should be some suggestions on using the table of contents and/or the index of the operator's manual to quickly locate the desired information.

Class rules are established that (1) no maintenance work is to be done until the appropriate page of the operator's manual has been located; (2) the teacher will be present when the work is being done. When supervising the shop activities the teacher can glance at the guide to determine whether or not the page the student has reached, then look on that page in the manual to verify that the student has selected the appropriate reference.

If the student's work is progressing satisfactorily and in accordance with the recommendations of the manual, the teacher can give appropriate recognition and move on to another student. One form of recognition might be: “You are the first one to encounter that problem and all the class should know about it. I would like for you to give a brief demonstration on this for the next few minutes of tomorrow's class.” On the other hand, if a student is experiencing difficulties, the teacher can intervene and assist with some of the more complex tasks. If, after a student spends a significant amount of time on a task, the instructor might be asked: “Why do you think you haven't been successful with this task?” The instructor can use these incidents to stimulate interest and provide the student with the motivation to achieve.

Figure 2

(Concluded on page 254)
IN-SERVICE WORKSHOPS

by

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The attendance of vocational agriculture/agribusiness teachers in in-service workshops has long been a very important and required phase of the normal program for the vocational agriculture/agribusiness program in Louisiana. However, because of the type training received at these seminars over the past several years, the word "required" has been removed from any discussion pertinent to attendance by the teachers. The skills learned by the teachers have been of the type and quality needed and attendance has been excellent.

The workshops are held in conjunction with the four leadership training conferences for local FFA chapter officers.

During the year teachers are given the opportunity to submit suggestions for the type instruction they feel is needed for the purpose of better conducting their programs of instruction. Developing important skills in agricultural mechanics has always been a priority in these requests and the State Staff has made every effort to arrange for intensified instruction in this phase of the program.

Each of the four workshops held during the summer are one week in length. Therefore, the program must be well planned if the information received is to be beneficial to the individual teachers. In obtaining the best qualified personnel to conduct the programs, it has always been the policy of the state department to work with industry and their resource people as much as possible. This has proved very successful and beneficial to all involved.

BUSINESS ASSISTANCE

Over the past several years updated information and new skills have been in electricity, welding, (acetylene and electric), surveying, and most recently, four week long air-conditioned engine work shops were held. It was rewarding to the staff concerning the excellent cooperation received from the various companies which were contacted for the purpose of obtaining instructors in these various phases of agricultural mechanics. Several companies provided materials, supplies, equipment, etc. in addition to providing the instructors from among their company personnel.

The four air-conditioned engine workshops held during 1978 were considered by many teachers to be the most successful type training they have received since the instruction in agricultural mechanics was initiated. Approximately four months prior to the time of these in-service training programs, members of the state staff contacted representatives from the various companies relative to their assistance. As previously stated, the response was very gratifying and certainly motivated the staff toward doing a good job of working with these people in organizing an instructional program.

Top personnel from this major company's office located throughout the United States, participated as instructors relative to the various phases of the program.

SMALL ENGINES WORKSHOP

Following is a list of the subject matters covered during the workshops on air-conditioned engines.

1. Starter systems, including the actual rewinding of the starters by the students (teachers)
2. Ignition system (magneto-sparkplugs)
3. Carburetion system
4. Crankcase pressure
5. Detailed study of cylinders
6. Valve systems
7. Tear down and reassembly of engines
8. Crank system (crank shaft and cam shaft)
9. Lubrication

The well planned instructional program was well received by all teachers and was very effective toward assisting them to do a better job of teaching in their local departments. Each vocational agriculture/agribusiness teacher received a certificate denoting that they had successfully completed a training course in repair procedures pertaining to the servicing of gasoline engines.

The workshops planned for these teachers have for the past several years been successful ventures resulting from the close cooperation between the State Department of Education and representatives from various industries.

A SMALL ENGINE DYNAMOMETER

by

Glenn Conklin
Farmer & Former Ag. Mech. Teacher
Brooktondale, NY

Teachers of Agricultural Mechanics!
Do you want a project that students can build at a reasonable cost? Would you like to be able to measure the horsepower of a lawnmower engine? Are you interested in having a device that will help teach tune-up procedures? Would you like a device that will help teach the concept of torque and horsepower? Do you want to stimulate student interest? If the answers to the above questions are yes, you should consider building a small engine dynamometer.

Most high school vocational programs offer a course in small engine maintenance and repair. An important part of such a course is student practice in engine rebuilding. All too frequently, however, students do not receive immediate feedback about the success of a given engine overhaul because the equipment the engine is intended to run on is not at the school, or (as in the case of a rotary mower) because the equipment cannot be tested under load as a result of the seasonal nature of its use. Consequently, the students do not receive the benefit of fully evaluating their overhauls while the details of the jobs are fresh in their minds.

DYNAMOMETER ADVANTAGES

If a dynamometer were available to a small engine program, students could test their engines immediately upon completion of rebuilding. Such a dynamometer can be built with an automobile power-steering pump which is readily available in a junkyard. This dynamometer will provide a means to (1) demonstrate the relationship between tune-up adjustments and performance, (2) demonstrate the relationship between engine horsepower before and after tune-up or rebuilding, (3) determine need for tune-up or rebuilding by comparing the horsepower of an engine to what it should put out, and (4) help students visualize the concept of torque and horsepower.

DEVELOPMENT STUDY

A study was conducted by the Agricultural Engineering Department at Cornell University to determine the relationship between the output pressure of certain GM power-steering pumps and the torque on the pump housing. This was accomplished by connecting a one-foot-long torque arm on the pump housing, clamping the pump so the housing could rotate, and making a series of readings on the scale of the arm. The pump was then coupled to a power source, and a gauge-valve setup for measuring pump output pressure was installed. The torque on the pump housing at various pressures was determined, and from this information an equation was developed.

FORMULAS

From the study an equation was derived that describes the torque on a power steering pump for GM power-steering pumps used on full-sized Chevrolet cars (Biscayne, Belair, Impala) from 1963 to 1973. It is:

\[ T = 2.15P - 335 \]

(1) Torque in ft-lb. (1016) (pressure in PSI) + 0.93

This formula allows us to mount the pump rigidly and still determine the torque on the pump housing and hence the torque of the engine driving the pump.

Since the formula for horsepower is:

\[ HP = \frac{T}{1550} \times RPM \]

Then by substituting formula (1) for torque into the horsepower formula, we get:

\[ HP = \frac{2.15P - 335}{1550} \times RPM \]

By simply taking readings of the pump output pressure at a chosen RPM, preferably in the range of 2500 to 3500, the horsepower output of a small engine can be calculated with formula (3) by plugging in the values for RPM and pump output pressure.

Formula (3) is adequately reliable when pumps from cars listed above are used, and if the pumps are not badly worn. Statistically the correlation coefficient is 0.95.

The GM power steering pumps tested have the capacity to measure up to six horsepower output of an engine. How did you do? (Concluded on page 254)
A LOW-COST, EFFECTIVE, FUMES EXHAUST SYSTEM

by C. O. Jacobs
Agricultural Education Department
University of Arizona

Providing a safe and healthful environment for the agricultural mechanics laboratory is a primary concern for administrators and instructors. Since the establishment of the National Occupational Safety and Health Administration in 1970, federal standards for safe working conditions have been accepted by most states as law. The regulations have had several profound effects. First, they provided insight into unsafe and unhealthy working conditions heretofore not recognized because of lack of understanding or concern, and second, they provided a mandate to do something about it.

FUMES HAZARD SUBTLE

The necessity to provide adequate eye and skin protection for all forms of welding is well accepted. It is simply impossible to weld without proper equipment and personal protection. The personal injuries resulting from improper equipment are immediate and measurable. The hazardous effect of improper ventilation of welding fumes is more subtle and the need to provide for adequate ventilation is often ignored.

The hazard to health from fumes and gases generated by a welding operation depends upon the following:
1. Chemical composition of the materials being used
2. Concentrations of chemicals in breathing zone
3. Duration of exposure

FUMES SOURCES

Air contaminants may arise from the filler rod, fluxes and oxides or alloying elements of metals being joined. The information presented in Table I is a summary of the elements which produce health hazards. Of those listed, ozone and nitrogen oxides are the principal poisonous gases, while toxic fumes are generated from metals coated or alloyed with lead, zinc, cadmium or beryllium. Fumes from metals including cadmium, copper, nickel and zinc produce "metal fume" fever.

Welding done with coated rods or electrodes releases fumes of metal oxides, hydroxides, carbonates, sulfates and fluors. Of these, fluors are especially toxic. Fluors are contained in low hydrogen, stainless steel, some hard-surfacing electrodes, mild and low alloy open arc wire, non-ferrous electrodes and many brazing and soldering fluxes.

Some silver solders containing cadmium and metal alloys containing beryllium which can generate fumes which cause severe lung irritation. The results may be fatal.

VENTILATION PROBLEM

The physical problem of providing adequate ventilation for the welding instruction area for the agricultural mechanics laboratory is complex. The specification published by CSEA identifies the following minimum requirements:
1. A minimum ventilation of 2000 ft³/min. per welder, or
2. A capture velocity of 100 linear ft. per minute air flow per welder when using local exhaust hoods placed near the work.

Most schools are equipped with a common intake hood mounted over the fixed welding stations; the attached exhaust fan generally provides the minimum of 2000 ft³/min.

Airflow. This type system has three primary faults as follows:
1. Welding fumes move upward directly past the welding helmet of the person. Some of the fumes enter the face shield where they are confined and breathed.
2. The high exchange rate of air in the building increases the heat load less than is economically allowable.
3. The high cost of equipment is a deterrent to installation.

LOW COST EXHAUST SYSTEM

A consideration of these factors prompted the author to develop a low cost welding exhaust system adapted to agricultural mechanics laboratory arrangements found in many departments of vocational agriculture in Arizona. The design and operation of the system proved usable and effective. Features of the system are:
1. Capacity—up to eight arc welding stations; more with larger fan.
2. Cost—less than $75 per station using student labor to install.
3. Effective—meets flow rates of 100 linear ft. per minute. Intake hoods are adjustable to allow use of positioners for providing vertical and overhead welding.

The heart of the system is the intake hood, Figure 1, which is attached to the welding screen. The hood (one for each welding station) is constructed of 20 ga. galvanized steel sheet. The fabrication was completed in a local sheet-metal shop using the pattern provided. A four inch air duct is...
approach permits the teacher to be a partner, a co-investiga-
tor, with the student in solving the problem and reinforces manual as a guide to, and source of, information for tractor maintenance.

The bulletins can also be used, in conjunction with a plan, to provide a classroom activity for those students who have engaged in tractor maintenance activities in the shop while room often stimulates a "bring in a tractor" response.

LEMONADE? The at the beginning of this article it implied, through a description of the great variety of makes, models and types of tractors which class members might have for a unit of tractor maintenance, that this would be an impossible or at least an undesirable situation. In reality, by good planning and effective use of operator's manuals, this apparent "lemon" can be made into lemonade in the form of a richer, more comprehensive learning experience for the student, with this activity as a base. By learning to use the operator's manuals, the students will still have the basic information for tractor maintenance in the future, regardless of how much machinery advances modify current tractor mainte-
tance procedures.

LEADSMAN FROM Instructional Materials Service, 3 Stone Hall, New York State College of Agriculture and Life Sciences, Cornell University, Ithaca, N.Y. 14855. The price of this 30-page publication is only $2.00.

If a teacher were willing to spend the time to build a power steering pump calibration unit, he would have a device that would very accurately determine the horsepower of a small gasoline engine and he could also demonstrate the concept of horsepower. A copy of Glenn Conklin's study of power steering pumps, how he constructed a pump calibration unit, and how he derived the horsepower formulas discussed above can be obtained by writing to Fred G. Lechler, Associate Professor of Agricultural Engineering, Kellogg Hall, Cornell University, Ithaca, New York 14853.

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POST-SECONDARY PROGRAMS IN AGRICULTURAL OCCUPATIONS

by

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Teacher Education
Ohio State University

In 1977-78, post-secondary programs in agricultural occupations were the largest ever. There were continued increases in the number of post-secondary institutions, number of programs offered, and the number of students enrolled.

DATA SUMMARY

When the data compiled for 1978 Directory of Two-Year Post-Secondary Programs was compared to previous data, there were some interesting developments. While the number of institutions grew over seven percent, the number of students enrolled increased less than one percent. A comparison of the 1976-77 data and the 1977-78 data is shown in Table 1.

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Institutions offering programs</td>
<td>478</td>
<td>513</td>
<td>+ 7.32</td>
</tr>
<tr>
<td>One and two year programs</td>
<td>1,640</td>
<td>1,731</td>
<td>+ 5.55</td>
</tr>
<tr>
<td>Full-time faculty</td>
<td>1,903</td>
<td>1,941</td>
<td>+ 2.00</td>
</tr>
<tr>
<td>Part-time faculty</td>
<td>1,585</td>
<td>1,956</td>
<td>+ 2.33</td>
</tr>
<tr>
<td>Student enrollment</td>
<td>63,717</td>
<td>64,125</td>
<td>+ 0.64</td>
</tr>
</tbody>
</table>

Slightly more than one-fourth (27.9%) of the institutions provided curriculum-related student organizations. This represented a decline of nearly sixteen percent from 1976-77. Some of the institutions reported organizations for each student on their instructional program rather than a single organization.

An important part of the education programs at many of these institutions is the adult education offerings. Over 24,000 adults are enrolled at 181 institutions. The majority of these programs are production oriented with titles such as Adult Farm Management, Farm Management Records, Veterans' Farm Training and Farm Management.

REcATIONS AND IMPLICATIONS

The data collected in 1978 provide evidence that post-secondary education programs of less than baccalaureate degree level continue to be important in meeting occupational objectives for many students. However, the amount of growth has slowed dramatically and would indicate that there may be a plateau of more moderate growth ahead as the era of reduced high school graduates becomes a reality.

The reduction in student enrollments must be taken seriously. In most states, graduates of the post-secondary programs will be looked upon as leaders in their communities. In the opinion of this writer, it appears that the need for leadership training cannot be overlooked. The national meetings in 1978 and 1979 indicate there is a concern about this trend. The opportunities for programming in this area may need to be re-evaluated.

In the adult education programs, the trend continues to emphasize agricultural production. In the near future, it appears there will be a need for program opportunities for employees of agricultural businesses, especially previous graduates of post-secondary programs.

Finally, this reduced rate of growth will provide an opportunity for the institutions to begin qualitative assessments to keep their programs relevant to the occupation needs of young people and the employment needs of the agricultural industry. The need for well-trained technicians in agriculture has never been greater.

REFERENCES

Directed by: Lawrence H. L. Thompson, Director of Two-Year Post-Secondary Programs Department of Agricultural Education, The Ohio State University, Columbus, Ohio. Issued as a Contribution of the Two-Year Post-Secondary Program in Agriculture, Agricultural Education, Natural Resources and Environmental Sciences, Department of Agricultural Education, The Ohio State University, Columbus, Ohio. The Journal of Agricultural Education, The Ohio State University.

MAY 1979

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THIS WORKED FOR ME!

A MULTIPLE SKILLS PROJECT

by

Kirk Edney
Voc-Ag Teacher
Ade, TX

In addition to two sections of Vo-Ag II, I teach a two-hour Pre-employment Laboratory course in General Agriculture Mechanics. For use in my pre-lab, I adapted this project from a laboratory exercise assigned by Mr. Paul Clifton in Agricultural Engineering 223, at Texas A & M University. This project should require at least five class periods to complete. I like it because it utilizes the principles involved in proper time cutting, off-hand grinding, filing, layout work, drilling, tapping and threading.

BILL OF MATERIALS

3/16" mild steel plate, finished to 3/16 X 14" 3/16" all-thread rod, 36 X 16 NC, 4" long 3/16" mild steel rod, 4" long 3/8 X 20 NC flat head stove bolt, 3/4" long (2) 3/8 X 20 NC flat head stove bolt, 5/16" long (2)

PROCEDURE

1. Use a center punch to indicate hole to a size that can be finished to 3/16 X 14"

2. Clean up plate edges on pedestal grinder

3. Drill plate edges, instructor check with straightedge and 0.100" feeler gauge

4. Paint one side of plate with LYKEM BLUE or similar solvent

5. Sand center line along length and width

6. Screw bolts to locate centers of holes

7. Use punch to indent places that proper lines intersect

8. Drill pilot holes (6)

9. Drill holes:

A. 3/8" drill bit (for stove bolts - 4 holes needed)

B. 3/16" drill (for all-thread rod - 2 holes needed)

C. Q drill bit (for steel rod - 2 holes needed)

10. Assemble the A location, drill countersinks for stove bolts

11. Tap holes:

A. 3/16 X 20 NC for stove bolts

B. 3/8 X 16 NC for all-thread rod

C. 3/8 X 24 NF for mild steel rod

12. Chamfer one end of mild steel rod, thread with 3/8 X 24 NF die

13. Cut plate in half at center width with hacksaw, file edges

14. Assemble the two plates with the fasteners, they should be in tight and flush

This project can be easily altered for various sizes of rods, plates, bolts, etc. A 3/16" bit can be used in place of the 3/8" and a 5/16" bit in place of the Q, if necessary or numbered bits are not available.

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Leader in Agricultural Education:

N. E. FITZGERALD

by George W. Wiegert, Jr.*

Nugent Edward Fitzgerald, Dean Emeritus of the College of Education, recently stated that he enjoyed every minute of his forty-two years of active service at The University of Tennessee. His contributions to the field of agricultural education, and to the larger field of general professional education, include establishing a new department of agricultural education two years after the passage of the Smith-Hughes Act, reorganizing the College of Education by bringing together practically all teacher education units, including agricultural education, and applying ideas tested in agricultural education to the College of Education, such as full-time, off-campus practice teaching. At that time, practice teaching was done every other day during the week. Soon after becoming dean he tried the idea of sending student teachers from all subject matter areas off campus as full-time teachers for a quarter. They lived in the community full time. In most cases a university faculty member went along as supervisor of practice teaching and lived in the community, too.

Dean Fitzgerald was born in the "Shaw Shirt" state - Ohio, in 1891. He began his career as a school administra-
tion by earning a Bachelor of Peda-
gogy degree as the State Teacher's Col-
lege, Cape Girardeau, Missouri. He served in the military during World War II. Two years later he completed

the B.S. in Education degree at the University of Missouri, and in 1917 completed the work for a B.S. in Agriculture degree at the same university. He next ventured north to earn the M.S. in Rural Education degree at Cornell University (1926). Later he concluded graduate work at both Col-
burnia and The Ohio State University.

Like many early leaders in agricul-
tural education, Fitzgerald began his teaching career in a rural community. In 1909, he taught in a rural elemen-
tary school, and after one year became a history and English teacher and prin-
cipal of a rural high school. In the summers of 1915 and 1917, he served as an instructor of agriculture in the State Teacher's College, Springfield, Missouri. He moved from Missouri to Texas to teach agriculture for elemen-
tary rural teachers at the University of Texas in 1915. While at the Uni-
versity of Texas he met a certain Aus-
girl named Julia Richardson. In 1918, he began serving as associate pro-

*George W. Wiegert, Jr., Professor, Vocational Technical Education Department, College of Education, The University of Tennessee, Knoxville.

(Concluded on page 262)
ACCOMPLISHMENTS OF BLACK YOUTH IS COMPARED

by

Robert C. Haynes, Chairperson
Vocational Teacher Education
University of Arkansas at Pine Bluff

Because the integration question and the FFA and NASA have emerged, per-
haps we should reexamine briefly what we expected and how it is to be
improved. The U.S. Supreme Court ruled unanimously that segregation of black and
white students in public education at any level was unconstitutional.
Monday, May 17, 1954, started out as a quiet day at the United States
Supreme Court in Washington. Report-
er was not expected routine decisions.
But the day became momentous in American history when Chief Justice Earl
Warren began reading the court's judgment on Brown v. Board of Educa-
tion of Topeka. Within a minute, Warren came to the
numinous words, "We must conclusively, un-
biasedly, and peacefully in the field of public
education doctrine the education of separate students of different races can be nowhere.
Separate educational facilities are inherently unequal."

"One must be heard in mind that it
was a day and three months later before the actual merger of FFA and NASA became a reality.
In the meantime, both youth organizations
in both local, state and national level were
leading in a great deal of progress. Dur-
ing this interposing period (the period
between the 1954 Land Mark Supreme Court decision and actual merger in 1965) the Arkansas
Association of the Future Farmers of America (FFA) emerged as one of the foremost youth or-
ganizations in the state.

The Future Farmers of America (FFA) was a program
for Negro boys studying agricultural curric-ulum in secondary schools. The new Negro
farmers of America (NASA) was a similar program
for Negro boys studying vocational agriculture.
The National Future Farmers of America (NFFA) was a
similar program for Negro boys studying vocational agriculture.
The Negro Farmers of America (NFA) became inte-
grated, members of the NFA became mem-
bers of the FFA.

CONTINUED
ACCOMPLISHMENTS . . .

METHOD

The method used in this study con-
sisted of the following steps:

1. A difference between the effec-
tiveness of FFA as scored with the FFA.
NFA graduates in NASA in terms of the training they received much higher
than those who graduated from FFA.

2. The new training provided for them to be directly responsible for
their success in many ways. The NASA graduates presented a positive feeling for them because many of them were success ful, business, professional, and community leaders.

3. Those who graduated prior to 1965, who were not members of the NFA, placed a low value on the need and adequacy of the agricultural education program.

4. The study revealed that NASA graduates were involved in community leadership roles, and they were better qualified to discharge their duties and responsibilities than the FFA graduates.

5. The NASA graduates held signific-
tially more responsible community

6. The study revealed that NASA graduates were more likely to use the leadership skills than the FFA graduates, and they were extremely satisfied with their community status.

7. It was apparent that the NASA group possessed more knowledge and ability about leadership and citizenship than did the FFA group. This was evidenced in the tables to support the fact that graduates in non-FFA groups were inadequately prepared to assume community leadership roles.

THE GREENHOUSE ENVIRONMENT

by John W. Mastaler, New York University, New York, N. Y.
P. 77, 1977, 629 pp., $18.50

This is a comprehensive book covering
topics associated with the greenhouse en-
vironment and greenhouse culture. This
book is intended for both the amateur and
professional and contains information for
the greenhouse hobbyist, the student, and
the professional grower. The book is
written to be understood by the general
reader who is interested in the greenhouse
industry. The book is divided into four major sections: the greenhouse, the plants, the growth media, and the environment. Each section is covered in detail with a focus on practical applications and case studies.

The greenhouse section covers the history and development of the greenhouse, the types of greenhouses, and the construction and maintenance of the greenhouse. The plants section covers the growth and development of plants, including their nutritional requirements, water and nutrient management. The growth media section covers the use of different growth media, including soil, peat moss, and hydroponic systems. The environment section covers the use of environmental control systems, including lighting, heating, and cooling systems.

The book is written in a clear and concise manner, with a focus on practical applications and case studies. The authors provide a wealth of information on the greenhouse industry, and the book is an excellent resource for anyone interested in the greenhoused. The book is well-organized and easy to read, and it covers a wide range of topics in detail. The book is an excellent resource for anyone interested in the greenhouse industry.
continued leader

The first State Plan designated The University of Tennessee at Knoxville to train Agricultural and Industrial State Normal at Nashville to train black teachers. No teacher training program was offered to serve future Smith-Hughes teachers until the fall of 1919. An agricultural education program was scheduled for the following year, but only one teacher showed up. He was given a pig by the Dean of the Department of Agricultural Education and sent home. For the new program, Professor Fitzgerald organized "Special Methods Training" to serve two years of vocational agriculture. Two seniors and eight others with degrees met Smith-Hughes requirements in 1920.

To assist beginning teachers with needs not met in on-campus courses, he initiated an internship program during his first year at The University.

The agricultural education department at U.T. grew and prospered under Professor Fitzgerald's leadership for four years. He was named as department head and eighteen as dean of the College of Education. He took an active role in national and state organizations and maintained vocational education programs to comply with the state laws and agricultural education Act. He was instrumental in helping to get adult farmer classes organized in the state. He worked to help organize and assist in helping to organize the Future Farmers of Tennessee (later Future Farmers of America) at local high schools. He spent much time in the early days of the teacher education program helping me to get what seemed at first sound supervised farm practice programs with their students.

Professor Fitzgerald was head of the department, he initiated a publication called "News Letter to Tennessee Teachers of Vocational Agriculture" that was published for many years. From 1923-25, he was editor for the Agricultural Education Section of the Educationally Specialized Societies, 1938-42, editor for Agricultural Education of the American Vocational Association Journal, and author of Farm Practice Accounts in 1931.

Professor Fitzgerald carried out an idea of his for providing for a laboratory facility in a nearby vocational agriculture department to train farmers of vocational agriculture. The local teacher who taught vocational agriculture and supervised the students was an employee of local school and The University.

In 1929, Professor Fitzgerald employed a person to provide a leadership for establishing and improving the farm shop programs in the state, and in 1938 he secured a person to develop subject matter for teachers and another person to do research in agricultural education. These early specialists, Professor Henry C. Graybill in agricultural mechanics, Dr. A. J. Paulson on subject matter, and Dr. E. B. Knight in research, made significant contributions to vocational agriculture education and to the profession. Through the years Professor Fitzgerald placed much emphasis on serving teachers on his field trips and professional field courses and organized subject matter publications, and in 1947 when the University of Knoxville, now The University of Tennessee, was cited by Governor Ray Blanton, an agricultural education graduate of The University of Tennessee, was also cited by the State Legislature for his achievements. He resides at 6 Hillside Circle, Knoxville, Tennessee.

continued seeking a job?

The low rating received for hiring experienced teachers over teacher training was in keeping with the steadily decreasing preference for hiring experienced teachers in Oregon during 1978. Likewise, the low rating on institution of preparation also is of interest considering the seemingly preference principles exhibited last year in Oregon.

INTERRELATION

It appears that one cannot totally separate the factors identified in the interrelated form for administrators a composite picture of a candidate's worth. However, the table does provide a prioritization which a candidate may utilize in preparing for an interview.

continued project construction...

7. Utilize community resources to provide facilities, equipment, or expert that the school or the teacher do not have.

8. Develop standards for facilities and equipment which facilitate the project construction method.

9. Work with the school's insurance company to provide coverage for the liability associated with storage of machinery in the vo-ag shop.

SUMMARY

Project construction can cause the teacher to face many more problems than those that may arise from a "bunch-type" approach. In some areas of instruction, the bunch is not so great to solve. However, the merits are such that every effort should be given to maintain proper construction in as many phases of the agricultural curriculum as possible.
Torque it down tight Tracy! Tracy Office of Coffee High School, Coffey, Washington. It's seen in the final stages of small engine overhaul. These and other Ag. Mechanical skills will enable him to eventually find a career in agriculture. (Photo courtesy of his teacher, Fred Crossley and Dr. Joe Cronce of Washington State University.)

Project construction is a practical way to develop these critical Ag. Mechanical skills according to Wynn Van Andel, Coffey, Washington. His student, Marty Reeder, is cutting wood. The plans he used to his wood burning stove. (Photo courtesy of Wynn Van Andel and Dr. Joe Cronce of Washington State University.)

Display boards prepared by students help get the idea across to Ya-Ya students at LeRoy-Odessa, Minn. Mr. Frederick Schaefer, below, shows the teacher of the display is an effective teaching tool. (Photo by Dr. Curtis Horenborg, U. of Minn.)

Publications and tractor safety are two very important skills for Pete Simpson’s (top) and Jay Meal of Council High School, Council, Washington. Their ya-ya teacher Phil Ropp teaches critical skills via the items by doing them. These boys complete the roll bar installation on the school tractor. (Photo courtesy of Kyle Bols, Council High School and Ron Craighead, Department of Agricultural Education, State Department of Education, Wash.)

(L-R) Sam Stempel, IVYATA Executive Director; Ma, Pat Stempel; J. J. John-son, General Sales Manager; Ford Tractor Operations for North America; James W. Guillinger, President, IVYATA. Ford Tractor Operations sponsors a dinner annually during the National FFA Convention for exceptional agricultural teachers receiving the Honorary FFA American Farmer Degree. The teachers are eligible to receive a Ford Tractor Power Train for instructional use in shop classes. (Photo courtesy IVYATA)