THEME: Achieving Quality Laboratory Projects
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ARTICLE SUBMISSION

Articles and photographs should be submitted to the Editor, Empirical Editors, or Special Editors. Items to be considered should be submitted at least 60 days prior to the date of issue intended for the article or photograph. All manuscripts must be accompanied by a written request. Articles should be typewritten, double-spaced, and include information about the author(s). Two copies of articles (in宠爱 should be submitted. A recent photograph should accompany an article in order to be considered by the editor.

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THEME

Projects Affect Our Image

PROJECT QUALITY IS JOB 4!

It is September, and the new school year offers opportunities for accomplishment. Remember last year when you wished for time to “do it differently”? We have the time to do it right now if we plan, organize, execute, and evaluate. This cycle does not guarantee quality but it sure improves the odds. The national news media calls for improved educational and product quality and workers with a competitive edge. We have admired the Japanese Quality Circle. Yet, many vocational education project “quality circle” in place and demonstrate it through laboratory projects.

Quality does not happen by coincidence. It is the result of a well planned, four step sequence of classroom instruction, demonstrations, student try-out, and practice. Projects provide an excellent vehicle which transplants abstract theory into practice. Well planned projects encourage the development of life skills in problem solving, applied mathematics, time management, and real economics. Projects also foster an understanding of productivity, work, craftsmanship, and individual responsibility. I am continually amazed that you, as a vocational agriculture instructor, can take “Cinderella" students and help them to develop these skills and understandings.

When selecting projects, we should consider several criteria questions. Are the skills required an outgrowth of our instructional goals and objectives? Is it a safe activity? Is it reasonable in scope? Is it economical? Does it have utility? There are several sources of ideas for laboratory projects, such as Instructional Materials Laboratories, Research Coordinating Units, Cooperative Extension Service, (Continued On Page 4)
Too, you can share the satisfaction that comes as you watch the student's expression as their engines start or their pom-poms blossom.

The Cover
Quality projects are undertaken in many instructional areas of vocational agriculture which develops much pride in the students. (Photographs are courtesy of John Wallace, Ava, Missouri; Robert Pearcy, Vassal, California; Willbut Chancellors, Arcton, Mississippi; Richard Makin, Edenburg, Pennsylvania; and Joe Farrell, Hill City, Kansas.)

THEME
Competent Students Through Quality Laboratory Projects

"In these days of adversity it is well that we take time to check up on our agricultural mechanics teaching. All vocational education is undergoing the acid test. Continually we hear rumors of reduced salaries and curtailment of programs. We must do an excellent job. In other words, we must justify the course in the community in which we teach. To do this is necessary to organize our work to fit the needs of the community."

Does this sound familiar? This statement is the echo plea for quality which has been with us for many years. This particular quote came from the October, 1932 issue of The Agricultural Education Magazine. Although the subject matter and technology is as relative today as it was when it was written, the problem that agriculture has progressed as fast as it has in the last 50 years is in part due to our forefathers' commitment to those ideals.

We, as vocational agriculture teachers, must also hold fast to those ideas stated above if we are to prepare students for employment in today's agricultural industry. In preparing students for careers, we use classroom and laboratory instruction, supervised occupational experience (SOE) programs and the FFA. Laboratory projects can be a way of practicing and developing skills learned in the classroom and/or laboratory. Laboratory projects can also be used by students to meet their needs for SOE programs. When selecting lab projects, teachers and students should carefully select those projects which are consistent with the philosophy of vocational agriculture and reflect a current level of technology and practice in line with students' career goals.

Concerns & Problems with Project Selection
There are several major concerns and problems teachers face when selecting laboratory projects. When you are faced with project selection, ask yourself these questions.

Are the Projects Purposeful?
Teachers cannot teach everything that students must or should know. Thus, it is important to select content and laboratory activities which can best meet the needs of students and lay the foundation for future skill development and learning. Research is one source of information upon which to base selection of content and laboratory activities.

Research which has been conducted to determine jobs performed by farmers, tractor mechanics, greenhouse operators or managers and others, can be a source of this information. For example, Crable analyzed the jobs performed by two John Deere tractor dealerships in Mississippi. By knowing what jobs are being performed in tractor dealerships, teachers can better prepare students for employment in those businesses.

You do not need to conduct an elaborate research project like this one. There are results of research projects similar to this one that are available for your review, synthesis and adaptation to your program. If related research data are not available; then you can, through an advisory committee, prepare an instructional outline and a project plan and proceed from there.

What are the Logistics of the Project?
After deciding that a particular project is relevant, several other concerns of equal importance need to be addressed. These concerns, relating to the problem of logistics, should be asked and answered long before the project begins. In determining about a project, these points should be considered: Who will furnish the materials? Is there enough space for all the students to work safely? Is there enough space for all projects? Will the project obstruct other classes? Are there enough tools for students to work at a satisfactory pace? Will specialized tools be required? Will students be able to complete the project in the allowed time? How will materials or parts be ordered; in what quantities? Will materials or parts be ordered individually or in groups? Will students be working individually or in groups? And last but most important of all, is the project safe?

What Resources are Available?
Three aspects of resources that cause teachers concern is money, facilities and materials. These are very real concerns and much that can be said about funding except that it is a function of local and state attitudes and priorities. We do need to spend wisely what we have.

The importance of program planning can be seen when the school year is half gone and 90 percent of the funds for the programs are spent. The cost of materials or parts for projects is one big drawback to many programs. In the past, teachers have encouraged students to bring projects from home. Today, with the diverse background of students, it is unreasonable to expect all students to provide their own projects. In recent years, FFA Alumni and young farmers chapters have aided in providing students with materials. There can be problems of suitability of projects acquired this way.

Teachers can, however, look to the community for help. In most communities there are businesses or factories which have a by-product or scrap which could be useful to your program. One of the most needed materials for laboratory projects is metal. Places that sell metal sometimes have scrap bins which are filled with odd lengths which have been scrapped. These can usually be acquired for a reasonable price. Some factories will provide material to the schools and some will swap.

There are hundreds of possibilities which exist and you may never know until you have a proposed search. You can find out about possible donors by word of mouth, through advisory committees or by scanning a manufacturers' directory. Once you find a manufacturer or a factory, you can be sure that they are aware of it. Business and community members are aware, if they are not they could tell you, that the Internal Revenue Service recognizes deductions for donations to schools and institutions.

Improving Projects
Teachers are in a difficult position. As the prime mover in the program, they are to weigh the concerns they have discussed and decide what projects to attempt. When the problems are to do with materials, tools, space, and money are of little or no concern, then selecting quality projects that can meet the students needs is easier.

One way that teachers can work to make their program is to standardize projects. Standardizing takes the responsibility off the student for finding project ideas. It can be advantageous for both teachers and students. The major advantage is that students can each have experiences with better supervision from teachers. Students completing a program (Continued on Page 6)
In 1947, the Hill City Vocational Agriculture Department inherited a 160 acre farm. This farm, located nine miles south of Hill City, has been a blessing in disguise for the youth of Graham County. The FFA chapter began farming the land on a 1/3 to 2/3 basis from the vocational agriculture department in 1953. As a tenant farmer, the FFA started without any equipment of their own. They had to rely on the individual FFA members and their parents to furnish the needed equipment to carry out the farming operations. With the two-thirds share of the crop, the FFA chapter began investing the profits in farm machinery of their own. They have continued this practice as well as securing loans from the department to build an inventory of over $60,000.

Wheat and milo are the major crops produced on the farm. Fields of grain and a few pumping oil wells are the concrete signs of prosperity on the farm. However, a more unique type of prosperity has been reaped from the farm. This is the knowledge which the students have acquired from this learning laboratory.

Providing Practical Experience
Many of the students do not have a production agriculture background. Usually farming is a new experience for them. They must be taught to operate the tractor and various pieces of farm machinery correctly. To accomplish this, one of the tractor operators has a special seat mounted on it for the instructor. The student is given hands-on training in independently performing the tasks, but has the security of knowing the instructor can assist with problem situations. Once the competencies and confidence needed to continue are developed, students are permitted to work on their own. For an experienced operator, this usually takes about half a day. Operating the hydraulics, using the turning brakes and manipulating the tractor and equipment on turns are a few of the basic maneuvers they must learn.

Along with learning to operate the tractor and other equipment, students also get legion?r mechanics lessons. Most of the equipment was purchased used; therefore, the unavoidable repairs and adjustments are made as the need arises. Learning to properly service the tractor and machinery is also a valuable part of the students' learning experiences. The students who have learned to operate equipment are elected farm area leaders by their classmates. Employers want student workers who know how to operate, adjust, and care for the equipment with which they are working.

Cooperatives Are Formed
Another area of student involvement in our farm operation has been designing and constructing attachments for the farm equipment. Examples include the anhydrous am

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The School Farm: Educating Through Laboratory Experience

(Continued from Page 7)

monia tank mounting brackets and applicator, tredders for the undercutter, and a special tool bar for mounting the minimum Tillage "buffalo planter."

The students working on the school farm are paid an hourly wage. Our pay scale starts at $2.50 and goes to $3.00 per hour, depending upon experience. The chapter retains 20 percent of all wages and places the money in a labor cooperative fund. They are paid dividends of 6 percent on the money in the cooperative, plus the money being paid to the FFA in September following their graduation. Most of the graduates choose to use the money from the labor cooperative to pay their chapter dues for the next three years. Some have applied their earnings toward purchasing a life membership in the FFA Alumni.

To give members a feeling of ownership, a wheat coop- erative was formed on a 10 acre of wheat. The students purchase $5.00 shares in the wheat crop. When the wheat is harvested, the student is paid by voting for whether the wheat will be sold at harvest time. The profits for the wheat cooperative are calculated at the time of sale or September 1, whichever comes first. As students graduate, their stock and dividends are repurchased by the incoming freshmen. The income the FFA receives from the sale of shares has been some of the money that made possible our farm machinery. This cooperative arrangement stimulates a great deal of interest in the members and gives them a feeling of ownership.

The students are eager to be a part of these cooperatives. They reap financial rewards as well as becoming actively involved in the farming operation. Long after they have graduated, alumni often recall events in which they were involved on the chapter farm during alumni gatherings.

The cooperative attitude is also evident in the FFA ex- ecutive committee which serves as the board of directors for the chapter farm. Their responsibility consists of making many decisions and presenting major problems or ideas and suggestions to the chapter. The executive committee also plans activities and programs that help make the chapter farm a success. The committee helps in the decision-making process and in planning activities.

Teaching on the Farm

The farm is an excellent teaching aid in illustrating crop production techniques. Planting dates, variety selection, fertilizer trials, insect control, weed control, and other problems can be observed on the field trips taken to the farm. First hand information is available through the students, as they share their actual experience from the previous year.

Finally, the harvesting, storage and marketing of the products of the students' toil complete the production phase of the farm operation. Students living on farms may have the opportunity to gain this experience at home, but for the town student the chapter farm gives the classroom-related study a real meaning.

As the students master the production aspect of crop production, they become more involved in the management phase of the farm. Making marketing decisions is a very challenging task for high school students. Deciding when to market crops is one of the highest in the school term. It is one of the most critical decisions which must be made.

The students are also taught from several other options available to them. Should part of the crop production be marketed through "Promark," a marketing program offered through Farm and Home, an All American student will take out an option on the home receipt? This last method will offer a lower price at the time of the sale but will not allow the option of re-educating the loan and selling the grain at a higher price when the price is high.

These experiences become as real to the students as they do to the farmers in the area. Over the years, the students have had to make decisions affecting the farm operation as it relates to the various government programs that have been offered. They certainly learn more about these programs as a result of the decisions they have to make as it affects the chapter farm.

To help with such decisions, the department purchased a computer that has become useful to our farm operation. Crop analysis information and a program that assist in determining the advantages and disadvantages of entering the FIP-program are just two examples of computer uses on our farm.

The FFA is a member of the local cooperative, so we are able to experience first-hand the benefits of doing business through the coop. The dividend checks received from the coop make a lasting impression on students.

Conservation Practices Employed

Sound conservation practices have been implemented on our farm. With the assistance of the Conservation Service, a wide variety of soil and water conserving structures and practices have been established. Two types of grassed waterways were needed and a willow bottom is being utilized.

These waterways, a flat channel and a parabolic, have a water pit at the outlet end. The object of the pit is to provide a water supply for wildlife. A variety of terraces can be observed on our farm. This was purposely done for educational value. Students can compare level, grade, flat channel, and parallel terraces and see how they control water erosion. When the terraces were constructed, we had some of the level terraces constructed from one side and others were constructed from both sides. In this way students were able to observe the methods used and what kind of equipment was required to construct various types of terraces.

Since some areas of the farm had slopes too steep to farm safely, these areas were seeded back to thirty-eight different varieties of native grasses by the students. These grass plots have been a source of study and comparison for several years. The tall varieties also make excellent cover for wildlife which we have attracted to our farm. The soil conservation and wildlife plan on our farm has been maintained through crop rotations, strip cropping, stubble mulching, wildlife plantings, brush piles, and food plots.

A Part of a Total Program

The farm has been useful for our FFA chapter program of activities. We have tied various areas of our program of work into our farm plan. These areas include numerous events.

SUPervised OCCUPATIONAL EXPERIENCE PROGRAM (SOEP) — The farm provides a work experience program for FFA members not living on a farm.

COOPERATIVE ACTIVITIES — Through our farm we have been able to work with the Soil Conservation Service, Extension Office, seed companies, and an area experi- mentation station. We have also been a Christmas tree coop- erative with a neighboring chapter.

COMMUNITY SERVICE — Various groups tour our farm every year. The soil conservation office takes all county (high school) students to our farm to see conservation and wildlife practices each year. The two hour tour through the farm consists of presentations and questions and answers sessions led by FFA members. We also plant wheat and sorghum demonstration plots for area farmers to view and compare.

EARNINGS AND SAVING — The farm has been a helpful source in providing ample funds for chapter activities.

RECREATION — Recreation on our farm consists of hunting. Our wildlife habitat program has improved hunting conditions in our farming area.

PUBLIC RELATIONS — The activities on our farm have been a major part of our yearly thirty minute television program during National FFA Week. We have also presented talks to various groups. We have included pictures of our activities in our banquet program. Our local and school newspapers do a tremendous job of keeping our organ- ization in the limelight.

ALUMNI — We have received a great deal of help and support from our alumni. We rely on them for use of farm equipment, seed samples, and assistance with our conser- vation projects.

SAFETY AND BUILDING OUR AMERICAN COM- MUNITY (BOAC) — Our award winning safety and BOAC programs had their origin on the chapter farm. We promoted safety through fire extinguishers, slow moving vehicle signs, agriculture chemicals, and conducting a farm wives safety day. Some of our BOAC awards were achieved through wildlife conservation and community beautification programs.

The teacher must be careful not to regard the school farm as a substitute for the student's individual supervised occupational experience program. With guidance from the instructor, the school farm can supplement the student's SOEP and also serve as a meaningful teaching aid.

The students have the opportunity to apply field trip concepts as well as classroom concepts to their own SOEP program.

Impact on the Teacher

The school farm justifies the summer program of an in- structor, but it also limits other areas of accomplishment. Undoubtedly, the biggest drawback of a school farm is the amount of time the teacher has to be available to work on the farm. The teacher must be present everyday, and sometimes even at night, when the students are working on the farm. We have reduced this time somewhat by hav- ing two tractors with equipment that can be used at the same time. Although having more equipment adds to the cost of operating the farm, it does provide more learning experiences for the students.

The school farm gives the instructor a “Learning by Doing” situation. One of the aspects that is often overlooked is the educational value an instructor will receive from managing the farm. The farming experiences give a better understanding of the farmer's problems. Supervi- sing and managing a farm provides first-hand information and facts needed to determine necessary production goals and to recognize the standards of efficiency needed by a farmer to stay in business. This knowledge and understand- ing will be taught to the students.

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SEPTEMBER, 1983
Quality Laboratory Projects: Occasion or State

A purpose of vocational agriculture is to teach salable skills that lead to gainful employment in agricultural occupations. What difference does a feed scoop, brooder, a bunch of poinsettias, or any of an endless list of laboratory projects make? Why do teachers simply not instruct a student in how to pot, water, and fertilize poinsettias or how to properly use a hammer and saw?

Obviously, the student involved with laboratory projects is comparable to the physician without patients. In both cases, much time, effort, and money have gone into skill development with no useful outcome. Neither the student nor the doctor can practice the knowledge and procedures that he or she possesses.

Are your students engaged in quality laboratory projects or "do-what" skill development with no end product? Ideally, quality laboratory projects are a goal of every vocational teacher. Four aspects of laboratory projects in the total agriculture program are:

— the basis of quality laboratory projects
— instruction for quality laboratory projects
— advantages of quality laboratory projects
— the importance of quality laboratory projects today.

What Makes a Quality Laboratory Project

A quality laboratory project is a useful, observable end-product that evidences proficiency in certain agricultural skills and knowledge. Such projects are characterized by planning, meeting, or exceeding predetermined standards of excellence.

Some agriculture teachers initiate and supervise poor laboratory projects. Even worse, there are agriculture programs rooted in alleged laboratory projects that are nothing more than busywork or at best, custodial responsibilities. Firing cafeteria chairs, plowing snow, mowing grass, pouring and curing sections of concrete for the principal to use at home. These and other "projects" are very limited in their value as a structured learning experience.

Quality laboratory projects can begin with either the teacher or the student. Regardless of origin, planning is the cornerstone for success. Although important to a quality laboratory project, teachers all too often consider the dimensionless drawing an adequate plan and turn the student loose. For any undertaking to be successful, there must be a plan outlining the purpose, resources available and needed, procedures, evaluation, and hopefully a time table. Student laboratory projects are no exception and are more apt to possess quality with prior planning than those based on the plan-as-you-go process.

Quality laboratory projects meet or exceed predetermined standards of excellence. Again, these standards can be outlined by the student, teacher, or both. It is essential that the standards be understood by the student prior to the beginning of the project. During the evaluation of the project, the student should lend input.

Lastly, laboratory projects are not restricted to agriculture mechanics. Quality laboratory projects can also be adapted to the greenhouse, land laboratory, forestry plot, or home farm.

By RICHARD C. MARRS

(Editor's Note: Mr. Marrs is a former Vocational Agriculture Instructor at Abbeville-Perry Area Vocational Technical School, Eldenburg, Pennsylvania. He is currently beginning graduate study at The Ohio State University.)

Instruction For Quality Laboratory Projects

Quality laboratory projects begin with quality instruction. However, is it wrong for a teacher to totally repair a small engine rather than having a student in a trouble-shooting approach? Should a teacher occasionally construct a literal arrangement that meets industry standards? Should all students work on projects for other than a demonstration? A teacher must establish credibility with his or her students in terms of tangible projects as well as explanatory demonstrations. There is a distinct difference between demonstrating a correct head and designing and welding the table for that demonstration.

As a teacher, you need to prove your ability to complete a quality project with quality being a primary concern. Observational learning takes place in your classroom and laboratory each day that you teach. Teachers are examples for students and quality in their work will help to insure quality in the students work also.

Once a teacher learns more about his or her students, and in particular what motivates them, competition can enter into the picture. Competition can be used as a catalyst for quality projects. In some cases, a comparison and close scrutiny of both sister boxes can bring sustained efforts at meeting or exceeding the standards for the project. Interestingly enough when it is understood that an outsider or peers themselves will determine the best, quality can nearly become an obsession.

Other students may respond better to the anonymous challenge. Upon entering the laboratory, students find select silk flowers designed in a horticultural design. Curve the materials or project. In your classroom, "do you do better with the same materials?" Results can be surprising. Again, the anonymous designer may be a retail florist, another student, or even you.

In any case, quality laboratory projects can become a state rather than an occasion when rightfully recognized. The means for arriving at this end are countless: exemplary laboratory projects displayed at the local fair; the FFA banquet, or in the school superintendent's office; a newspaper article highlighting quality laboratory projects during the FFA week; or a county-wide contest to determine the outstanding laboratory project. Regardless of the approach used, it is not the teacher or school that should be recognized, it is the student.

Commitment Through Quality Laboratory Projects

Students will benefit most from quality laboratory projects. Skills are honed and confidence grows. There are also other somewhat subtle advantages to quality laboratory projects. One of these, commitment, is extremely important to the well-being of the agriculture program.

Quality laboratory projects can insure commitment from the school and the community. When a school administrator or board member pays the unexpected visit, which is almost sure to bring a positive image, a student may have the confidence to ask, "Why have we turned the wood lathe or a portable farrowing unit?"

There are too many projects that do nothing for the credibility and reputation of the program or instructor. Commitment can be measured by the following as a guideline in regard to laboratory projects. Each instructor should be sufficiently satisfied with

Students can complete projects while developing unique creative skills.

the quality of a project to the extent that he or she could comfortably withstand the presentation of that project to parents, other teachers, or school administrators as typical of the agriculture department.

Again, such a standard would benefit most the student. At the same time, those projects greatly benefit the agriculture program in schools where budgetary cuts may well pit vocational areas against each other regarding funding for materials and supplies, equipment, field trips, or even as a course offering.

Going one step further, the life of the school is and must be closely related to the life of the community. With this in mind, teachers can use quality laboratory projects as a natural public relations tool. Quality laboratory projects can strengthen the position of the agriculture program in the community. People become aware of what the vocational agriculture means and is doing. The new park benches, fences for the school barn at the fair, gourd residential landscape designs, and bluebird nesting boxes for a conservation project provide ways to contribute to the community than through quality laboratory projects. At a time when community support is growing increasingly important, agriculture teachers can ill afford anything less than quality in any aspect of the agriculture program.

Quality Laboratory Projects Today

Due to the nature of today's agriculture student, quality laboratory projects are more important than ever. First, school enrollments are declining and so are or will the number of vocational agriculture students. Programs may be cut. What justification is there for a vocational agriculture department experiencing a continual decline in members with those who are enrolled not capable of quality work? It becomes imperative that all or most students can perform "quality-wise." A decline in enrollment will produce smaller classes which in turn can lead to improved student achievement in the basic skills (Gardiner and Shakeshaft, 1953). Critics will be quick to point out that this improvement should be visible in laboratory projects.

Secondly, agriculture teachers are no longer dealing (Continued on Page 14)
Quality Laboratory Projects: Occasion or State

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with students predominantly with farm backgrounds. Generally, farm students had a good understanding of the quality concept upon entry into the vocational agriculture program. Anything less than quality work meant fewer dollars on the farm. Students today may not identify with a farm or agriservice and so overlook the importance of quality while striving to simply achieve skill development. The quality of American products is said to be diminishing. It is ironic that corporate executives are spending time and money to study Japanese strategies and practices to insure quality and industrial settings. In the United States is to continue to pace the world in agriculture production and the agriculture sciences, quality must remain the watchword. Are individuals in your classroom charged with this tremendous responsibility? As teachers of agriculture, we cannot allow quality to erode from laboratory projects or any component of the agriculture program.

References


Organizing, Operating and Financing Laboratory Projects

What is a successful laboratory program? Is it a program that builds several big projects? Or is it one that builds a few smaller ones and teaches skills? How do teachers determine what constitutes an acceptable laboratory experience for students and also fulfills some of the project needs they have at home? How are these projects financed? Where is the money to be raised and equipment to be found? These are some of the questions I asked as a beginning teacher and are problems many of us still face. Building a successful laboratory program is not an easy task. It takes a great deal of planning, organizing, negotiating, and many hours of hard work.

There are many variables with which each teacher must deal. No two teaching situations are the same. Each teacher must analyze the local situation, list priorities, and work with the administration to implement them. The success of a program will be based on the quality of the student work, the skills he/she learns, and the financial soundness of the program.

Quality laboratory projects fit into regular instruction. They may be a supplement to Supervised Occupational Experience (S.O.E.) programs or may be used as foundation skills to be further developed by post-secondary training.

How We Operate Our Program

Being in the Ozark hills, we engage primarily in livestock, dairy, hay, and pasture production. Most of our laboratory projects are items to be used in these areas. We are a two-teacher department with an enrollment of 102 students, most of which come from the farm. Each first-year student receives 6 to 9 weeks of actual laboratory experience. After 2 years of a regular classroom instruction, and demonstrations, each student completes four basic skills: arc welding, oxy-acetylene welding and cutting, power and hand tool maintenance, and cold metal fabrication. Only after satisfactorily completing these areas are students allowed to construct a laboratory project. This project must relate in some way to their S.O.E. program. What they build is also determined by their competencies, their needs on the farm, their ability to finance the project, and by how much time is available. Second-year students develop advanced skills. They have more laboratory time and build more complicated and expensive projects. Third- and fourth-year students are involved in advanced laboratory classes. Specialized agricultural courses include Construction, Mechanics, Structures, and Power. These courses can either have larger individual projects or class projects to be made and sold.

Financing Laboratory Projects

Financing may be a stumbling block to a successful program. Many instructors are faced with shrinking budgets. At the same time, the need for tools, equipment, and materials keep going upward. Yet, we are expected to maintain the same standards as in the past. Our laboratory programs should not be expected to make a profit. Nor should we compile insurmountable deficits. Some departments are unable to manage their operating funds. The key to a financially successful program is to work out a suitable operating budget with administrators. The awareness and support of these people are essential for quality laboratory programs. The need for materials should be presented by realistic data. The current laboratory situation should be correctly presented. Then, submit a list to upgrade the program. This plan might include these budget items:

1. Tool and equipment purchases. In many states, federal formula money is made available to vocational departments for this purpose. In Missouri, state matching funds are provided, upon approval, to help purchase equipment. The amount of these monies vary each year. Local school money may be needed to supplement this budget area. Needs should always be ranked according to priority.

2. Upkeep and repair of tools and equipment. Of what good is a new Cadillac if there is no fuel to operate it? By the same token, what good is a laboratory ful of tools in need of repair? Equipment should be kept in good working order. A reasonable amount of money should be set aside for this purpose.

3. Supplies in teaching basic skills. Before project construction begins, the basic skills of that area must be taught. Consumable materials are used without a way to recover the cost. This should be pointed out to administrators. These costs should accurately be estimated. It does not take long to use several dollars.

4. Resale supplies and materials used in project construction. This budget area will require the most money to operate. The raw materials needed for project construction should be estimated, include in this amount the supplies used to work with these materials such as electrodes, saw blades, oxygen and acetylene. By using a cash flow record keeping system, the teacher should keep a running balance of the resale account.

These accounts should be budgeted under four separate codes, if possible. This will simplify record keeping and indicate clearly how much money was used in each area. Copies should be kept of all purchase orders, and sales tickets when recorded.

How Much Supplies and Materials Should Be on Hand?

This depends on your situation. Money can often be saved by buying in volume. If the facilities have ample storage room and there is a well-planned budget, the instructors should buy in volume. More planning is required when buying this way. If facilities and budgets are small, suppliers should be brought as they are needed. If there is a convenient local source, you may choose not to tie up large amounts of money. A teacher can overstock, thus spending an entire budget leaving no additional money until previously purchased items are used and resold. A good supply of nuts, bolts, screws, nails, paint brushes and paint may be kept on hand. This will reduce those countless trips to the hardware store.

What the Student Should Provide

Students should provide materials for project construction not available in the department. A teacher should not spend time running errands for the students when they could be doing more important things.

The students, if possible, should provide their own measuring tape. School owned tapes have ways of disappearing during the year. If the students furnish the tape, they show that they also care about the project.

If suitable project plans are not available, they must be supplied by the students. The instructor should check each plan carefully and give approval before project construction begins.

Do not discriminate because of a student's economic situation. When building smaller projects, the instructor should try to find a way that disadvantaged student to work out the cost. Perhaps extra work around the department can be done by the student. The cost can be absorbed if necessary. The pride of completing that first project and taking it home gives self-confidence a boost. When the students advance to more expensive project construction, they should be allowed to build projects financed outside the department. The students may also construct items to be used in the department or work on a B.O.A.C. project built in the laboratory.

Always give an estimate of the cost of a project before construction begins. This will almost eliminate unpaid accounts and unclear price list should be posted for the students. When calculating project cost, an additional 20-30 percent service charge should be included in each bill for the consumable supplies. This is an easy way to recover some costs without guessing.

Keeping a resale budget in the black can be a difficult task. Several projects can help maintain a solvent account. Accurate records should be kept. Every purchase and sale should be recorded. Values for all supplies and materials used in small quantities should be identified. An accurate inventory of supplies and materials should be maintained.

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At the completion of the academic year an inventory should be made. All receipts and expenses should be totaled and the balance or deficit should be compared to the value of supplies and materials remaining in inventory. A balance of plus or minus $200 is a successful operating year. Any deficit exceeding that figure could warrant further auditing to determine the cause.

Cutting Cost Corners

The inflated cost of supplies, materials, tools, and equipment has reduced the purchasing power of the budget. Therefore, devising ways to save laboratory project money is even more important. Saving a few dollars here and there can amount to a considerable sum over a school year. Some ways to stretch the dollar are:

1. Laboratory equipment can be built. Many items used in a laboratory could be constructed rather than purchased. Wood and metal storage racks, arc and oxy-acetylene welding stations, test cabinets, work benches and electrical display boards are just a few items that can be built much cheaper than purchased.

2. Shop for supplies and materials. This can require more time but the benefits can be great. The instructor should shop as though it is his or her money being used rather than the school's.

3. Used materials should be substituted whenever possible. Not all laboratory projects require new materials to make them functional. Adequate used material can sometime be purchased at a fraction of the cost of new. Salvage materials from local factories, lumber yards, metal yards, or construction. Scrap should be completely used. A department can accumulate a considerable amount of short pieces of metal and wood. Shop projects should be designed to make use of these pieces. Minimizing scrap can result in considerable savings.

4. White elephants should be avoided. Equipment purchased should be planned with ample justification before buying. Industrial quality tools and equipment are the best buy. The increased cost will more than pay in longevity.

5. Tools and equipment that are not functional should be sold. Items that are no longer needed may be sold, upon proper approval, at auction or by sealed bid. This money could be used to purchase needed items.

6. Repair the equipment if possible. Service manuals should be kept to use in repair and for ordering replacement parts.

7. Match student capabilities to the difficulty of laboratory projects. The cost of damaged projects can be greatly reduced.

8. The laboratory should be scheduled during the warmer months of fall and spring. This can result in savings in heating costs to the school, which indirectly could mean more money for the department. Point this out to the administration when presenting the budget.

9. Projects should not be removed until the account is paid. Stress can result from trying to collect a bad debt from a student or parent. This policy should be established early. It will result in considerable savings.

Indirect Savings

Clean, well organized facilities should be maintained. Extra effort should be made to see that the laboratory is the cleanest, best-organized department in the school. When not in use, tools and equipment should be in their proper places and in good working condition. It not only teaches the students good work habits, it indicates to the administration and public that the program is well planned and under control. Many teacher's contracts have not been renewed due to lack of maintenance. A $200 or more deficit in tool dollars can be cut severely if administrators consider the laboratory poorly managed. On the other hand, budget dollars can be increased for tools and equipment if they are being properly managed.

Organized storage can speed project construction. Less time spent searching for correct tools enhances project completion, thus increasing the turnover of tools. Properly constructed projects should not leave the department. Low quality projects reflect directly on the instructor and program.

Ample time should be allowed for project completion. Many dollars can be tied up in incomplete projects. The taking in of additional outside projects after regular project construction has begun can lead to delays in project completion dates. Policies should be established pertaining to this. A program can be abused by individuals with all kinds of good intentions.

A tight rein should be kept on tool and equipment loan. The well-equipped laboratory can be the source for tools needed by every other department in the school. A strict loan policy should be established using a check-out system. Replacing lost tools can unnecessarily use up budget dollars.

High quality, financially sound laboratory programs are an asset to vocational agriculture. Establishing and maintaining a superior laboratory program is determined by design, planning, cooperation, patience and hard work. Maximum effort in all of these is a prerequisite to achieving a quality program.

THE AGRICULTURAL EDUCATION MAGAZINE

Laboratory Projects As A Stairway to Success

Laboratory projects are one method for students to demonstrate skills previously learned. One important aspect of projects construction is quality. Everyone expects purchased products to be reliable and of sound craftsmanship, and the same consideration should be given in all phases of constructing laboratory projects. Quality projects will have several virtues which set them apart from ordinary projects. Three major virtues are design, craftsmanship and finish.

The design of projects is the foundation of quality projects. Students, with the aid of the instructor, should analyze the functional requirements of the proposed projects according to what the projects are to do, environmental conditions and service requirements. All of these factors are considerations involved in the selection of materials for each projects.

The sizes of the selected materials should be sufficient to withstand the conditions to which the projects will be subjected. Figure 1 shows the construction of the front axle of a four-wheeler wagon using available material. The kingpin and axle have adequate strength for normal usage without specifically being designed by an engineer. If any question exists as to the proper strength of local extension service agricultural engineers can be contacted for further help. Several years of supervising construction and following the usage of projects yields valuable experience to the instructor in selecting proper material.

Good projects will also be original in design. Figure 2 shows three-point hitch carrier. This is unique in financing attachment method. New designs can originate from determining the positive and negative attributes of similar machinery and equipment. The positive attributes can be combined into designs used for projects. Figure 3 shows a hitch for a bale carrier which has been designed by combining positive attributes of other bale carriers.

Craftsmanship

Quality is not an accident, it is the result of craftsmanship. Well designed projects are enhanced by the demonstration of craftsmanship during construction. Shop projects often contain both metal and wood which require similar but distinct skills. These skills are acquired through demonstration and practice prior to construction of projects. Metal working skills such as welding, cutting, joint construction and edge finish are all acquired through practice with guidance. Woodworking skills such as cutting, joint construction and fastening do not occur easily. Metalworking and woodworking skills are not rapidly developed but require time and devotion. If it is desired to have students demonstrate developed skills by frequently constructing of projects, small projects are desirable and can be used to show specific skills. Large projects such as machinery should only be constructed after at least two years of skill development.

An annual inventory of tools and equipment is an essential task a laboratory instructor must perform. Tool serial numbers, purchase dates, and current operating conditions can be included in this list.

THE AGRICULTURAL EDUCATION MAGAZINE

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By James D. Summers (Editor's Note: Dr. Summers is Assistant Professor of Agricultural Engineering at Oklahoma State University, Stillwater, Oklahoma 74074. He is a former vocational agriculture student who participated in the National FFA Agricultural Mechanics Contest and exhibited the Grand Champions Farm Mechanics Project at the Minnesota State Fair.)
Once the competitive environment has been established, the students will strive to construct quality projects.

Useful Skills
The ultimate result of the time and effort invested by students in quality shop projects will be an asset to them in the future. If they are personally recognized for their efforts, they will be encouraged to continue the quality work. The students will build confidence in their abilities which will be future attributes when seeking employment. Employers look for people with experience and who demonstrate the ability to learn. The success in constructing quality shop projects demonstrate experience and skills necessary for employment after completion of high school. For people continuing on to post secondary education, the experiences obtained in constructing quality projects will give them a competitive advantage after completion of their higher education.

Quality projects are media through which students can mature and learn. The benefits of constructing quality projects are satisfying in the short term but are assets in the future. One of the best ways to inspire students is to emphasize the success of prior students. The remainder of the inspiration rests on the instructor providing constructive remarks throughout the development of projects from planning to completion.

Agriculture Mechanics: Pride, Workmanship, and Quality

Twelve years ago, I started teaching vocational agriculture and, after two years of dividing my time and efforts in many different areas, I began to work more with agriculture mechanics than with plant and animal sciences. By putting my interest and skills in an area that I enjoyed, I began to feel like I was accomplishing more as an agriculture teacher.

I could see progress from day-to-day on various projects in the laboratory and evaluate my progress and teaching technique as students completed their work. I suppose that over the past few years I have tried most of the teaching techniques offered by the experts but not all techniques work all the time.

If I had to choose one thing that has inspired students to construct quality projects, I would choose "examples". By this, I mean show students that something can be built and the ideas are theirs to develop.

Each year as our freshmen enter school I asked numerous questions such as, "Was that trailer built here?", or "Where did you get the idea to build that spray rig or wood splitter?" New students do not realize that top quality work on large involved projects can be done by high school students. By providing examples of projects and ideas, students can readily see that they too could build large complicated projects.

Students experience a tremendous change in their lives from the time they enter high school until they graduate four years later. They begin as immature individuals unable to identify tools, materials, etc. Hopefully, these same youngsters will develop into skilled young people with the basic vocational skills necessary to provide them with employment.

Project Selection

It is hard to describe a project idea by simply telling someone. The old saying "A picture is worth a thousand words", is never more true than in my classes. We have at least 300 different photographs of projects that have been built over the past few years. When students ask me about a project that we have built before, I will refer them to a picture similar to what they have in mind. Usually a picture will help direct them toward a project with certain design changes.

Basic skills are gained during the first two years of vocational agriculture. During this time, students are provided practical experience with shop tools, safety, drawings, welding, cutting, woodworking, painting and finishing, small engine repair, hydraulics, electricity, plumbing, concrete work, surveying and more. I try to provide enough experience in agriculture mechanics during these first two years that the student can return the third year and be ready to start a major project with a minimum of help from me.

When I ask my juniors and seniors what kind of project they intend on building, most students say that they do not have anything in mind. They all want to build and construct some major project but do not have a need for, or the money for such a project.

Over the past years we have gained a reputation for building top quality projects and consequently have numerous people asking us to build various things for them. Usually throughout the summer and fall I will receive requests to build a dorr major items such as livestock trailers, wood splitters, cattle loading chutes, wood stoves, etc.
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These students examine a brake lines and compare it to one they expect to construct.

Information from various companies are on the wall of the classroom. Numerous ideas and projects are illustrated.

Avoid students using each other's metal, wood, etc. For these reasons, I try to provide all the necessary materials for the more common projects.

Financing Projects
If a student chooses a project from the list of things we have been asked to do, or something he or she wants for themselves, certain requirements must be met before construction can begin. Financing seems to be the most important factor when considering a project. Financing can be handled in several different ways. Firstly, nearly all materials are ordered and paid for by the department. I do not encourage students to bring their own materials for projects because it is hard to keep materials separated and half-way jobs are not permitted. Occasionally, a student may have to rebuild a portion of a project before it is allowable to be critiqued for their mistakes. I have told numerous students that it is just as easy to build it right as to build it wrong and the end results will be more satisfying if the project looks good.

If poor quality work is allowed by the teacher, then students will do poor quality work. I feel it is my responsibility to expect the best at all times.

Anyone can frame a small trailer, or frame a feeder or small building but that is the easy part of the project. The hard part is the finish work, the detail painting, etc. For example, a fireplace and even a small wood stove can be framed together and welded in just a few hours, but the front door, trim and finish involve several weeks of work in order to achieve an attractive appearance.

An added incentive for students to do quality work is the opportunity for awards and recognition. I encourage each student in my construction classes to enter the Lincoln Arc Welding Contest. During the year pictures are taken to show the progress and steps in construction of each project. All reports are completed in May and submitted for cash awards. These reports become a very valuable aid to me and my students. The detailed plans aid future students in planning and building similar projects.

Students need to be praised for their work and at the same time need to be challenged. I have told numerous students that it is just as easy to build it right as to build it wrong and the end results will be more satisfying if the project looks good.

Placement in industry is an important aspect of agricultural mechanics. Numerous calls come in during the year for part-time welders, small engine repair mechanics, etc. I am proud to be able to recommend a student to a prospective employer, even more proud when that student is hired and stays on the job for several years. I am proud that I can get my students to achieve quality work and be proud of what they are doing, instructors must be proud of what they are doing. They must be willing to give praise for good work to the student and take the criticism from other teachers and parents for poor work. Fortunately, the criticism is outweighed by praise and satisfaction if they put out a little extra effort. An agriculture teacher can earn the same salary whether he or she does that extra effort or pushing for quality work.

The A-B-C's Of Project Quality

A quality projects begin on the first day students come in contact with a description of the outcomes expected of them. After student personal data forms are completed, we start work on safety tests. Each student is given tests on fire prevention and control, tornado, and shop safety. The fire prevention and control test is designed to help prevent laboratory fires, but also to help the student to know how to control it if one should occur. The tornado test is used to make sure the students know where to go and what to do in the event of a tornado. The shop safety test covers the use of all equipment and the laboratory rules and regulations.

Each student must pass each of the three tests with 100 percent accuracy before going any further in the agricultural mechanics program. The students realize after taking these tests that quality work is a must, even if it has to be done a second or third time to achieve that level.

Basics Are Essentials

Everything has to start somewhere and we start with the basics. What are the basics? Well, the basics for us is starting at the beginning in every area that we cover.

We have three major subject matter areas: welding, combustion engines (small engines), power and machinery. Our welding program is broken down into individual units of arc welding, TIG welding, MIG welding, oxyacetylene cutting, oxy-acetylene welding and oxy-acetylene cutting. Each of these classes meet 2 hours a day, and spend approximately 2 hours on each unit, depending on how fast the students develop, before going to the laboratory for demonstrations and beginning practice. Each unit is taught separately, and each student has time enough to learn the basic operations, characteristics, and skills before going to another unit.

Once the students go to the laboratory and observe demonstrations on different units, they begin practice to develop skills and techniques that will be used later on various projects. The students start out with small projects and work up to larger and more complex projects.

These welding projects start from scratch with design, bill of materials, layout, construction and finish. Each project is graded on the above mentioned criteria plus the amount of time spent to complete the project and the total quality of the completed project. The projects are checked daily, and students are advised as how well their projects are going. Students can ask for advice or help at any time, but the student is responsible for making the final decisions. Quality workmanship is a must and if necessary the project will be reworked.

September, 1983

By Wiliam G. Chancellor
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The internal combustion engine program is mainly used as an introduction to larger engines and to teach operating principles and theory. But we do a certain amount of small engine work.

The power machinery program takes up where the internal combustion engine program ends. Again class time is spent learning the basics and how to use various reference materials. Differences, types of equipment and tools are discussed and demonstrated and the student learns how to use them.

The use of the tractor-use system by Ford Tractor Operators is an excellent teaching aid and a good way for the student to receive individualized instruction.

Projects in the power and machinery program are graded on a performance basis from beginning to end. Some of the projects in this program are engine overhaul, hydraulic system repair, clutch and pressure plate replacement and transmission repair. Also included is machinery equipment repair and refinishing. In this area as well as others quality is essential.

Competition

Competition is one good way of obtaining quality projects and quality performance. Student competition in the laboratory is a teaching aid when you are striving for top quality and performance. Whether it is working on tractors, machinery, or welding projects, my students try to do the best job possible.

We encourage competition within our department, but we also enter other contests such as FFA contests at federation and state levels, the Lincoln Arc Welding Awards Program and the farm mechanics project competition held at our state fair. We have entered 18 projects over a three-year period at the state fair and have won all blue ribbons.

The quality shown up in the projects but also in the students. Each year we work to maintain the quality achieved in former years and set a new standard themselves.

Organization and Finance

Laboratory organization and adequate financing are important aspects of achieving quality performance and quality projects. First off, all, the laboratory should be organized in such a way that the total facility can be utilized. A well-organized tool room or storage room with an ample inventory of needed supplies is a must. In our department, we build a lot of welded projects and use a lot of metal. We have a metal rack for larger materials and a metal storage room for the smaller materials. Both of these are located inside the laboratory to help protect the metal from rusting. The supplies used in finishing are stored in the painting and finishing room. All other supplies are stored in the tool room.

Financing laboratory projects can present a real problem. Our department gets the necessary supplies furnished, but when it comes to buying metal, paint, and tractor parts, we have to look elsewhere. We have a 15 percent cover charge, above the cost of materials, for repair projects such as tractor overhaul, equipment and machinery repair, and refinishing. We also build welded projects to sell for small profit which gives us some operating money to buy materials.

The students are able to obtain practical experience instead of just being allowed to weld in a booth. These projects help the community by providing them with quality products at a reasonable price and my students gain valuable practical experience.

The students' interest and concern for the program is a major factor in obtaining quality projects. If the students realize from the start that the training they receive will help them in securing a future job, they usually make the changes necessary to fit into the program.

The students learn various employability skills which will give them a better chance of securing a job. While learning and using these skills, the students are achieving the quality performance and workmanship necessary to produce quality projects.

The students' attitude toward achieving quality projects in our department is exceptionally high. It does not matter where we get our field trips or just visiting, my students are always comparing the quality of other's work to the quality of their own.

Pros and Cons

The advantages of project construction by students include:

1. Students are forced to plan — existing plans may be adopted or students may develop their own plans.
2. Material calculatons — the students learn to produce an accurate bill of materials.
3. Project economics — the students learn to determine the cost of a project, and decide whether or not it is feasible.
4. Accountability and efficiency — hopefully, students work more conscientiously and efficiently with purchased project materials than they do with materials commonly used in skill development exercises.
5. Responsibility — in the real world students must learn to suffer the consequences of mistakes; if materials are damaged or ruined, replacements must be obtained.
6. A parallel to the real world — ideally the conditions of building a quality project are very similar to working conditions on-the-job.
7. Amplification of training — project provides an excellent opportunity for students to put into practice newly-acquired knowledge and skills.
8. Pride, recognition and motivation — a well made project can be a tremendous source of pride and motivation for the students, and it is an excellent way to get favorable recognition for both the student and the program.

The disadvantages of project construction include:

1. Storage — Storing partially completed projects can be a problem, especially when the laboratory is used by several other classes during the day.
2. Managerial time drain — There is no question that worthwhile projects may require a tremendous amount of personal supervision (from the teacher, especially when several different projects are developed simultaneously.
3. Financing — Usually quality projects are expensive, and unless adequate provisions are made prior to construction, problems arise. Some students may not be able to purchase the necessary materials. Alternative financing takes time to secure.
4. Scheduling — It is difficult to accurately estimate the time requirements for projects. Assigning individual students to work at different rates. A serious problem occurs when students run out of time prior to completion. Sending a partially completed project home will result in a negative perception of the program.

Recommended Steps in Project Adoption

1. Weigh the pros and cons and make sure the advantages outweigh the disadvantages for each project.
2. Inventory the present use of student projects by type and determine whether they should be continued or discontinued; also, determine if additional projects would enhance learning.
3. Assess the limitations and abilities of the students, facilities and equipment, budget, and the teacher.
4. Identify the interest and needs of students, school, and the community.
5. Assess the goals and missions of: the school and the local program.
6. Blend projects with teaching units. The haphazard approach must be avoided. Projects should be related to recently completed instruction.
7. Determine each project's educational worth, cost, time requirement, feasibility, and relation.

Project Worthiness Criteria

Before a particular project is cleared for construction, the following questions must be answered:

a. Does it have educational utility?

b. Does it have a practical application?

c. Does it have home, farm or community utility?

d. What is the cost/value ratio?

e. Will it result in positive relations?
f. Is the project appropriate compatible with the program's overall purpose and mission?
Stories in Pictures

When identifying project ideas, a picture is worth a thousand words. (Photograph courtesy of Robert Pearcy, California.)

Adequate storage for salvage material saves money and time. (Photograph courtesy of John Wallace, Missouri.)

Planning and cooperation are essential life skills. (Photograph courtesy of W.G. Chancellor, Mississippi.)

The vocational agriculture instructor must carefully supervise quality projects. (Photograph courtesy of Verlin Hart, Oklahoma.)

Quality projects provide valuable experience and a source of income. (Photograph courtesy of Joe Farrell, Kansas.)

This trailer, a premium winner at an Oklahoma State Fair two years ago, was built by the Broken Arrow FFA Chapter. It now takes its place as a useful piece of equipment. (Photograph courtesy of Verlin Hart, Oklahoma.)