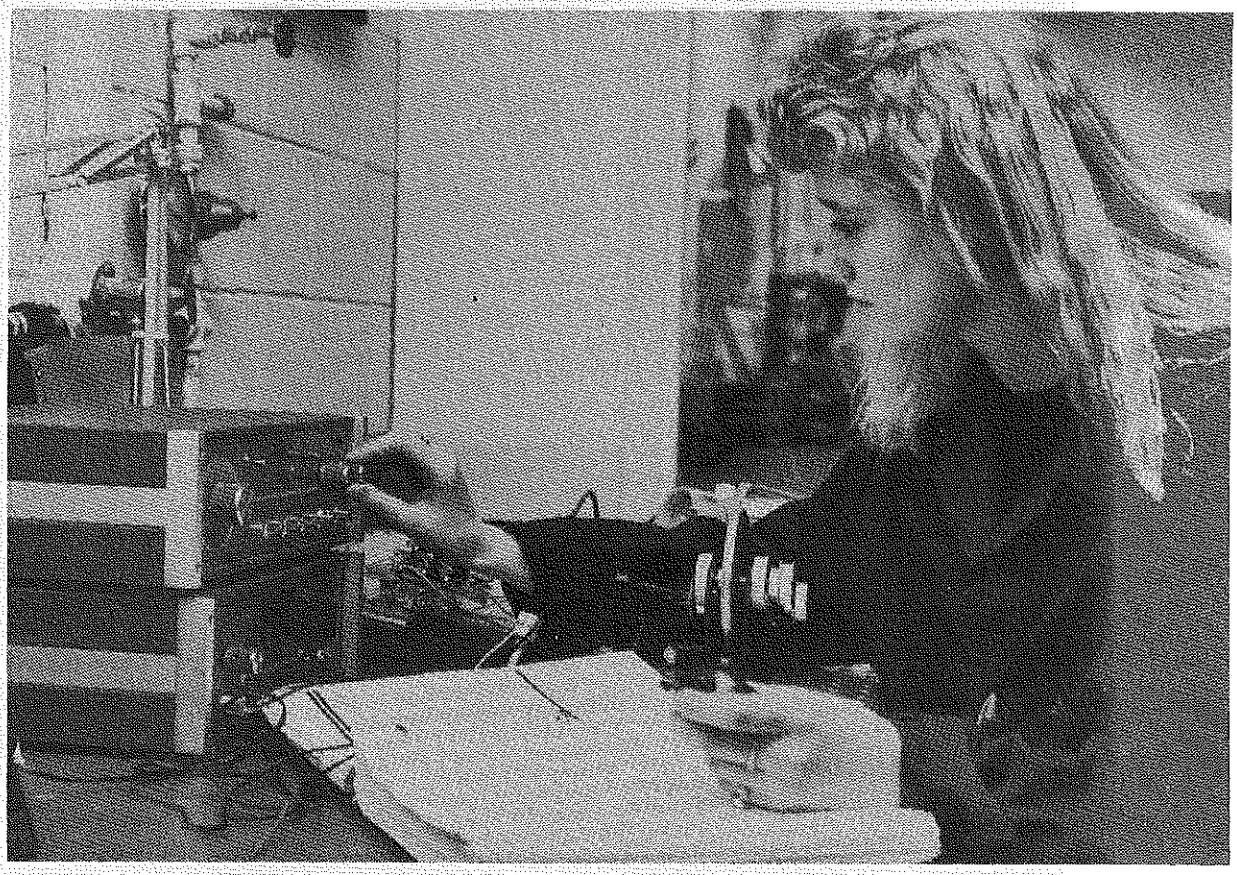
The
Agricultural Education
Magazine

November, 1992
Volume 65
Number 5



Problem Solving/Inquiry Teaching

THE
AGRICULTURAL EDUCATION
MAGAZINE

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PUBLICATION INFORMATION

THE AGRICULTURAL EDUCATION MAGAZINE (ISSM 7324677) is the monthly professional journal of agricultural education. The journal is published by THE AGRICULTURAL EDUCATION MAGAZINE, INC., and is printed at M & D Printing Co., 616 Second Street, Henry, IL 61537.

Second-class postage paid at Mechanicsville, VA 23111; additional entry at Henry, IL 61537.

POSTMASTERS: Send Form 3579 to Glenn A. Anderson, Business Manager, 2441 Suzanne Rd., Mechanicsville, Virginia 23111.

SUBSCRIPTIONS

Subscription prices for THE AGRICULTURAL EDUCATION MAGAZINE are $7 per year. Foreign subscriptions are $20 (U.S. Currency) per year for surface mail, and $40 (U.S. Currency) foreign airmail (except Canada). Student subscriptions in groups (one address) are $4 for eight issues. Single copies and back issues less than ten years old are available at $1 each ($2.00 for foreign mail). All back issues are available on microfilm from Xerox University Microfilms, 300 North Zeeb Road, Ann Arbor, MI 48106. In submitting subscriptions, designate new or renewal and address including ZIP code. Send all subscriptions and requests for hardcopy back issues to the Business Manager: Glenn A. Anderson, Business Manager, 2441 Suzanne Rd., Mechanicsville, VA 23111. Publication No. 73246

Leading The Way

By LON MOELLER,
Dr. Moeller is Regional Editor and associate professor of agricultural education at South Dakota State University, Brookings.

Teaching today includes both good news and bad news. First the good news. Much of what we have been doing in agricultural education for years is now being identified as the "in" thing to do. Concepts of teaching and of learning are changing. Teachers, administrators, school boards, and state departments of education are re-evaluating what teaching and learning are, and we are striving for change.

One of the important changes happening today is the move by many schools and even states to OBE, outcome-based education. We are seeing an emphasis in education that focuses not on models or strategies of teaching, not on hard and inflexible curriculums, not on rigid guidelines for preparing lesson plans, but rather on student learning. We are recognizing that not all students learn the same and that we need to look at changing our instructional methods to meet the needs of individual students.

For agricultural educators, more good news is that we have been working with the concept of outcome-based education all along. From the time that we took our first education course we have learned about the importance of first identifying needed student outcomes. We have learned about behavioral instruction, student-centered curriculums, mastery learning, and learning styles, all of which focus upon students, their learning, and how our teaching should enhance this learning. All of education is now looking at developing programs that focus on student outcomes rather than instructional strategies as the basis for instruction.

Our leadership is needed. Most teachers and administrators are not familiar with the concepts of outcome and competency-based education. They are searching for ways to implement outcome-based education and in many cases are only becoming frustrated. We need to communicate to our fellow teachers how what we are doing with competency-based education fits the idea of outcome-based education.

These two approaches, however, are not the same idea using different terminology. In many cases schools go through a rigorous process to define student outcomes. The result is a listing of outcomes for students at the district, school, or program level. They are stated in terms such as the following: all graduates will live healthy lifestyles, all graduates will be technologically literate, all graduates will be able to effectively communicate, all graduates will know how to learn, etc. Teachers are then asked to ensure that their classes are aligned with these outcomes. In reality, the outcomes are so broad and generic that, with little instructional change, teachers can easily justify that they are meeting the needs of the students. My fear for OBE is that this is where it will end, with few changes happening in the classroom.

Change will take place if teachers have guidance for implementing outcome-based education. Competency-based education is the next step in this process. It is at this level, where individual competencies are identified for each student, that changes in the classroom must take place, if we are really going to see growth in student learning.

Two different views of learning illustrate my point. Most teachers operate from a receptive-accrual view of learning the view that students receive knowledge as it is presented by teachers and accrue it over a period of time. A simplified illustration of this view shows students' minds as partially filled containers into which teachers pour additional information. The opposite view is that students construct their own knowledge using information from all of their life experiences, of which schooling is only a part. Competency-based education endorses the concept that students construct their own knowledge. Because many teachers do not operate from the view that students construct knowledge, and because they are not familiar with competency-based education, we have an opportunity to enhance outcome-based education by showing how competency-based education can be implemented in the classroom. Outcome based education will only succeed if student learning is improved as teachers change their methods of teaching.

Now the bad news. We in agricultural education need to be changing, and this is not easy. For a long time we have been focusing on learning the facts of agriculture. Industries are now asking for →

Problem Solving Instruction: Making Students Gladiators Instead of Spectators

By JIM FLOWERS

Dr. Flowers is associate professor of agricultural education at North Carolina State University, Raleigh.

In ancient Rome, the gladiators occupied a prominent position in their culture. These warriors were known for their courage and for the battles they had won. Thousands of spectators would gather in the arenas to watch the gladiators in action. The gladiators did what the spectators only dreamed of doing, and as a result, they received the rewards that were never given to the spectators in the galleries.

Are your students spectators or gladiators? Boehrer (1990-1991) suggested that often teachers relegate students to the role of spectators, when they would actually prefer to be galdiators. Sometimes this may be true when agriculture teachers present problem solving situations to the students in their classes. Instead of allowing the students to become engaged in working through the solution to the problem, Boehrer observed that teachers are often tempted to take over working the problem and only ask the students to learn the result. Of course, this sends the students into the galleries as spectators, when they belong in the arena — as gladiators!

Philosophical Considerations

Regardless of how long problem solving instruction has been taught by agricultural educators as an effective model for teaching students, problem solving is still considered a nontraditional approach. In the "traditional" model of education, the core concept is teaching, while the core concept of problem solving instruction is learning. With teacher-centered (tradtional) models of instruction the assumption is made that if the teacher does a good job of teaching, learning will naturally occur. Dewey (1933) addressed this problem when he compared teaching to selling commodities. He explained that no one can sell a commodity unless someone is willing to buy. Yet, Dewey observed that many teachers think they have done a good job of teaching regardless of what their students have learned. Student-centered models place more responsibility for learning on the students — they reduce the role of the educational spectator. According to Garvin (1991), student-centered models of teaching, such as problem solving, have been honored more in theory than in practice.

. . . teachers are often tempted to take over working the problem and only ask the students to learn the result.

Problem solving instruction requires that students become involved in the learning process. In fact, Garvin (1991) stated that true education requires students to be involved in the learning process. Those of us who promote problem solving instruction will argue that real student involvement will only occur when students have input in the content, direction, and pacing of their classes. This type of student involvement is a core component of problem solving instruction. Students who become gladiators in our classrooms also serve →

Leading The Way

(continued from page 3)

graduates with skills that go beyond this. In his book, ***America and the New Economy,*** Anthony Carnevale identifies sixteen jobs skills crucial for success. Included are foundation skills to know how to learn, read, write, compute, problem solve, and be creative. In addition, students must have self-esteem, motivation and goal setting skills, personal and career development skills, interpersonal skills, negotiation skills, teamwork skills, organizational effectiveness skills, and leadership skills. Clearly, the task before us is great, and changes will need to be made.

While much work is before us, the really good news is that we have the opportunity to affect major changes in agricultural and general education, and we have the expertise to do so. We can facilitate changes that in the end will provide additional opportunities for students to learn and will enhance our own abilities to be effective teachers. ■

to energize teachers by introducing new ideas and thoughts to all too familiar material.

Furthermore, students must be actively engaged in real agricultural problems that have meaning to them. They should feel the urgency to take on agricultural problems like gladiators. However, real problems are anxiety-producing for students (perhaps for teachers, as well). Because they have been spectators through a large part of their educational lives, students have grown accustomed to having someone provide the answers, and they may need help in developing some of the skills required to locate information and reach conclusions on their own. But retention appears to be markedly increased when learning is solidly anchored in personal involvement in learning (Garvin, 1991). Without some personal sense of investment in reaching a solution, students are poorly motivated to overcome some of the obstacles that accompany genuine learning.

Changes Required To Use Problem Solving Instruction

According to Garvin (1991), in order to utilize student-centered models of teaching three fundamental changes must occur. Using problem solving instruction involves these three fundamental shifts from the traditional model of instruction. In order to effectively use problem solving, a teacher following a traditional approach must change (1) the balance of power in the classroom, (2) the focus of attention, and (3) teaching skills.

However, real problems are anxiety-producing for students (and perhaps for teachers, as well). Because they have been spectators through a large part of their educational lives, students have grown accustomed to having someone provide the answers, and they may need help in developing some of the skills required to locate information and reach conclusions on their own.

With traditional approaches to teaching the teacher is all-powerful, deciding what is to be taught, when it will be taught, and how it will be taught. True problem solving approaches to teaching require a more democratic environment in the classroom, with students sharing in these decisions (Phipps and Osborne, 1988). This is not to suggest that the teacher abandon the role of leadership in the learning process. It only means that the learners have some input into what is happening as they learn.

While the subject matter, or content, is the major focus of traditional approaches to teaching, with problem solving instruction the focus includes the content, the classroom process, and the learning climate. It is not that agricultural subject matter is not important. We must continue to teach valid and up-to-date agricultural content, but problem solving instruction recognizes that the content in agriculture changes continuously and that the process of solving problems may be just as important to our students as the agricultural facts that we may impart.

The third fundamental shift required for successful problem solving instruction is a change in what happens in the classroom or laboratory. Traditional approaches to teaching emphasize declarative explanations (lecture, if you will), with the emphasis on the teacher's knowledge of the subject matter. Problem solving instruction relies very heavily on questioning, listening, and responding. While the agriculture teacher still needs a solid foundation in the subject matter, equally important in the problem solving approach are interpersonal skills and skills in group dynamics. Of course, a lecture may be an appropriate learning activity in a problem solving model, but lecture is less likely to become the primary teaching technique employed.

Epilogue

One of the outcomes of problem solving instruction is that learning is not stagnant; it is ever changing. Conclusions, solutions to problems, and points of view provided by the students are difficult to predict, and surprises are inevitable. Teachers often must react to situations that were not anticipated, which may create some uncertainty. This is why the proper classroom environment is critical. But with uncertainty comes the desire to learn more, for both the teacher and the student, and perhaps this is the real benefit of problem solving instruction.

While we must be concerned with teaching sound agricultural principles, the overarching problem for students is learning itself, for themselves. Agriculture teachers should not only be concerned about the knowledge students carry away from their classrooms, but even more important, the capacity they take with them throughout life for learning on their own! Let's produce gladiators instead of spectators in our agriculture programs!

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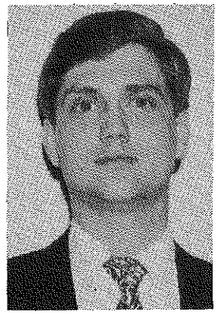
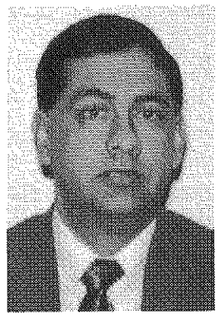
THEME ARTICLE

Problem Solving Teaching: Is It For Everyone?





By BRYAN L. GARTON and JAMIE CANO

Mr. Garton (top) is a graduate associate and Dr. Cano is an assistant professor in agricultural education at The Ohio State University, Columbus.

The problem solving approach to teaching has been the most utilized way of teaching students in agricultural education. Teachers in the profession have found the problem solving approach to be an effective way of teaching students the subject content in a practical and meaningful manner. Through the use of problem solving, teachers of agriculture have been able to relate classroom learning to real life situations (problems) that students may encounter in their chosen field of study.

There is a sense of pride in the profession for the continued use of problem solving as the primary way of teaching. This professional pride has especially become predominant during the past few years. During this time, educators from across other disciplines have been calling for the use of problem solving in teaching their subject matter. Agricultural education takes great pleasure in knowing that others recognize the importance of problem solving and acknowledge what our profession has been doing for years. However, is it possible for every teacher of agriculture to become proficient in the use of the problem solving approach to teaching?

There are two important factors of teaching and learning which must be considered before a teacher can utilize the problem solving approach to its fullest potential. First, agricultural educators encounter a student body that is composed of individuals with different learning styles, personal characteristics, and abilities. And secondly, teachers vary in their teaching styles, personal characteristics, backgrounds, and abilities that influence what methods or approaches they use to teach this diverse group of students.

Let's explore the problem solving approach to teaching, learning styles, and teaching styles. In addition, let's explore the relationship which may exist between problem solving and learning styles.

Problem Solving Approach

A large number of educators in the agricultural education profession have utilized Dewey's process to teach the problem solving approach. Newcomb, McCracken, and Warmbrod (1986), developed a six-step framework for teaching using the problem solving approach. In the first step the teacher creates the need to learn through an **Interest Approach,** which causes students to realize that they do not know enough about the subject matter. Step two is the establishment of **Group Objectives** by which the students identify the goals that they hope to achieve by studying the unit. In step three, the teacher leads the students into identifying the **Questions to be Answered** which are necessary to meet the objectives established in the previous step.

In the **Problem Solution** stage, step four, students seek data and information needed to formulate possible solutions to the questions identified in step three. The fifth step, **Testing Solutions Through Application,** involves the application or "doing stage" of the learning process. In the sixth and final step, **Evaluation of Solutions,** the students evaluate if the solutions solved the problem.

Learning Styles

A student's learning style describes the process that they use to sort and process information. Learning style is an important factor in several areas, including students' academic achievement, how students learn and teachers teach, and student-teacher interaction (Witkin, 1973). A person's learning style "consists of distinctive behaviors which serve as indicators of how a person learns and adapts to his environment. It also gives clues as to how a person's mind operates" (Gregorc, 1979, p. 234). As educators, we must accept the premise that students learn differently and teachers teach differently under a variety of environments and situations. Thus, learning style differences pose a major challenge to all educators.

The most widely studied learning styles have been field dependence and field independence. Research (Witkin, Moore, Goodenough & Cox, 1977) has shown that a person whose mode of perception is strongly dominated by the surrounding field is said to be leaning towards a field-dependent learning style. While a person →

who perceives items as more or less separate from the surrounding field leans more toward a field-independent learning style. Thus, students who are field dependent perceive globally and must look at the entire picture because they are unable to separate items from their surrounding fields. A student who is field independent perceives analytically and is able to look at items separately from the big picture.

As educators, we must accept the premise that students learn differently and teachers teach differently under a variety of environments and situations.

Field-dependent/independent students are described by the characteristics in which they prefer to learn. Field-dependent students prefer to learn in a social orientation. They do their best learning when studying and discussing the content of the lesson in small groups. Because of this social orientation, the field-dependent student is externally motivated and affected more by criticism.

Field-dependent students attend best to subject matter and material that is relevant to their own experiences. When field-dependent students are faced with a difficult task which requires many steps, they are unable to "break up" the difficult task into several small tasks. Due to this inability, field-dependent students are poorer at analytical problem solving. When given an assignment they need the exact directions and are not inclined to be creative. Field-dependent students are highly organized and are very particular about the neatness of their class notes and assignments.

Learning styles are not always clustered into neat packages as described. People have varying degrees of their field-dependent/independent learning styles. They do, however, consistently tend to stay with their preferred learning style.

Field-independent students, on the other hand, are impersonal in their orientation to learning. They would prefer to learn independent of other students in the class. If the subject content can be learned by reading, studying, and analyzing the material, the field-independent student would prefer to study alone. They tend to be good at abstract analytical thinking, making them excellent problem solvers. These students are interested in learning new concepts for their own sake and for the enjoyment of learning. Field-independent students are intrinsically motivated, have self-defined goals, and are less affected by criticism.

A field-independent student prefers to structure the learning situation and tends to be very creative. This student likes to try new tasks without the aid of the teacher and is usually impatient to begin an assignment. They are also very competitive individuals, and because of this competitiveness, they like to finish first.

Learning styles are not always clustered into neat packages as described. People have varying degrees of their field-dependent/independent learning styles. They do, however, consistently tend to stay with their preferred learning style. It is important to note that studies have consistently demonstrated that this level of field dependency is unrelated to intelligence. "Field-dependence field-independence appears more related to the 'how' than to the 'how much' of cognitive functioning" a student possesses (Witkin, Moore, Goodenough & Cox, 1977). Learning style only describes the way in which an individual prefers to learn. Does the way one prefers to learn affect how one prefers to teach?

Teaching Styles

Teaching style is consistent with individual learning style. "Teachers teach the way they learned" (Dunn & Dunn, 1979). Since there is a consistency between learning and teaching styles, we can describe teachers as having either a field-dependent or field-independent teaching style.

Teachers with a field-dependent teaching style have characteristics that are consistent with the field-dependent student. They are socially orientated with their students by encouraging them to cooperate and work together as a unit. They always find something positive to say about each student and avoid the use of negative evaluations. Their lessons are extremely clear with logical steps toward the objective of the lesson. In addition, they are very student-centered. Field-dependent teachers perceive globally, therefore finding it more difficult to solve problems and teach using the problem solving approach.

A teacher with a field-independent teaching style prefers impersonal teaching situations. They make it clear that they are the authority figure in the learning environment and that they are responsible for "guiding," not necessarily "teaching" the students. Field-independent teachers are subject-centered and focus on instructional objectives. They encourage independent achievement, emphasize the importance →

of individual effort, and encourage students to learn through trial and error. The characteristic that is most beneficial to the field-independent teaching style is the ability to promote problem solving, critical thinking, and the inquiry approach to learning.

Learning Styles and Problem Solving

When developing lesson plans, consideration must be given to the environmental influences and the characteristics of the student. Are both the field-dependent and field-independent teacher and student as successful in teaching and learning using the problem solving approach? If all students cannot learn as efficiently under the same approach, then as individual teachers we must make some adaptations to our styles of teaching.

It is important to note that studies have consistently demonstrated that this level of field dependency is unrelated to intelligence. "Field-dependence field-independence appears more related to the 'how' than to the 'how much' of cognitive functioning" a student possesses.

Ronning, McCurdy, and Ballinger (1984) found that field-independent students were able to solve problems more successfully than field-dependent students. The study suggested that field-dependent students benefitted from carefully structured instruction with clearly defined objectives. It was also reported that students' inability to solve problems interacts with their inability to use past knowledge and experiences to help in the solution to the problem (Ronning, McCurdy & Ballinger, 1984).

Summary

The problem solving approach has been the most utilized way of teaching in agricultural education. By teaching using the problem solving approach, teachers in the profession have made the subject matter come alive and become real to the students. Problem solving has given meaning and purpose to the subject of agriculture, thus creating a desire in our students to learn.

If all students cannot learn as efficiently under the same approach, then as individual teachers we must make some adaptations to our styles of teaching.

The concern presented with teaching through problem solving is in the individual learning styles of our students and the teaching styles of the teachers. Also, a concern to teachers in the profession should be the match and mismatch of students' learning styles and teachers' teaching styles. Knowledge of field-dependence/independence should contribute to students' and teachers' ability to utilize their own styles, appreciate the style differences of others, and develop diverse strategies to facilitate success in learning.

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Note from the Editor:

In 1993, we will consider for publication short articles that describe success stories in all types and levels of agricultural education. Examples might inclu de facility expansion, motivating students, learning activities, new course offerings, innovative SAE programs, increased students participation in FFA or SAE programs, or any other facet of teaching and learning in agriculture. Original copy should be no more than 1½ double-spaced, typewritten pages.

Also, a *Debate the Issues of In My Opinion* column is being considered for selected 1993 issues. Teachers, supervisors, teacher educators, administrators, and others are invited to share their viewpoints. Original copy should be no more than 2½ double-spaced, typewritten pages. Possible topics include leadership and national trends, programmatic changes, teacher preparation, research, or any other issue in the profession. Articles may be submitted at any time.

SCANS Report and Problem Solving: A Natural Alliance

By JOHN R. CRUNKILTON

Dr. Crunkilton is professor of agricultural education at Virginia Tech, Blacksburg.

Agriculture teachers will have it easy when it comes to assuring students and the public that they will develop the foundation skills called for in the report **What Work Requires of Schools: A SCANS Report for America 2000** (1991). This report, based on the U.S. Department of Labor Secretary's Commission on Achieving Necessary Skills, has described what may be called "workplace know-how skills."

The skills contain two elements for effective job performance: namely, five competencies (resources, interpersonal, information, systems, technology) and three foundation skills (basic skills, thinking skills, and personal qualities). Educators in general, and special reform groups in particular, are now beginning to realize that what agricultural and vocational educators have been practicing for years makes good sense, and these sound educational practices develop those skills students need for occupational placement or advancement into further education.

The problem solving approach to teaching provides a natural environment for including those instructional strategies, resources, and activities which will enhance the development of those three foundations in our students. For years we in agricultural education have promoted basic skills, thinking skills, and personal qualities in our students. We have much to offer other educational colleagues as school systems address this challenge. Likewise, we can learn much from them as to how our educational programs can become even better.

Figure 1 on the next page takes each of the three foundation skills with the 16 supporting skills and provides an application example as to how that skill could be enhanced or developed through a problem solving mode.

Caution must be given here that just teaching in a problem solving mode will not in itself develop that foundation skill in students. It is the application part of the problem solving approach where true and lasting learning will occur.

The challenge to us in agricultural education is to be sure we carry our instruction to the transfer or application stage. To do otherwise will not make our teaching as effective as it could and violates one of the basic tenets of the problem solving approach to teaching.

How many application examples can you identify for each of the 16 supporting skills?

Reference

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1993 Themes

Issue/Theme	Copy Due	Theme Editor
January *The NAS Report - Five Years Later*	October 1	Dr. Bob Stewart University of Missouri
February *Solving Problems in Teaching*	November 1	Dr. Dean Sutphin Cornell University
March *Serving Individuals with Disabilities*	December 1	Dr. Marty Frick Purdue University
April *Teaching Agrimarketing*	January 1	Dr. Jim Leising University of California, Davis
May *Lab Facility Improvement*	February 1	Dr. Glen Miller University of Arizona

Figure 1 — Foundations of Education and How Problem Solving Teaching Reinforces Those Foundations

Foundations of Education	Problem Solving Reinforces Foundation Yes	No	Application
BASIC SKILLS			
A. **Reading** - locates, understands and interprets written information in prose and in documents such as manuals, graphs, and schedules	✓		Reads chemical pesticide label for proper mixing and application.
B. **Writing** - communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts	✓		Prepares position paper on pros and cons of proposed land development plan in local community.
C. **Arithmetic/Mathematics** - performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques	✓		Determines ration for feeder pigs and amount needed for 100 pigs.
D. **Listening** - receives, attends to, interprets, and reponds to verbal messages and other cues	✓		Determines possible problems with a lawn mower from the symptoms given by customer.
E. **Speaking** - organizes ideas and communicates orally	✓		Shares ideas with other class members on proposed project for laboratory.
THINKING SKILLS			
A. **Creative Thinking** - generates new ideas	✓		Designs landscape for entrance to school grounds
B. **Decision Making** - specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative	✓		Selects among best alternatives for postsecondary education.
C. **Problem Solving** - recognizes problems and devises and implements plan of action	✓		Determines causes of health problems in animals and prescribes treatment.
D. **Seeing Things in the Mind's Eye** - organizes and processes symbols, pictures, graphs, objects, and other information	✓		Visualizes how a floral arrangement should look
E. **Knowing How To Learn** - uses efficient leaning techniques to acquire and apply new and skills	✓		Uses computer databases bases and other information systems to obtain latest knowledge
F. **Reasoning** - discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem	✓		Determines the effect of pulley size on RPM of other pulleys
PERSONAL QUALITIES			
A. **Responsibilities** - exerts a high level of effort and perseveres towards goal attainment	✓		Fulfills homework assignments and class expectations
B. **Self-Esteem** - believes in own self-worth and maintains a positive view of self	✓		Selects appropriate dress for upcoming banquet
C. **Sociability** - demonstrates understanding, friendliness, adaptability, empathy, and politeness in group settings	✓		Accepts membership on FFA committee and fulfills that commitment
D. **Self-Management** - assesses self accurately, sets personal goals, monitors progress, and exhibits self-control	✓		Sets goals for personal FFA awards and strategies for reaching those goals
E. **Integrity/Honesty** - chooses ethical courses of action	✓		Takes a position on a practice/activity that impacts the environment in a local community

The Future of Problem Solving In Agricultural Education

By
LYNNE M. COOK
Ms. Cook is an agriculture teacher at Tift County High School, Tifton, Georgia.

As the saying goes, "Give a man a fish, and he will not be hungry today; but teach a man to fish, and he will never be hungry again." With this basic idea in mind, agricultural educators founded the problem solving method of teaching. This method was used extensively throughout the early years of agricultural education. Recently, however, its use has declined dramatically. Why are teachers ignoring this teaching method? Is it effective? Is the problem solving method still needed today? Does this method increase reasoning skills and help achievement scores? Answers to these questions must be found to determine whether problem solving should continue to be emphasized in agricultural education programs.

Yesterday's Problem Solving

Our forefathers realized the importance of education when they established our public school systems. In those early days of America, teaching was much different. Teachers demanded strict discipline within their classrooms, and no student input was tolerated. Students were taught rote memorization of facts and information, and if any students questioned the teacher, they were quickly scorned and punished into subordination (Herren, 1987).

The turn of the century, however, brought a major series of changes in industry and education in the United States. One of these changes was the switch from memorization - teacher-oriented teaching - to teaching which emphasized reasoning skills and was more student oriented. The three major reasons for this change in education were the tremendous change in technology during the era; the backlash reaction to classical, teacher-oriented education; and the rise of psychology. With psychologists such as Edward Thorndike leading the rebellion of Americans away from traditional education, and with new inventions being developed every day, the method of educating the young people of America had to be changed to meet the industrial revolution (Herren, 1987).

Thus, the problem solving method of teaching was born in the early 1990s. Dr. W.H. Lancelot of Iowa State College, one of the proponents of the problem solving teaching method, felt that problem solving brought true-to-life situations to agriculture students which they could apply to their own family farms (Herren, 1987).

Today's Problem Solving

Times are changing once again. Technology has increased production on farms so much that only two percent of Americans now live on a farm, and yet 40% of all Americans are employed in the agricultural industry. Eight percent of these agriculturalists find jobs as agricultural production specialists, while the other 92% are employed in marketing, research and engineering, management and finance, social services, education, and communications areas (Whaley and Lucero, 1991). Agriculture is an ever-changing industry, and as the National Summit on Agricultural Education concluded, "Change is rampant in agriculture, and agricultural education must keep pace or become an obsolete remnant of the past."

There are many arguments which proponents of problem solving use to boost the use of the method, the most important of which is the increase in students' critical thinking skills. Rollins (1990) studied 10,603 agriculture students in 262 Iowa secondary agriculture programs. He found that student's abilites to think clearly increased dramatically when teachers incorporated critical thinking concepts into their curriculum. A similar study conducted by Boone in 1990 involved 99 freshmen enrolled in Ohio production agriculture programs who were taught by teachers that successfully used problem solving. Boone concluded that while students' achievement in a particular unit was affected by their prior knowledge of the subject, problem solving did indeed significantly increase retention.

Do the problem solving abilities developed by students in agricultural education help in other areas besides agriculture? According to Cano's study in 1991, the answer is a resounding "yes." Cano studied 10 Ohio secondary agriculture classes. He chose those schools which had excellent supervised agricultural experience programs, courses of study, FFA programs, administrative commitment, and →

overall facilities. Cano found that problem solving significantly increased the development of cognitive abilities and critical thinking. He also found that agriculture students taught problem solving scored higher on the achievement test than students in a heavy science or heavy social studies area.

There are many arguments which proponents of problem solving use to boost the use of the method, the most important of which is the increase in students' critical thinking skills.

Even with data of this nature, which show the definite benefit of students being taught by the problem solving method, some teachers still do not use problem solving in their teaching. Osborne and Hamzah (1989) surveyed full-time agricultural production and agricultural business teachers in Illinois. Results indicated that those teachers who had used problem solving during student teaching and were encouraged to use problem solving throughout their preparation program were more likely to use the problem solving method. Teachers were also more confident in using the problem solving method when they gained more experience in its use. The main two barriers identified by teachers were not having appropriate reference material and thinking that their subjects were unsuited for problem solving.

Albeit that at time reference materials are scarce, can our agricultural subjects be unsuitable for problem solving? No. One of the basic foundations of agricultural education and the FFA is the method of problem solving. Every class and every FFA contest or function has some problem solving application. Supervised agricultural experience programs were developed for students to experience critical thinking in a pragmatic setting. Students then learn about their projects and about record keeping during agricultural education classes. Further research into the subject area is encouraged, and at times required, to rectify a problem or to develop a plan of action. In this way students can develop the much needed critical thinking skills, put them into action, and evaluate the results.

Classroom activities also serve as a perfect harbor for critical thinking skills. Landscaping is a classic example of a problem solving lesson. The students are allowed to choose a site for beautification, identify the site's needs and characteristics, design the landscape, select plant materials for the landscape, plant the landscape, and develop a maintenance plan. In this project the student carries the problem of beautifying a site through to fruition (Conjura-Colgin and Rollins, 1991).

Every class and every FFA contest or function has some problem solving application.

Other ideas for problem solving in today's agriculture class include reviewing rejected loan applications for flaws, welding at different amperages to determine the difference, renovating a building, allowing students to decide which seeds to plant in the greenhouse, testing the differences between forage harvesting methods, developing a health maintenance plan for livestock, having students develop advertisements for the FFA, writing out a step-by-step plan for chemically treating a garden, or predicting the prices of an agricultural commodity. There are many more ways to infuse problem solving into the agriculture classroom. A suggested practice for all agriculture teacher is to pose a question and insist on five minutes of quiet time for the student to think and write a response before discussing the topic. The student then has his ideas on paper and is more apt to share his ideas with the class (Crunkilton, 1991).

Conclusion

A student cannot afford to miss problem solving skills. Employers of today and the future are constantly asking educators to include more critical thinking skills when teaching students. Employers want their employees to have interpersonal skills, communication skills, and business and economic skills. Employers have repeatedly said that they would rather hire a person who is high in critical thinking skills and lower in knowledge of subject matter than a person who knows a lot about the subject but has no reasoning abilities (Whaley and Lucero, 1991).

Thus, the facts are clear. Employers need for schools to produce students with high critical thinking abilities. Problem solving is a proven way to improve critical thinking skills while increasing the student's retention of the subject matter. Agricultural education was founded on this problem solving method and has many ways to use problem solving within each subject taught today and in the future. Problem solving is the wave of the future. If agricultural education is to stay ahead and produce successful students in the days to come, agricultural educators, →

(continued on page 20)

Using Experimentation As Experiential Learning

By JAMES A. SPIESS
Mr. Spiess is an agriculture teacher at Wauseon High School, Wauseon, Ohio.

The use of experimentation as experiential learning is certainly something that is not new in the education process. However, its application and use today present some new and exciting possibilities for increased learning and the reinforcement of the problem solving method of teaching.

Agriculture students have changed from the early sixties when they were very broad based in their fundamental agriculture skills. It is important to note that their attitude toward the traditional "work ethic" was very aggressive. Since that time these values have changed along with those of society to the degree that it is difficult to apply today's instruction to prior learning experience. Students seem to be grasping for a sound basis of understanding from which they can apply their creative thought processes to the solution of an unknown.

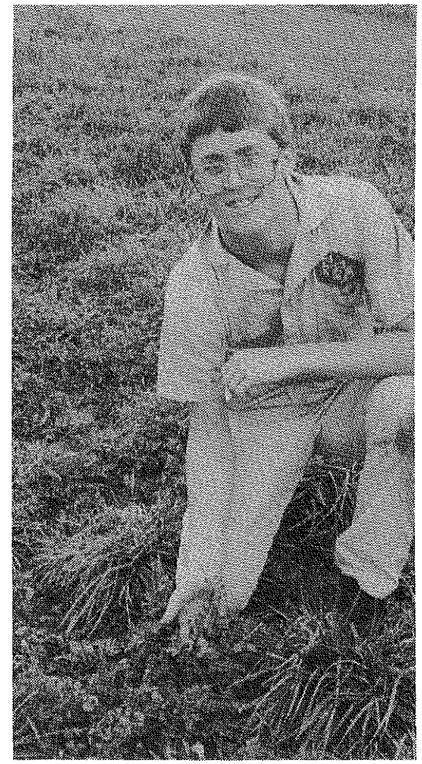
The application of experimentation as experiential education within the agricultural education process is very natural. Agriculture is and has always been defined as a science. Within the definition of science the philosophy of experimentation is assumed. Therefore, the utilization of this method can greatly enhance the experiential learning of the students in agriculture programs.

It is the application of experimental projects or learning tasks within the Supervised Agricultural Experience (SAE) program of each student that makes this experience a totally encompassing educational program. In essence, it is the controlled application of learning skills in a variety of situations that allows for creative thinking from a basis of acquired learning.

At Wauseon High School, a student's SAE program includes experimentation projects and activities that enhance learning in the classroom. The areas addressed in the curriculum are determined by the agricultural opportunities of our community. These may be traditional, as well as futuristic, as we plan to meet the labor needs of the community, as well as the particular interests of each individual student.

In the following outline, particular experimental educational efforts will be related to selective areas within our program. Present facilities at Wauseon High School include the traditional classrooms, mechanics laboratory, greenhouse, 100 acre land laboratory, orchard, 7.5 acre wildlife area, and a livestock facility for beef and sheep. The department owns and manages a registered suffolk flock, housed at the school throughout the year. The facility also includes a computer lab, as well as satellite downlink capability, data network, and other informational sources.

Experimental opportunities are provided in each of these areas for students to →



The effective production of forages is one of the studies that has been ongoing for the past 20 years. Factors such as plant resistance, blends of plant seeds, fertility rates, micro-nutrients, and insecticide application and rate have all provided excellent information to students and citizens in the community.

participate, either as individuals or as a member of a small group. Group activities are utilized to enhance the cooperative spirit of the learning process and especially the interpersonal skills that are so important in the successful work ethic. Listed below are some of the experimental activities in which students have participated over the past two years.

Agricultural Education (Freshmen)
Areas of experimentation:
1. Breeding and genetics - Suffolk flock
2. Feeding trials on livestock (forages & minerals)
3. Ultra-sound for pregnancy

Agricultural Engineering (power and machinery)
1. Harvest loss study on combines (corn vs. soybeans)
2. Tillage comparisons (plow, minimum till, ridge till, no-till)
3. Fuel cost study (diesel vs. gas)
4. Soil compaction study
5. Study of harvesting techniques of forage (traditional baling vs. large round bales)

Animal Science
1. Comparison of preventive health techniques
2. Compare ration formulation for starting cattle

Conservation and Natural Resources
1. Comparison of natural habitats of wildlife
2. Study of migration patterns of wildlife
3. Study law of natural selection
4. Population study of habitat
5. Comparison of surface and tile drainage
6. Study of well water quality of surface and deep wells in the community

Agricultural Engineering (construction)
1. Comparison study of fencing materials
2. Comparison study of wood preservatives

Landscaping and Horticultural Science
1. Comparison study of fertilizer application
2. Effects of temperative and light quality on growth of garden plants
3. Turf grass plots for study of textural qualities and general turf suitability of new hybrid varieties of bluegrass and rye grass
4. Conducted performance trials of new varieties of peaches, apples, and pears

Agricultural Business and Farm Management
1. Effects of organic fertilizer vs. commercial fertilizer on corn
2. Effects of plant tolerance to insect infestation
3. Economic impact of using insecticides on forages
4. Comprehensive study of various preservatives and their effect on forage quality in high moisture plant materials

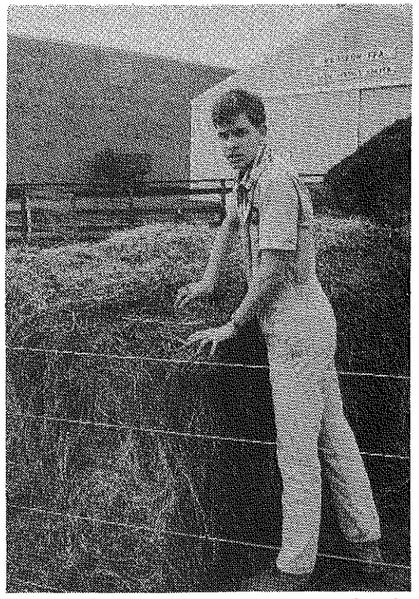
Agribusiness
1. Research study on attitudes of high school students about agriculture
2. Traditional marketing strategy research with grains produced on the school land lab

Eighth Grade Agriscience
1. Growth rate of poultry
2. Comparison of windbreak construction and variation in plant materials used
3. Comparison of various type of mulch used in starting a new lawn seeding

A particular example in which we involved students in these activities occurred during the 1988-89 school year when we looked for a better method of handling hay. In the early spring of 1989 a former graduate of the agriculture program who had experienced the utility of the school land lab in his educational experience program made a personal contact with the Agriculture Department at Wauseon High School. He presented several students with the opportunity of conducting research with his company.

The study concerned the evaluation of bacterial innoculant on high moisture alfalfa. Since alfalfa, as well as grain crops, is raised at the land lab, members eagerly accepted the challenge. Each time the hay was harvested, personnel from the company would travel to the school from their international headquarters and assist with the research. During each cutting, the hay was treated with bacteria in different doses, as well as with different materials. Each sample, as well as the control sample, was placed on individual pallets and identified. After a period of 60 days each sample was examined both chemically and visually for final anaylsis.

This research was duplicated seven other places in the world during that year. The research resulted in the development →

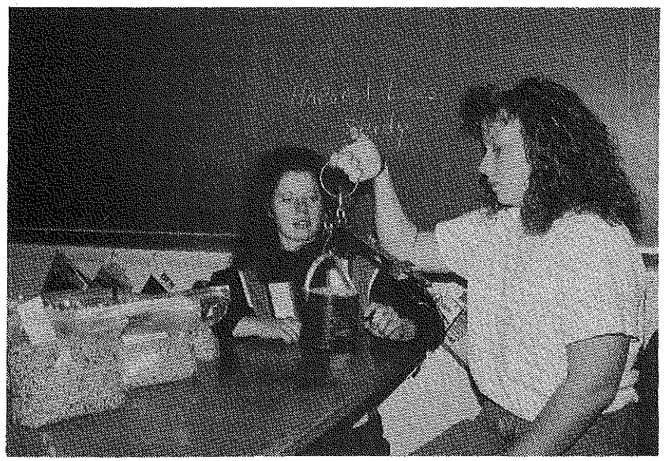


A study of hay quality improvement was conducted because of the high risk of hay making in our climate. Bacterial additives, as well as alternate harvesting techniques, were studied. This past summer students baled hay in large round bales in an attempt to lower the labor requirement. Pictured here is a student determining the amount of spoilage and comparing this loss to labor savings.

of a product that became public in 1989 and is today available to the commercial producer. It also allowed our students to better understand the process involved in research, as well as work alongside very skilled professional researchers. It is also important to note that utilization of this product became popular with our students, as well as the adult commercial producers of forages in our area.

It is important to note that teaching, as well as learning, is enhanced by applying the experimental method. Concepts can be illustrated and clarified by a teachable moment in a real setting. Complex questions can be mastered by step-by-step participation of the student within the process of actually solving the problems presented.

Application of these experiences will enter the plan of the students' SAE program in their home or business setting. It is also important that the attitude toward learning through experimentation be encouraged in the student, if we expect adults to be leaders in their trade or business.



Students participated in a national research project with Farm Journal *magazine and the Ohio State University in an attempt to determine the actual harvest loss of combines operating in the field. Each test required about an hour of the students' time and included about ten variable skills and experiences. Pictured here are two students determining the grade and quality of the grain, as it relates to the harvest loss of a particular combine's performance.*

Application of the experimental method in the educational process also serves other important functions. The participation of community and business interests in the process tends to cement long-term support between business and education. Research or experimental education processes may be more efficiently performed within a community, thereby providing more reliable data to those who mutually share in the resulting outcome. At this point the school is providing a service function to the community or business. It is also important to note that the cross involvement of young students with the adult business person presents many mutually shared moments of appreciation and social understanding. This reinforces the realization that education is a continuous process, as well as a mutual interest of successful individuals, regardless of age or position.

Students involved in the application of the experimental method in their SAE program will be more likely to apply learning to their individual setting, if they can be a functional part of the experimental process. It is often a poor economic base that prohibits students from venturing on their own into experimental or creative query. However, if application through participation is achieved in the educational process, students quickly apply this learning in their own supervised SAE program. It is this infusion of information that adds substance, as well as interest, to this method of education.

Experimental education as it applies to agricultural education provides students with a means of applied learning and creative thought within a controlled situation, which better prepares them for the uncertainties they will face in the future. ■

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The Ultimate

By SUSAN S. CAMP
Ms. Camp is an assistant professor in the Department of Vocational and Technical Education at the State University of New York, Oswego.

Agricultural education and the problem solving approach to teaching have long been linked together — like raising hogs and growing high-lysine corn. Not everybody does it, but those that do see results that are worth talking (and writing) about.

The media constantly remind us that Americans can not think critically and solve problems in everyday life. But recent research by Cano and Martinez (1991) shows that high school agriculture students do think critically and can solve problems better than students of other subjects, such as science and social science.

Advocates of the problem solving approach to teaching offer explanations of its effectiveness. We learn more when we can relate it to our real world. We learn more if we can see why something occurs. We learn more if we can apply knowledge to a problem or situation. And we learn more when more of our senses are stimulated during the experience.

The 1990 reauthorization of the Carl Perkins Act demands that we integrate vocational and academic education — that we help students learn how to apply the theory of academics to the world of work and the world of living. What better way to do this than using the problem solving approach to teaching?

With the diversity in today's classrooms this method is even more useful to the teacher of agriculture. Students come to us with varied abilities, experiences, learning levels, interests, and social skills. How does a teacher take these diverse students and raise them to a new level of thinking and problem solving? The first step is to do what agriculture teachers have always done. Get to know your students. Talk with them, their parents, their former teachers, and yes, even look in their student records. You owe it to individual students to find out what their needs and interests are so that you can guide their learning.

Next, group students based on their interests. Group those with similar interests together, but do not separate them by ability. Grouping students with a range of abilities aids learning in a cooperative learning environment. Be sure to monitor your groups to ensure that they follow cooperative learning guidelines.

The third step is to create realistic case studies or problems for the groups to deal with, investigate, recommend solutions for, test, and evaluate for the best solution. Remember, the teacher does not preach to the students but instead guides them in using resources and identifying solutions.

Before all of this can begin, resources must be identified and made available to the students. What can these recourses be? They primarily include people, magazines (agriculture and others), agricultural newspapers, Cooperative Extension Service publications, textbooks, reference books, catalogs, computer software, other students, and the teacher.

After resources are identified, help your students learn how to access the resources and gather the information they will need. If they need to make phone calls, give a demonstration and have them role play telephone calls to agribusinesses or to the Cooperative Extension Service. If the students are afraid of the resources, they will not approach them and secure the information they need to make their decisions. As a beginning step, assign small problems that require students to locate information. Make sure that the first time they engage in problem solving, they are successful. Remember, if I succeed early in my learning, I will be more likely to retain what I learned and I am more likely to try again.

The problems or the case studies should meet several criteria. They should be realistic, of interest to the members of the group, doable in the time allowed, and challenging for a variety of levels of learners. Consider the examples highlighted in the box on the next page. →

Problem Solving: The Key To All Levels of Agricultural Education

By REGINA A. SMICK-ATTISANO
Dr. Smick-Attisano is Acting Assistant Director of Resident Instruction in the College of Agriculture and Life Sciences at Virginia Tech.

Problem solving — a key concept in the process of agricultural education. Throughout the methods courses I enrolled in as an undergraduate student, the method of problem solving was considered utopia for us in agricultural education. We have been espousing this methodology as the way to teach for years. Today suddenly, others in education are awakening and telling of the merits of problem solving, although they sometimes do not use the term "problem solving." The terminology often used includes critical thinking, higher order thinking, metacognition, etc.

As educators, we need to involve our students in the learning process — an obtainable goal when using the problem solving method. Secondary agriculture programs around our country are doing this. Exemplary secondary programs and teachers who effectively use problem solving instruction are found in every state. This tradition of teaching agriculture through problem solving needs to continue, but not just in secondary agriculture programs. Teaching agriculture through problem solving should flow into our two-year postsecondary agriculture programs.

Postsecondary agriculture programs? Should we become concerned about postsecondary agriculture? Can problem solving/inquiry teaching work at this level? The answer to these questions is a resounding yes! The continuation of agricultural education at the postsecondary level is clearly positive and desirable. Three reasons are outlined below.

Reason 1 — Tech Prep - Articulating secondary programs with those in a postsecondary setting is an idea whose time has finally come, and with government funding. Postsecondary agriculture programs exist in every state. Collaboration between secondary and postsecondary programs needs to happen, keeping the problem solving approach to teaching as a prominent component. What better preparation for students entering the increasing technological and scientific career field of agriculture than a planned, articulated program which emphasizes development of the student's thinking ability?

Reason 2 — Governmental reports →

Animal Science Class

You work for John Kolwalski on his 200 cow dairy farm. He has just purchased 10 replacement heifers at a dispersal sale. He does not know what they were being fed prior to the sale. John wants you to analyze the situation and formulate a ration for the group. He does know that they are all between five and seven months old and out of cows that have annually produced over 20,000 pounds of milk in the last two years. John wants a written plan for the feeding and care of these heifers on his front porch by the time the heifers arrive tomorrow morning.

Horticulture Class

You have just inherited $15,000 from your grandfather. He states in the will that you are to use the money to start your own business to use the knowledge you have about greenhouses and horticulture. In order to claim your money you must develop a small business plan and have it on the lawyer's desk in two weeks. The Plan must include type of business, location, product or service, financial statement, cash flow statement, types of facilities and equipment needed, additional money needed to initiate the business, and estimated profit or loss for the first year.

The Ultimate . . .

In each of these cases, worksheets that will guide students through their investigation would be helpful. Ration balancing worksheets, blank financial statements and cash flow statements, and computer programs that are in current use would keep them on track. Allow the students to be the pioneers and you, the teacher, be their guide.

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About the Cover

Agriculture provides unlimited opportunities for students to practice problem solving/inquiry skills. (Photo courtesy of Kent Boggs, Executive Secretary, Oklahoma FFA).

and national studies predict that by the year 2000, 75% of all jobs will require education and training beyond that of high school (Parnell, 1990). Careers and jobs in agriculture and all of its related businesses and industries will not be exempt. Even though the census reports that approximately two percent of Americans are farmers, agriculture is much, much more. In the August 1992 issue of Glamour Magazine, it was noted that agricultural scientists are among the top ten career areas for 1990s and beyond. Agriculture has a definite future, and that future includes postsecondary education in agriculture.

Reason 3 — We need to educate our current workforce in agriculture. In 1990, 16.5% of farmers had a college degree compared to 22.6% of the general public. This is salient because education and income are related. In general, the higher the education completed, the higher the annual income for the household (Kiplinger Agriculture Letter). As educators, we need to encourage and facilitate the continued education of our students.

Numerous other reasons/justifications can be espoused for bringing postsecondary agricultural education to the forefront. However, the underlying rationale is that postsecondary programs are partners with secondary agriculture programs. The traditional method of teaching in secondary agriculture programs is problem solving. Even as the agenda for secondary agricultural education changes and unfolds with time, our teaching of young people is notable. Much of our success is due to the use of problem solving, a method which was taught to me as I was preparing for my role in agricultural education. Can this methodology work at the postsecondary level?

Using the problem solving approach in the postsecondary classroom is an unbeatable strategy. Linking instructors and students in the learning process is easily achieved by utilizing the problem solving method. Varied aspects of this method manifest themselves in the postsecondary setting. The elements are quite conducive for problem solving teaching. For example, the essential element in problem solving is the problem. In the postsecondary setting problems abound, as the students have had more experience and are more focused in an agricultural career. Students are willing to share and take a greater responsibility for their learning. The teacher becomes a facilitator and a participant in this setting.

Another aspect involves questioning. Questioning is a teaching technique frequently used with a problem solving approach. Teachers use this technique to involve students in learning. Teachers using problem solving instruction utilize questions that are well thought out and executed. The teacher, however, is not the only person in the classroom to ask questions; students should feel comfortable raising questions as well. Strother, in her article "Developing Thinking Skills through Questioning," pointed to this fact as crucial for the development of thinking. Problem solving is surrounded by questioning.

The key to effective use of problem solving is the teacher (Crunkilton & Krebs, 1982). The teacher element could pose the quandry for problem solving in the postsecondary setting. The number one reason for this belief is that a majority of instructors at the postsecondary level have not had the fortunate experiences of being taught the problem solving approach as an undergraduate or graduate student. Therefore, it becomes a responsibility of the profession to share our knowledge and expertise, especially as we begin to collaborate with postsecondary institutions and articulate agricultural education programs in our communities, states, and nation.

The problem solving method is a key to effective postsecondary agricultural education. Spreading this message can be as easy as inviting postsecondary instructors to workshops and teachers meetings that focus on teaching via problem solving. Problem solving must be used throughout postsecondary agricultural education.

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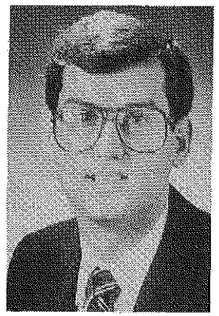
LABORATORY TEACHING:

Presenting Effective Method Demonstrations



By DONALD M. JOHNSON

Dr. Johnson is an assistant professor of agricultural education at Mississippi State University.

During the course of an average school year, the typical agriculture instructor plans and presents dozens (or possibly hundreds) of method demonstrations. Subject matter for these demonstrations ranges from arc welding to plant tissue culture, and from computer software use to job interviewing skills.

Since the demonstration is such an important teaching technique, agricultural educators need to be highly proficient in planning and delivering demonstrations. A previous article (Johnson, 1992) discussed the steps in *planning* method demonstrations. The present article will describe how to *present* effective method demonstration.

Presenting Effective Demonstrations

Successful demonstrations are carefully planned; unfortunately, not all carefully planned demonstrations are successful. The benefits of careful planning can be largely negated if the demonstration is poorly presented. In order to ensure that the demonstration is presented effectively, teachers should: (a) motivate the learners, (b) prepare the learners for the demonstration, (c) present the demonstration, and (d) summarize the demonstration.

Motivate the Learners

Motivation is essential to the teaching and learning process. Early American educator Horace Mann made this point clear when he stated that, "A teacher who is attempting to teach without inspiring the pupil with a desire to learn is hammering on cold iron." This statement is certainly as true today at it was in Mann's era.

Teachers can use a number of techniques to motivate students. The following techniques are among those that work especially well in demonstration teaching:

- Ask perplexing questions which will be answered during the subsequent demonstration.
- Create uncertainty or a "need to know" which will be resolved as a result of the demonstration. (This works especially well in demonstrating scientific principles.)
- Show a high quality finished product of the skill to be demonstrated.
- Relate the skill or principle to real-life situations.
- Schedule demonstrations to coincide with the students' needs to use the skill or information in the classroom, laboratory, or supervised experience program.

Certainly, many other motivational techniques are available to the creative teacher. The important point is that teachers must motivate students in order to avoid "hammering cold iron."

Prepare the Learners

The effective teacher prepares students before presenting the demonstration. Both physical and mental preparation of the students is essential. Physical preparation involves ensuring that students are safe and that they are properly positioned to observe the demonstration. Mental preparation involves providing students with information that prepares the students for the demonstration.

Physical Preparation. Teachers enhance student safety and learning when they provide (and require students to use) all equipment needed to safely observe the demonstration. In addition to preventing injuries, this practice reduces student fears and allows them to concentrate on the demonstration.

The teacher must carefully position students so each can safely observe the demonstration from the proper perspective. Since the demonstration is primarily a visual teaching method, students must be positioned so that each has an unobstructed view of the demonstration. When manipulative skills are being demonstrated, it is often necessary to position students so they can observe the demonstration from the same perspective as the teacher. For example, during a demonstration of how to run a bead in arc welding, students should stand beside the teacher rather than facing the teacher. This allows students to see the skill as it is actually performed rather than seeing a mirror image of the skill.

Mental Preparation. It is also important for the teacher to mentally prepare students to observe a demonstration. →

Mental preparation includes telling students exactly what is to be demonstrated and where to focus their attention during the demonstration. Continuing with the arc welding example, a teacher might mentally prepare the students by stating:

> *Today, I am going to demonstrate the safe and proper procedure for running a stringer bead on mild steel plate using the Brand XYZ AC arc welding machine and a 1/8-inch E6011 electrode. As you observe this demonstration, pay particular attention to the length of the arc, the work and travel angles, and the speed of travel.*

Such a statement enhances student learning by serving as an advance organizer. Advance organizers prepare students for new learning experiences and make these experiences more meaningful.

Present the Demonstration

In order to present an effective demonstration, a teacher must accomplish two distinct but related objectives. First, the teacher must perform the demonstration in a manner that allows the important movements to be observed by the students. Second, the teacher must focus the students' attention on these important movements as they are demonstrated (Magill, 1989). Using the practices listed below enables teachers to accomplish both of these essential objectives:

- Demonstrate one step at a time.
- Be definite — both in what is done and in what is said.
- Demonstrate the one preferred performance method. Demonstrating multiple methods usually confuses students. (If desired, additional methods may be demonstrated after students have mastered the original method).
- Stress related information at appropriate points during the demonstration.
- Do not talk unless something needs to be said. Unnecessary talk diverts student attention from the demonstration.

Summarize the Demonstration

Like any well taught lesson, a demonstration should conclude with a summary. The summary reinforces student learning and brings closure to the learning experience. Ideally, the summary should lead directly into supervised student practice of the skill or process which has been demonstrated.

Summary

The method demonstration is a widely used teaching technique in agricultural education. Agriculture teachers should continually strive to improve their demonstration skills. Careful planning and attention to the details of presentation are essential to successful demonstration teaching.

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The Future of . . .

(continued from page 12)

with the help of businesses, teacher educators, local and state administration, and researchers, must put problem solving back into their curriculum and classes. Learning these critical thinking skills is the only way that today's students will be ready to face the challenges of tomorrow.

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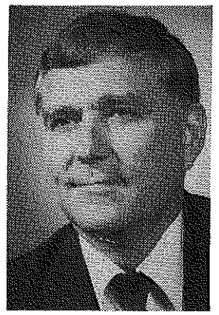
TIME MANAGEMENT

Desk Stress



By GARY E. MOORE

Dr. Moore is professor of agricultural education at North Carolina State University.

Somewhere, in every agriculture department, there is a teacher's desk. This desk can be the source of stress and lost time. In a recent issue of **American Demographics,** it was reported that during a lifetime an average person will spend eight months opening junk mail and another year looking for misplaced objects. My experience in agricultural education verifies this statement is true; we get tons of junk mail and we do lose items on our desks. In case you haven't seen your desk lately, its the rectangular flat surface found under stacks of lesson plans, curriculum guides, notes, student papers, textbooks, slides, and FFA forms.

Those lost lesson plans, slides, exams, and FFA forms invite stress to creep into our lives. There are enough other things in life to get stressed about other than our desks. Can agriculture teachers learn to handle "desk stress"? Yes, here's how.

The Clean Desk/Sick Mind Rationalization

Most people can accomplish more if they keep the desk and office clean. If we have no room on our desks to spread our work out, we may not get it out. Also, items scattered all over the desk tend to catch our attention instead of the task at hand. And it is possible to misplace important items in all the clutter. The saying "a clean desk is the sign of a sick mind" is rationalization by people who aren't on top of things. Most highly efficient people operate from clean desks.

Operating From A Clean Desk

It is one thing to say we should operate from a clean desk, but it is another thing to actually operate from a clean desk. There are three major actions we can take to help us operate from a clean desk.

Use a desk drawer as an In Basket. After we come back from the school office with our load of mail, we often toss it on the desk and then go teach class. After class we toss student paper on the other corner of the desk. In a few short hours the desk is covered. Just looking at the desk is too overwhelming — we don't know where to start. The first place to start is to clean out a desk drawer and use it as an in-basket. Just drop the mail in the drawer and close the drawer. This reduces desktop clutter and prevents being distracted by items stacked on the desk. Consider using a second drawer for student papers. When it is time to read the mail or grade papers, pull out one or two items at a time. There should be a clean desktop on which to work.

Schedule time to handle paper work. We should regularly schedule time to handle paperwork. Paperwork doesn't get done by osmosis. It is time consuming and requires effort. Set aside time each day or week for paperwork. We schedule meetings and appointments with students, parents, and other teachers. It is okay to schedule an appointment with our desks.

Use the TRAF systems for handling paperwork. A systematic procedure, other than stacking stuff all over the desk, should be followed in handling paperwork. A procedure developed by Stephanie Winston called the TRAF system is a good model to follow. TRAF is an acronym for Toss, Refer, Act and File.

TOSS - Much of the mail that passes over our desks could be tossed without even opening it. Be selective in what is opened and even more selective in what is kept after being opened. For each piece of paper critically ask:

What is the worst thing that could happen if I threw this out?

If I needed this information later, where could I get it?

Would someone call me on it later?

Have a goal to toss (or recycle) as much paper as possible. Remember the adage, "If in doubt, throw it out." Let's not spend eight months of our lives opening junk mail.

REFER - As each piece of paper is handled, decide if someone else could respond to the request or supply the information. Jot a note in the corner asking a student worker, an FFA officer, or some other person to handle the item. We can delegate much more paperwork than we currently do.

ACT - If we don't toss the paper or refer it to someone else, then we must take some kind of action. A rule of thumb →

FEATURE COLUMN

COMPUTER-ASSISTED TEACHING:

LANDCADD: Professionalizing Agricultural Graphic Applications in the Classroom

By BARBARA M. KIRBY

Dr. Kirby is associate professor of agricultural education at North Carolina State University.

The use of LANDCADD by horticulture and other agriculture teachers and students is on the rise in classrooms across the country. LANDCADD, along with AutoCADD, gives instructors and students creative tools, enabling them to produce quality designs from conception to final presentation.

One does not have to be a landscape architect or civil engineer to produce professional land use plans. Given basic computer skills, an understanding of menu driven or windows-supported software, and the ability to use AutoCADD, agriculture teachers and students are capable of using the LANDCADD system.

Applications in Agriculture

The program is excellent, as it prepares students for technical through management positions in numerous agricultural areas. Examples include nursery designer or manager, park and recreation resource planner, natural resources manager, educator, landscape architect, soil and water manager, land use planning specialist, agricultural engineer, irrigation and/or erosion specialist, and others who must demonstrate land use planning and design skills.

Every agricultural area of study has an opportunity to use this program to reinforce skills taught in the specific subject areas. For example, agricultural engineering teachers might use the program to teach students how to design an erosion control structure. Horticulture teachers have endless opportunities to apply learning when teaching home, commercial, or interior landscaping; golf course design; and plant identification and selection.

A natural resources unit might include drawing a site plan for the park, while the soil and water management unit could include using the program to teach site analysis, how to interpret topographical maps, or contour and terrain modeling. Agricultural applications are not the only educational aspect of the program. Applied basic skills reinforce concepts learned in coordinate geometry, communications, and writing or text editing.

Systems Requirements

Careful consideration of school budgets makes this program more affordable than in the past. Approximately $1,000 is needed for software. A new release, LANDCADD Light, will be available during the Fall of 1992 for about $600. This less expensive version includes basic features of the standard version (listed at $1,200) and is still a very comprehensive program for high school student use. The "light" version includes more symbols, more routines, and more pull down menus than →

is to go ahead and act on the item if it will take less than five minutes. Some teachers spend 30 minutes a week shuffling a paper all around the desk when it would have taken only five minutes to originally handle the item. Don't get into this habit. If the item requires more than five minutes, and time is available, go ahead and do it.

If the item requires more time than available, or requires additional information before a response can be made, use the A-B-C file system. Gete three file folders, baskets or desk drawers and label them A, B and C. Items that are very important or urgent are placed in the A file. Less important or less urgent items are placed in the B file. The remainder go in the C file. At the start of each day peruse the items in each file and place the items that need to be handled on a "to do" list, or schedule time for them. The worst sin in handling paper is to be indecisive. Don't let items float on the desk or stay in the in-basket. Make a decision.

FILE - For items that need to be filed, either file them, give them to the appropriate person to file, or have a special "To Be Filed" box where items can be placed.

Conclusion

Desk stress can be reduced by using a draw as an in-basket, scheduling time to do paperwork, and TRAFing all incoming papers during the day. We will be under less stress and so will our desks. ■

in the past. The program supports Windows technology if one is using an IBM or IBM compatible system.

The school must also purchase AutoCAD, which is marketed to schools at a cost of $495. AutoCAD Release 12 should be available Fall 1992. Schools who want to offer instruction in a computer laboratory may purchase a site license and offer courses involving the system to all students. However, most agriculture programs use LANDCADD in a single work station.

While minimum hardware requirements will run the program, one should use the most powerful configuration possible to enable students to really benefit from the technology. PC or MS-DOS based 486 machines, using DOS 2.0 or later (DOS 3.3 for PS/2 and enhanced 486 machines) with 2-4 megabytes of RAM and at least a 40 megabyte hard drive are desirable. Actually, a hard drive with 80 or more megabytes makes more sense in terms of providing the user ample opportunities for applications.

Macintosh II or Macintosh SE 30 will support the system. Apple system 6.02 or higher is required. It makes sense to go to system 7.0 at this point. Memory requirements include 8 MB of real memory, 40-80 megabyte hard drive (preferably 80 MB or more), and 800K floppy drive. Sun SPARK is another system that will support the software. The Sun operating system 4.0 or higher is required, a Floating Point coprocessor, 4 but preferably 8 megabytes of real memory, Sunview windowing environment, hard disk, and 3½" floppy drive.

A complete system requires a few peripherals. These include, if not already part of your system, a math coprocessor, graphics card, and monitor (EGA, VGA, or better). One also needs a mouse or digitizing tablet (12" x 12" or larger). Quality drawings reflect the quality of the printer. A pen plotter or laser printer is recommended. If a school system must purchase everything, at least $4,000 should be budgeted.

Education and Support

Most agricutlural educators were not trained as graphic designers. It is truly amazing what technology enables us to do. Some of us still can't draw a decent diagram on the board, but we can draw professional, impressive looking landscape plans through the use of this program. However, one must invest some time in learning the AutoCAD system. Once learned, the LANDCADD system is fairly simple to follow, because it uses the same format as AutoCAD. If you can move around in one, you can move around in the other by simply following the commands.

The features of both programs make them "friendly." There are several menu options. These include tablet menu, screen menus, icon menus, and graphic card hardware icons. The use of icons (or pictures) and software which operates from a "Windows" support version certainly eases the user's anxiety. If you can click the mouse on the picture, you can learn the program. Documentation and screen directions are also available to assist the user.

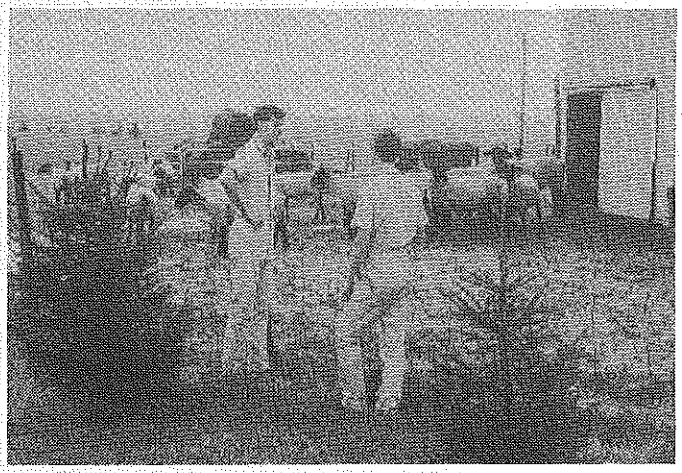
Authorized LANDCADD dealers provide education and support at local training centers. A technical hotline is available for a small charge. If you learn better on an individual basis, purchase the video training tapes. For more information, contact LANDCADD International in the United States at (303) 688-8160 or FAX at (303) 688-8178. If you need help getting started, a video demonstration tape is also available.

Summary

LANDCADD is a very dynamic, versatile program. If our graduates are to be competitive, they must develop marketable computer skills. Congratulations to those of you who teach with this program. Every program needs to invest in the technology that is going to help students become better planners, illustrators, technicians, and managers. LANDCADD helps your students prepare for career opportunities or further education in fields requiring agriculturally related graphic skills. ■

STORIES IN PICTURES

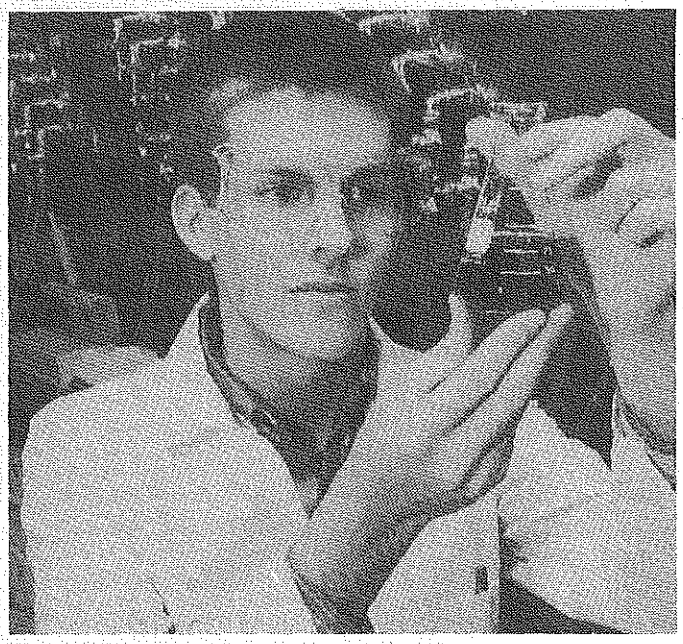
Students involved in the farm management class are expected to actually produce 20 acres of a crop which they determine and conduct at least one research study. This student is participating in a tillage study, which is examining the effects of reduced compaction and soil tilth.



A registered flock of Suffolk sheep provides a part of each freshman's SAE program and also allows for many experimental studies, such as ultrasound testing for pregnancy. Pictured here are students determining the results of a recent trial of a new worming agent on the school's flock.

Photos courtesy of James A. Spiess,
Wauseon High School, Wauseon, Ohio.

The agriculture department started a small orchard within the school land lab to study the practices involved in successful management of fruit trees. These two students are observing the results of a pruning exercise.



Experiments are one of the most effective inquiry learning activities that teachers can use. (Photo courtesy of Jeff Moss, University of Illinois)