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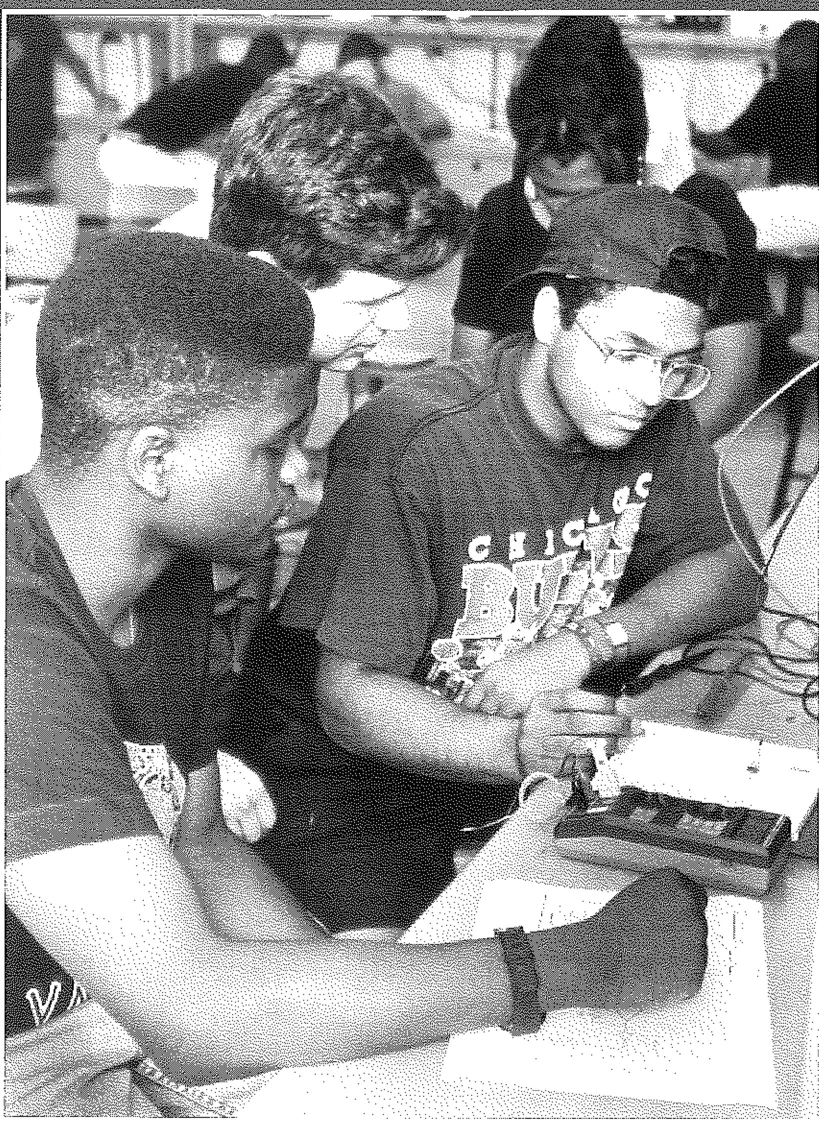
Agricultural Mechanics in Agricultural Education



Guest Editor's Comments

Everything Old is New Again

By Tim H. Murphy

Dr. Murphy is an assistant professor of distance learning in the department of agricultural and extension education, University of Idaho, Moscow.

I was asked to provide the guest editor's comments for this issue. Be forewarned, my views may be biased. Anyone who knows me at all knows I think that the crackle-pop of a properly tuned MIG welder accompanied by the staccato whine of an abrasive cut-off saw is music fit for Mozart.

There are some great articles here for your reading pleasure. Hoerner and Johnson (page 20) provide a history of the Agricultural Mechanics Career Development Event. Articles by Muller and Tidwell (page 13), Shinn (page 6), Bartholomew (page 5), and Rosencrans (page 18) suggest that change is in order, that teachers and programs are not keeping up with the recent technological developments in agricultural mechanics. They question the relevance of instruction in this area, and go on to provide frameworks through which we may consider improving instruction in agricultural mechanics. These are important and timely problems that confront each of us who teach students in the agricultural mechanics content area. They are not however, new problems.

Let's look at the issue of keeping up with technology. In the January 1955 issue of this magazine, 42 years ago, the theme was "The Increasing Emphasis On Farm Mechanics." Articles in that issue offered opinions that power tools (e.g., electric circular saws) both should (Finley, 1955), and should not (Russell, 1955) be used in a "farm shop" program. Ahalt and Miller (1955) report on a study of 205 "farm mechanics skills" (p. 160), and conclude that, "The rapid changes taking place in farm mechanics means new skills will be added rapidly...and that some skills now in use may gain or lose importance in a short period of time" (p. 164). Through the years, the debate has continued. "Great strides have taken place in the mechanization of agriculture. How has the vocational agriculture farm mechanics program kept pace with this change?" (Cain, 1958, p. 150). "Are you 'keeping up' with the agricultural engineering aspects of farming in your teaching?" (Johnson, 1962, p. 256).

Clearly, in-service education is vital to the process of upgrading teacher skills as technology advances. While most of us now support the use of circular saws, how many of us are prepared to include instruction in the electronic sensor, Global Positioning and database management systems needed for prescription farming? James Daniels (1986) suggested that we are all at various stages of being "out-of-date," and must work steadily to "stay current." Don Johnson (1986) outlined "six tools" vocational agriculture teachers could use to stay current. In this issue Swan and Zimmerman (page 16) describe a model for effective in-service and Johnson (p. 4) provides three views of the role of agricultural mechanics and its place in the curriculum. Believe it or not, with all this support for adopting innovative technologies in our in-service curriculum, some states 1997 summer in-service schedule include courses in advanced welding and air-cooled engine repair, and basic electrical wiring and hydraulics.

The relevance of instruction in agricultural mechanics has been addressed a few times before as well. Christensen (1964) suggested that many teachers need to revamp their entire curriculum in agricultural mechanics. Woodin (1964) suggested that we look outside the "shop" and classroom to find relevant experiences for our students. Shinn's 53 friendly critics in this issue (p. 6), outlining the purposes of an agricultural mechanics program, echo Johnson (1964) when he said, "In the past we perhaps taught our students too much of the 'know what' and not enough of the 'know why'" (p. 198).

Why did I suggest in my opening paragraph that Mozart would appreciate the "music" we make in the agricultural mechanics laboratory? No, it is not because he was deaf, that was Beethoven. The answer is because his music, more so than any other composer, is an exercise in higher mathematics. I had a music teacher who once told me that he wanted his students to see the math behind the music. My wife is a statistician, and she argues that it's far better to hear the music in mathematics. I'll borrow from the past for my argument, "What better way is there to learn mathematics and physics than to apply them to the problems of farming?" (Johnson, 1962, p. 199). The world is changing fast, more rapidly now than ever. Perhaps nowhere as quickly as in the fields associated with the application of technology to the solution of problems. Students will need to be prepared to live in a world in which all human knowledge doubles in weeks, or even days. A world in which specialized knowledge becomes obsolete very rapidly. In such a world, those who "know why" will prosper, while those who "know what" will not.

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THEME ARTICLES

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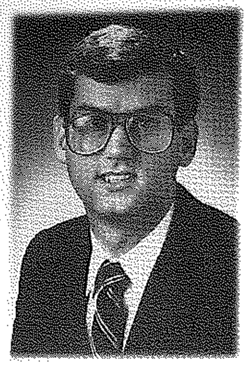
Agricultural Mechanics In Agricultural Education:

Three Common Views



By Donald M. Johnson

Dr. Johnson is an associate professor of agricultural education in the Department of Agricultural and Extension Education at the University of Arkansas, Fayetteville.

As agricultural education moves to a more science-based curriculum, the role of agricultural mechanics has been a subject of extended discussion and debate. As both a participant and an interested observer of this discussion, it seems to me that three different views of agricultural mechanics and its place in the curriculum have emerged.

The First View

The first view holds that agricultural mechanics is no longer relevant in a science- and mathematics-based curriculum. Persons with this view equate agricultural mechanics with training in "shop skills." They see the curriculum as emphasizing manipulative skill development in welding, woodworking, tool fitting and other "low-tech" areas. Based on this perspective, they feel time devoted to agricultural mechanics simply detracts from the time available for teaching more "important" subjects (e.g. biological sciences).

This view was expressed by a recent national "Agriscience Teacher of the Year" award winner. According to this teacher, not having an agricultural mechanics laboratory was an asset in winning the award. Since the teacher did not have to spend time teaching shop skills, more time was available for teaching the science of agriculture. This view is not limited to teachers; I have heard more than one teacher educator express the same thought.

The Second View

Individuals holding the second view of agricultural mechanics share one key element with those in the first group: they equate agricultural mechanics with shop skills, again, with primary emphasis on manipulative skill development. However, to the second group, this emphasis on skill development is a strength for three reasons.

First, they feel that developing skills in the use of tools and equipment has both intrinsic worth and utilitarian value. Second, shop skills classes provide a situation where even those with limited academic ability can experience success, since the emphasis is on "hand smarts" not "head smarts." Finally, though less commonly admitted, these classes are popular with students and tend to have fairly large enrollments. Thus, they help maintain the student numbers necessary to justify the entire agricultural education program.

> *"Instruction should emphasize the basic principles of modern agricultural technology such as electronics, robotics, hydraulics, pneumatics, computers, energy and power systems, machine systems and other "high-tech" applications."*

The Third View

The third view of agricultural mechanics is much different than the first two. Those with this view see agricultural mechanics as being much broader than traditional shop skills. To those with this view, instruction should emphasize the basic principles of modern agricultural technology such as electronics, robotics, hydraulics, pneumatics, computers, energy and power systems, machine systems and other "high-tech" applications.

Proponents of this view believe that instruction in agricultural mechanics should emphasize hands-on laboratory experiences designed to help students learn the basic scientific principles and mathematical relationships that undergird modern agricultural technology. According to Harper (1992, p.5), the goal is "not to convert our agricultural mechanics instruction to a science curriculum, but rather to a technology curriculum...in order to prepare students to work in a rapidly changing technology-based industry."

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Agricultural Mechanics: Its Place in Our World

By Tammy Bartholomew

Ms. Bartholomew is an agriculture teacher at Archie High School, Archie, MO.

Diversity. Non-traditional. Science integration. These are the buzz words that describe the direction agricultural education has traveled over the past several years. Mice and gerbils are replacing cows and sows as supervised agricultural experience programs. Laboratories with test tubes and tilapia are becoming more prevalent than arc and MIG welders.

It is possible to have a very successful agriculture program without a mechanics laboratory, but at what cost? The opportunity to develop basic mechanical and home maintenance skills is lost. The shop can be a very intimidating place because of the instructional content, but I feel it is more important to put feelings of inadequacy aside and dive into this very rewarding area of instruction.

Students who live in town and on non-production farms have the opportunity to use the shop as an SAE laboratory, and there is never a shortage of projects for those students who cannot afford to build something for themselves. These projects reinforce the students' use of basic skills and often require initiative and decision making. The agricultural mechanics laboratory also provides endless recognition for the agriculture program through community service projects. Our community would be at a loss without the welding services provided by agriculture students.

> *"Job performance skills such as problem solving, following through to completion of a task, sales and pride in workmanship can be attained by the students in construction classes."*

The shop is also where students with learning disabilities can excel. Developing welding skills and building a project can provide these students with a much-needed boost to their self-worth and overall self-esteem. All of this became even more evident to me during this past Christmas season. A young lady in my Agricultural Science II class was afraid to even set foot in the shop. With encouragement, not only from myself but also from her classmates, she overcame her fear and learned how to weld. In just a few short weeks, she completed a metal project for her father as a gift. I'm not sure which one was the most proud, the dad or his daughter. Since that experience, this student has been less intimidated by new experiences and has more confidence to take on new educational challenges.

Job performance skills such as problem solving, following through to completion of a task, sales and pride in workmanship can be attained by the students in construction classes. During Operation Desert Storm, a former student wrote me from the front lines. His responsibilities included welding military tanks when the tracking broke, many times under the protection of fighter planes flying overhead. He commented in his letter about how much he enjoyed what he did and how grateful he was to have learned to weld in high school. He took great pride in his responsibilities and realized the importance of getting the job done right the first time.

The basic reasoning for men and women giving up traditional mechanics programs stems not from the pressure to include more science-related curriculum, but also from a lack of confidence in their basic shop skills or a general lack of interest in the shop as a learning laboratory. This lack of interest is justified by comments of how today's students are not as interested in the area of mechanics or they no longer have the need to learn these skills. Now in response to this theory, we have young people who cannot make even basic home repairs or even know how to use common tools properly. We cannot depend on parents to teach these basic skills because the parents are no longer spending that kind of time with their children.

This lack of interest in mechanics may be substantiated further by our universities. It appears that new teachers entering the field are not as well trained in mechanical

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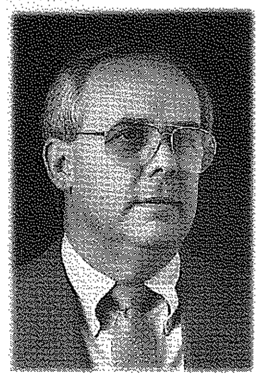
Theme Article

Spending 15 Minutes Listening to Our Critics. . .



By Glen C. Shinn

Dr. Shinn is professor and head of agricultural education at Texas A&M University, College Station.

Have you noticed that several so-called opinion leaders in education and industry have been more than just a little critical of our agricultural mechanics curriculum? Some even go so far as to charge that the secondary program must undergo revolutionary change or be abandoned! Perhaps our first response was to ask just where do these "so-called experts" get the license to tell us what to do?

Now before we get defensive, it may be well to consider the advice of Henry James. A noted 19th century philosopher, James reasoned that we should see the critic as a helper, as a torch bearing outrider, ...and even as a brother. Well then, we could just ask 53 of our friendly critics to share their perspectives in writing and see what advice they would offer. Surprisingly, it was not difficult to get them to make recommendations!

The way you ask the question will influence the answer you get!

The group of 53 friendly critics was assembled from departments of agricultural education, agricultural engineering, colleges of agriculture and state departments of education across the nation. A personal letter invited each friendly critic to share their opinions regarding the content, context, process and interrelationships of agricultural mechanics as a course of study in secondary agricultural education. Members of The Council Task Force on Agricultural Mechanics provided advice for the design. Ralph Tyler's work in evaluation provided a framework for the questions. The process allowed anonymous critics to write and rate critical statements in three independent rounds.

What should be the purposes of the secondary agricultural mechanics program?

Our critics reached agreement on three broad statements when asked about the purposes of high school programs. They recommended that the curriculum:

(1) develop positive attitudes about safety and quality of work;

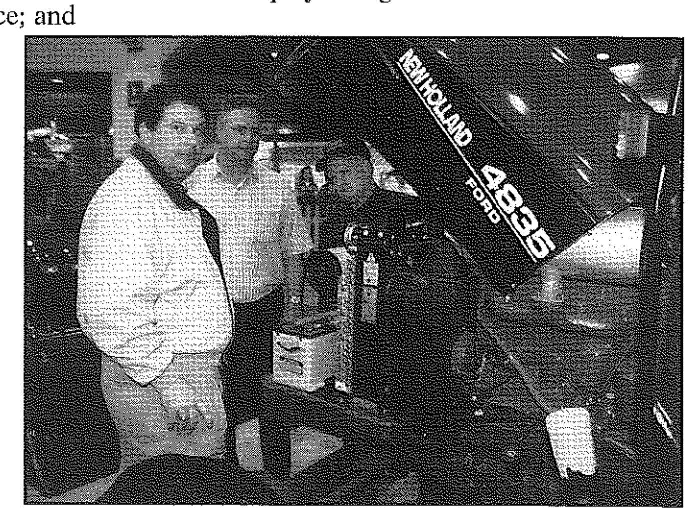
(2) include knowledge of principles that govern science; and

(3) develop useful skills that are appropriate for current applications.

Well, who would argue with that!

Positive Attitudes

When examining specific statements, the critics agreed that the program should develop attention to and consciousness in safety while using technology in agriculture. They also agreed that the curriculum should foster positive workmanship, work habits, time-on-tasks and decisions about the quality of one's work. As a result, the program should instill desirable work habits in students using a variety of "hands-on" activities that come from the modern workplace.



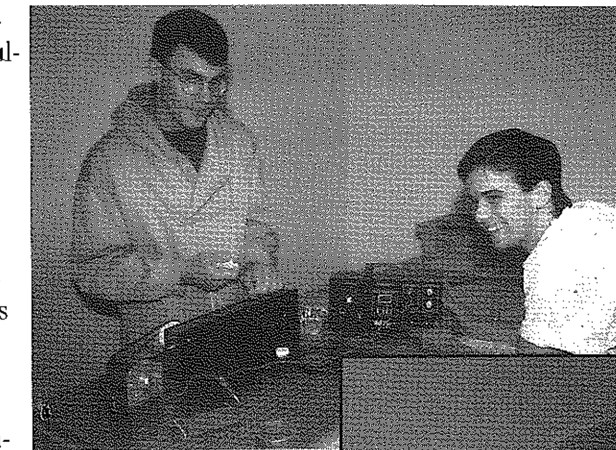
Critics recommend closer connections with industry and encouraged professional development. David Lyons, manager with New Holland North America, Tom Howell, AST teacher with Sulfur Springs, TX, ISD, and Ted Ford, professor with Tarleton State University, exchange ideas about the current New Holland tractor. Mr. Lyons and many other industry leaders support summer internships where teachers work in industry settings. (Photo courtesy of Glen C. Shinn.)

Universal Principles

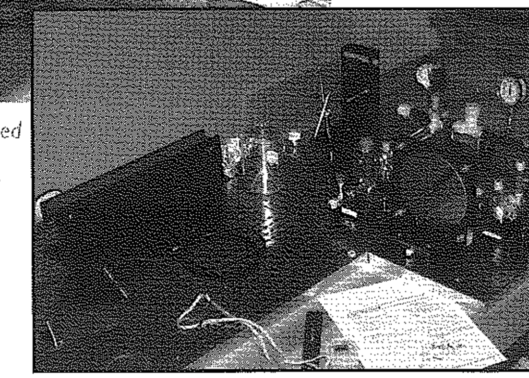
Critics agreed that the secondary curriculum should develop a working knowledge of science. Specifically, they agreed that the curriculum should acquaint students with principles and competencies related to the application of physical sciences to real problems in agriculture. Students should use agricultural technologies as tools to reinforce physical and biological science principles, mathematics and communication skills. Students should also develop an understanding of the role that technology plays in agriculture. The curriculum should complement a comprehensive curriculum in agricultural education.

Useful Skills

A consensus purpose for the secondary curriculum included agreement that the student recognize agricultural mechanics is much broader than production agriculture and shop. Specifically, the curriculum should develop knowledge and application of basic principles of power units, machinery systems, electricity and electronics, structures, agricultural construction and soil and water conservation and management. These understandings are used in decision-making for economic, social and environmental advantages in their careers. In a practical vein, the critics also agreed that the curriculum should develop a variety of mechanical skills that the student can use throughout life in both vocational and avocational settings.



Critics unanimously encouraged learning by doing—the more you are involved in the learning, the more significant your learning will be! Students at Elgin ISD use bench components to better understand the relationships of electrical and mechanical principles.



Experiential learning that develops problem-solving and decision-making skills are developed within a coordinated classroom, laboratory, supervised experience and FFA context. Components are a practical way to develop problem-solving skills while reducing risk of damage to large machines or equipment. (Photos courtesy of Glen C. Shinn.)

What are the best educational experiences for students in the secondary agricultural mechanics program?

In the final analysis, the critics agreed on three broad categories of educational experience that included:

(1) integrating teaching methods that foster knowledge and problem-solving in holistic systems;

(2) using project methods that employ current technology; and

(3) facilitating actual work experience for all students.

I'll bet we all agree on these recommendations!

Integrating Methods

In some detail, the critics recommended educational experiences that develop a systems perspective. Critics encouraged experiences that develop an appreciation for the principles of math, science and technology. They recommended a combination of classroom, laboratory and community-based activities that are very different from the past and more closely linked with current post-secondary programs. Classroom and laboratory activities should be integrated, connecting scientific principles and practical skills. The teaching should link acquiring technical information with hands-on experiences.

Using Projects

In order to connect project methods with real-world applications, the critics encouraged a variety of laboratory activities, simulations and projects. They believed instruction should emphasize safe use of equipment and develop critical reasoning skills regarding safety and work quality. Students should participate in hands-on activities in the laboratory with enough time assigned to accomplish the skills. Critics agreed that project methods provide opportunities to work on real problems using modern tools and equipment. They also agreed on the need to develop or retrofit shops (laboratories) that emphasize new technology. YES!

Facilitating Work Experience

Universally, critics recognized the value for increasing on-the-job experiences with real-world application. There was unanimous agreement for developing more opportunity for actual work experiences that include internships and co-op programs. When working with a group of students that bring little experience from the workplace, one would likely agree with this recommendation.

How should the experiences be organized?

Four primary categories described the consensus of our critics:

(1) insuring all experiences are safe;

(2) simultaneously coupling practical examples with theory in experiential learning settings;

(3) inferring to broader settings and applications; and

(4) organizing spirally sequenced experiences that foster technical knowledge, personal development, employability and entrepreneurship.

Safe Experiences

Like parents, critics warned that the experiences must be safe for the individual student. They recognized that what is safe for one student may not be safe for another. Critics recommended safety lessons that simultaneously involved theory and practical exercises to encourage active learning and teamwork.

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> "The program should instill desirable work habits in students using a variety of "hands-on" activities that come from the modern workplace."

Practice and Theory

Experiential learning that develops problem-solving and decision-making skills was encouraged by the critics. They agreed that the experiences should develop within a coordinated classroom, laboratory, supervised experience and FFA context. In order to better couple theory with practice, they endorsed a sequential curriculum where basic skills are followed with specific job-cluster skills.

Organizing Spiral Experiences

The curriculum should include semester-length courses that are sequenced from basic to complex. Specialization during the 11th and 12th grade and prerequisite courses before students enroll were recommended by the critics. The group criticized allowing open-entry enrollment in advanced courses.

Broader Settings

Technology skills needed in work settings should be integrated within the specific course. For example, horticultural courses with greenhouses should include a unit on electrical safety, circuits and controls. There was broad support for broad, career-cluster courses rather than subject-matter approaches. The critics recommended sufficient instruction before students participate in work experiences outside of school settings. More than two-thirds of the critics encouraged increased emphasis on entrepreneurship, including business principles.

What are the Strengths?

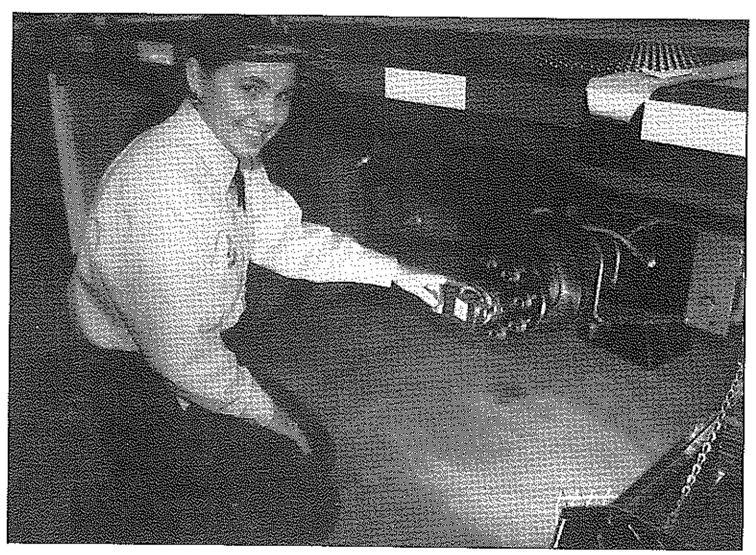
After three rounds of written dialogue, critics agreed on two categories of strength in agricultural mechanics programs:

(1) active learning by doing; and

(2) developing positive self-esteem among all students, especially under-achievers. As teachers, we are also likely to agree on these perceived strengths of the secondary agricultural mechanics program.

Learning by Doing

Most teachers understand the value of learning by doing and providing hands-on experiences for students. Critics unanimously encouraged learning by doing. Steven Covey observed that the more involved you are, the more significant your learning will be.



Critics unanimously encouraged learning by doing—the more you are involved in the learning, the more significant your learning will be! Students at Elgin ISD use bench components to better understand the relationships of electrical and mechanical principles. (Photo courtesy of Glen C. Shinn.)

The critics recommended engaging each student in meaningful learning experiences.

Building Self-Concept

Critics believed that the agricultural mechanics program provides opportunities for students to succeed. The program includes activities that build their self-esteem. Too, critics recognized that the curriculum currently reaches students who sometimes have difficulty with "academic" classes. They were very complimentary of the curriculum that develops and applies practical skills and includes "real-world" applications. All of us who have watched an at-risk student succeed in agricultural mechanics know the positive influence on self-worth and individual dignity.

What are the Limitations?

If you are still reading, you are likely willing to listen to our limitations as viewed by 53 unnamed critics. Some of the observations were not pretty! They agreed on five clusters of limitations:

(1) poor housekeeping;

(2) failing to address higher-level technology skills;

(3) using projects that are not appropriate;

(4) failing to incorporate electronics and other technologies into the curriculum; and

(5) limited teacher background and preparation.

Poor Housekeeping

This limitation was unanimously recognized by the 53 critics. Too, the critics concluded that females generally hold a more negative perception of the program. The program was often described by the group as dirty and low-tech. The critics recommended better laboratory organization to improve the image of the program.

Failing to Address Higher-Level Technology Skills

Critics agreed that many programs appear to be "low-tech" and "old fashioned," certainly not "state of the art." In many cases, critics believe that the courses are not addressing higher level technology skills that are commonly required for employment in agricultural industry or for ownership.

Projects That Are Not Appropriate

Critics reasoned that the projects used in many courses are based on past needs and experiences. They recommended that project methods use activities that are appropriate for the "new" agricultural industry; not "deer stands and BBQ pits." There was support for using components from electronics and hydraulic systems.

Failing to Incorporate Electronics and Other High-Tech Systems

The use of equipment that is outdated was a common criticism. Many critics believed the courses fail to address new technology and do not meet the needs of today's agricultural worker. The critics specifically cited the need for more electronics, controls and robotics as a part of relevant instruction.

Teacher Background and Preparation

Critics recognized the rapid changes that have occurred in agricultural technology and warned that the program is limited by proper backgrounding and preparation of teachers. The critics encouraged short courses and professional development for teachers. There was broad support for summer internships where teachers work in industry settings.

> "Certainly, the forces of change are at work in agricultural science and technology. We can recognize and value the advice of our critics, or we can take our place in the fence-rows filled with obsolete tools of yesterday. Pliny the Elder, circa 400 BC, observed 'criticism comes easier than craftsmanship.'"

What Should We Do? What Can We Do?

Often, "friendly critics" shared the same high goals and deep frustrations that "insiders" hold regarding the adoption of change. To be successful, the contemporary curriculum must foster positive attitudes, apply fundamental principles and concepts and develop useful skills. Educational experiences must be integrated and holistic using problem-solving to maintain both biological and physical science systems. Safety is a primary concern. Experiential learning must simultaneously couple practice with theory. Evaluation must use recognized techniques, but especially make use of authentic assessment and task performance.

The positive perceptions were that the current programs use active learning methods and build self-esteem among students. However, the program has a broad image of being dirty and low-tech. More often, projects are not appropriate for today's needs and the teacher is often viewed as a limiting factor to a high quality program. Those preparing teachers must develop stronger collaboration with industry, extend problem-solving skills and seek courses from non-traditional sources. Teachers must be active learners who continually re-evaluate needs and assess new technology through integration and collaboration.

These findings represent only one perspective; that of a national panel judged as being critical of the current program. Paul Kennedy (1993), writing to the larger society, chided that "it remains to be seen, therefore, whether traditional approaches will carry the American people successfully into the 21st century (or whether they will pay a high price in assuming that things can stay the same at home while the world outside changes more swiftly than ever before)" (p.325). Certainly, the forces of change are at work in agricultural science and technology. We can recognize and value the advice of our critics, or we can take our place in the fence-rows filled with obsolete tools of yesterday. Pliny the Elder, circa 400 BC, observed "criticism comes easier than craftsmanship."

A complete copy of a paper presented to the National Agricultural Mechanics Seminar is available on the Internet (http://www.tamu.edu/ageduc/mainpage_index.html). *An Examination of Curricular Issues in the Secondary School Agricultural Mechanics Program Area: A National Delphi Using "Friendly Critics" as a Jury of Experts.*

Reference

P. Kennedy (1993). *Preparing for the Twenty-First Century.* New York: Random House (p. 325).

Agricultural Systems Management/Technology Programs

By Leon G. Schumacher

Mr. Schumacher is an associate professor of agricultural education and engineering at the University of Missouri, Columbia.

Introduction

Agricultural mechanization has been a strong component of the local high school agricultural education program since its early beginnings. The mechanization of agriculture allowed agriculturalists to expand their business operations and to operate more efficiently. As a result, agricultural mechanization instruction was accepted as an integral part of the agricultural education program.

Agriculture teachers soon sought ways to reward students for their skills in agricultural mechanization. According to Hagen, "agricultural mechanization contests provided that reward as early as 1938" (Hagen, 1978); this was approximately 33 years before the National FFA Organization founded the National FFA Agricultural Mechanics Contest. The contest, which was a reflection of the instruction at that time, focused on mechanization skills that related directly to production agriculture.

Agricultural education programs at the university level moved quickly to provide mechanical skills needed by agriculture teachers and others employed in this facet of the agricultural industry. The academic programs at this level were named "agricultural mechanization" and "mechanized agriculture." These programs, like those provided at the high school level, provided students with knowledge about the mechanical skills that were needed in production agriculture.

A New Name

Changing times have brought about change within the agricultural industry. As early as the 1970s, fewer and fewer agricultural mechanization graduates were being employed in production agriculture. Rather, graduates were hired in managerial positions that required a sound understanding of mechanical systems and the business economics associated with these systems.

As a result, the former agricultural mechanization curriculum was redesigned and renamed "agricultural systems management /technical systems management" at most U.S. universities. These programs were designed to prepare students for careers that required the application, management and marketing of engineering technologies. Students study technological systems with more emphasis placed on business and economics (including organization, operation, management, marketing and sales) and oral and written communications.

The change of name to "agricultural systems management/technology" (ASM/AST) occurred as our graduates reported that the name "agricultural mechanization" no longer described the activities they performed in the agricultural industry. Our graduates reported that the food industry had become dependent on many complex, automated and mechanical systems for successful operation. Whether it was a computer-controlled grain terminal on the Mississippi River, a processing line at a food plant or a combine used during harvesting, the successful operation and management of these complex systems required people who understood physical systems such as energy and power utilization, mechanical, electrical and computer systems.

John Deere employees donate time and energy to assisting with the mentoring program. (Photo courtesy of Leon Schumacher.)

ASM/AST programs prepare students to be problem solvers in their profession. ASM/AST programs focus on skill development that leads to careers related to entrepreneurship, marketing representatives, project managers, plant managers, leaders of service organizations or trade associations, manufacturers, corporate farm managers, retail dealers, power suppliers, contractors and management companies from production through processing and distribution. Each of these career opportunities present our graduates with unique problems that "systems thinking" students are capable of solving. For example, resetting a breaker in a service entrance panel may momentarily get a production line back up and running; it may also serve as an indicator of other issues to be addressed. Specifically, an electric motor may be overloaded. Resetting the breaker restarts the motor, but does not reduce the excess load which caused the tripping of the breaker due to the overload. If this situation continues, the motor will need to be replaced. The replacement of the motor will most likely occur at a critical time, causing much inconvenience and lost revenue for the company involved.

Courses Taken by ASM/AST Students

Problem-solving skills are attained as a result of students enrolling in a broad spectrum of ASM/AST courses, as well as business and economics courses. Table 1 lists the mechanical and economic related courses typically taken by ASM/AST students.

Leadership Development

Each university sponsors an ASM/AST Club, where students sharpen their leadership and communication skills. They also become acquainted with other students, as well as professionals from many areas. Activities in which these students commonly participate include field trips, attending professional meetings and conducting fund raisers which allow the club to cover travel expenses related to professional meetings, national competitions and extended field trips. Students also sponsor and participate in social activities such as bowling, pizza parties, picnics, banquets and service projects. Professionals often speak at club meetings, sharing cutting-edge technology with the ASM/AST students.

Table 1

Courses Taken by Agricultural Systems Management Students at the University of Missouri

Agricultural Systems Course Titles	Business and Economics Course Titles
• Agricultural Equipment & Machinery	• Accounting I
• Agricultural/Industrial Structures	• Accounting II
• Electricity: Wiring & Equipment	• Introduction to Business Law
• Materials Handling & Equipment	• Introduction to Management
• Mechanization Systems Management (Capstone)	• Introduction to Marketing
• Mobile Hydraulics	• Financing the Farm Business
• Pesticide Application Equipment	• Legal Aspects of Businesses
• Physical Principles for Agricultural Applications	• Macro Economics
• Surface Water Management	• Micro Economics

Professional Growth/In-Service Through Research

Agricultural systems management/technology professors conduct applied research. The information learned through this research better prepares ASM/AST professors to teach the skills needed by their students. Problems commonly researched include issues related to student enrollment /recruitment, skills needed by our graduates, safety, water quality, soil and water management, efficient use of machinery and more. In essence, this program provides a link between the design engineer and the consumer.

Students are often involved in ASM/AST research. Several ASM/AST students at the University of Missouri (MU) have participated in on-campus internships that were specifically designed for this purpose. MU on-campus student interns have assisted with alternative fuels research efforts, global positioning-related research, student recruitment, and an assessment of competencies needed by ASM/AST majors.

...continued on page 12

Agricultural Systems Management/Technology Programs, continued from page 11

Change Facilitated by the Agricultural Implement Industry

The implement industry has become physically involved in helping design the academic program best suited for ASM/AST majors. For example, John Deere (Kansas City Branch) worked closely with the University of Missouri in 1988–1989 while selecting the courses needed for students enrolled in the "John Deere Mentor Program." Together they designed a four-year academic program that developed the mechanical and business background needed by students who plan to work in the agricultural implement industry.

The John Deere Mentor Program began when John Deere Kansas City Branch executives invited agricultural engineering faculty from the University of Missouri to form a partnership that would serve to strengthen the agricultural machinery industry. As stated by Hal Moon, John Deere Kansas City Branch, "We see fewer students that have the right combination of mechanical and business training which would permit them to eventually own and/or manage an implement business." According to Moon, if the agricultural implement industry fails to provide the appropriate combination of skills, much needed leadership for the agricultural implement industry will be left untapped.

During the mentor experience, students become familiar with the day-to-day operation and management of a John Deere dealership; students spend a minimum of two summers working at a dealership to develop this background. The first summer is basically a hands-on experience with the students working at a sponsoring dealership. The second summer of employment is an internship designed by the owner/manager of the dealership, John Deere mentor advisor and academic advisor. Students essentially identify, and have the opportunity to solve, real-world problems for the dealership.

The John Deere Mentor Program has become a model for other academic disciplines at the University of Missouri, and other Midwest universities, for developing future industry/ academic relationships with agricultural systems management/agricultural systems technology. These joint efforts (University of Missouri and John Deere) led to development of John Deere Mentor programs at the University of Illinois and Kansas State University.

Placement

Graduates find that they qualify for agricultural positions because the curriculum emphasizes a broad, technically based education. According to MU's Academic Chair for ASM, Dr. Bill Hires, the placement rate for graduates has been 100%. Graduates from agricultural systems management/technology typically find work as: 1) manufacturing supervisors; 2) area service specialists; 3) product marketing managers; 4) product support specialists; 5) test & development technicians; 6) district sales managers; 7) business managers, and 8) field service directors. The companies traditionally employing these graduates include: 1) Archer Daniels Midland; 2) J.I. Case; 3) Continental Grain; 4) Growmark, Inc.; 5) Pioneer Hi-Bred; 6) Cargill; 7) Caterpillar; 8) DeKalb-Pfizer Genetics; 9) Deere and Co.; 10) Ag CO; 11) Ag Chem; 12) Quaker Oats, and 13) Ag Processing, Inc. The remainder of these graduates tend to be self-employed in production agriculture.

Summary

Agricultural systems management/agricultural systems technology programs have been revised to reflect change that has occurred within the agricultural industry. Graduates have taken managerial positions requiring an understanding of mechanical systems and business/ economics. These programs are designed to prepare students for careers which require the application, management and marketing of engineering technologies.

Graduates of the program reported that the name "agricultural mechanization" no longer described the activities they performed in the agricultural industry. As a result, the names agricultural systems management and/or agricultural systems technology programs have been adopted by several colleges and universities across the United States. It is also important to note that changing the name was not just a cosmetic make-over. This change was welcomed by the agricultural implement industry and, in many cases, industry representatives have provided a significant level of support in the form of financing (scholarships), use of equipment (for teaching aids), and time. The response from students has been quite positive. Enrollment in these programs at the university has increased from 50 to 300 percent! This is no small wonder, since the placement rate for agricultural systems management/technology graduates has been excellent...often 100 percent!

References

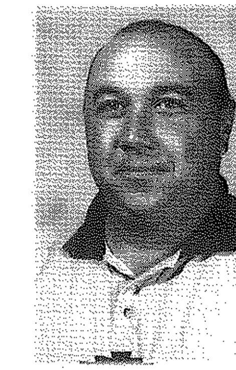
R. Hagen, *FFA at 50 in Missouri-1928-1978* (Jefferson City, Missouri: Missouri Association of FFA, 1978).

W.G. Hires, Personal Interview (1997).

H. Moon, Personal Interview (1995).

Theme Article

Is "Agricultural Electronics" Being Taught as Part of Your Curriculum?



By Joe Muller and Randy Tidwell

Dr. Muller is an agricultural mechanics curriculum specialist with the Instructional Materials Service at Texas A&M University, College Station and Mr. Tidwell is an agricultural science and technology instructor at Troup High School, Troup, TX.

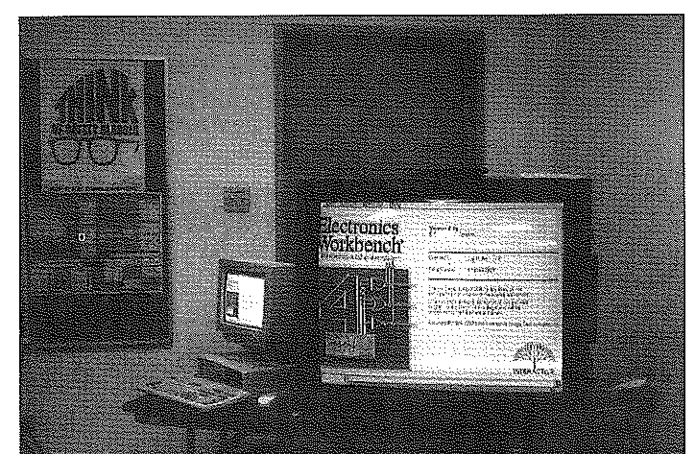
Electronics in Agricultural Education

We are all aware of dramatic increases in the use of electronic technology in every phase of agriculture within recent years. Regardless of career aspirations in agricultural production, processing, product distribution, sales, service or research and development, high school students who enroll in our agricultural courses will utilize electronic technology in some manner. As educators, we must ask ourselves, "Are we adequately preparing our students for these careers?" Regardless of their career pathway, knowledge and skills related to electronics are easily transferable among different applications when basic theories and principles of operation are understood.

In 1993, an agricultural mechanics advisory committee was formed by the Texas Education Agency (TEA). The charge given this committee was to review the content of the existing agricultural mechanics curriculum used in Texas, and to make recommendations for change. The committee included representatives from TEA, agricultural businesses and industries, high school agricultural science and technology instructors who specialized in agricultural mechanics, university instructors and professors who taught agricultural mechanics/ engineering related courses and university personnel from teacher-training institutions responsible for pre-service and in-service education.

To prepare students for the 21st century, the committee recommended eight broad essential elements (educational objectives) dealing with electronic technology needing increased emphasis in the total high school agricultural education curriculum. Where practical, these essential elements were to be infused into existing agriculture courses currently being offered. The committee further recommended a new semester course in agricultural electronics.

Curriculum of Instruction



The use of computer software to design, draw, simulate and test electronic circuits was demonstrated during an in-service workshop used to introduce agriscience instructors to the new agricultural electronics curriculum. (Photo courtesy of Joe Muller).

From the broad essential elements, an outline of specific units and topics of instruction was formulated by members of the committee (see Table 1, page 15). A semester shop/laboratory-oriented course in agricultural electronics was developed. The course content outline was designed to reinforce and extend a student's knowledge of mathematical and scientific principles and concepts involved in producing and controlling electronic impulses. With technical input from the committee members and other specialists within the agricultural electronics field, student information topics were developed for the course. Hands-on activities were included to provide students with generic workplace skills relevant to electronic applications in agriculture.

Although developed in a coherent sequence for a complete semester course, each of the student topics can be used individually as stand-alone units of instruction. For example, instructors teaching horticulture or aquaculture courses may wish to integrate several topics such as "Operation and Use of Actuators and Displays" or "Integration of Electronic Systems

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Is "Agricultural Electronics" Being Taught as Part of Your Curriculum, continued from page 13

in Various Agricultural Applications" within their curriculum. These topics could be used to help explain the basic operation and use of electronic monitoring and controlling devices being integrated into the heating, cooling, fertilization and/or lighting systems of a greenhouse, or the automated oxygen monitoring, water aerating and feeding equipment in an aquaculture operation.

"The course content outline was designed to reinforce and extend a student's knowledge of mathematical and scientific principles and concepts involved in producing and controlling electronic impulses."

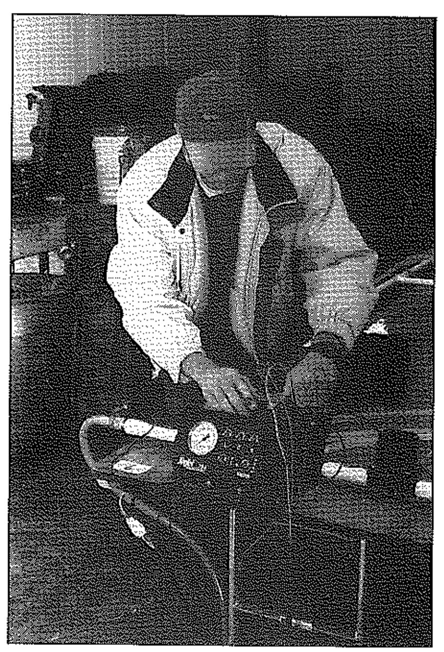
Success of Agricultural Electronics at Troup High School

Troup Independent School District is a small, rural district in East Texas. As such, we attempt to meet the diverse needs of our students in a wide variety of areas. We emphasize the use of technology in the classroom as a way to help prepare our students for life in the 21st century.

I was introduced to the concept of an experimental agricultural electronics course as part of agricultural mechanics curriculum at an in-service workshop held during the Professional Improvement Conference last summer. I felt that this course would enhance our current curriculum. Fortunately, our superintendent, Dr. W. L. Sanders, is a proponent of innovative ideas, particularly in technology. His support helped us get the course started.

We began teaching agricultural electronics as a separate course last fall. Because we operate under an accelerated block schedule, the entire course was taught in a nine-week period. The students benefited immensely from the hands-on applications designed into the course. They also enjoyed being able to see the results of their projects immediately.

The students explored AC and DC series and parallel circuitry and implemented Ohm and Kirchoffs' Laws. They designed circuits which they tested with a multimeter. In addition, they examined the operation of semiconductors, investigated the "hole flow theory," and studied different binary numbering systems used in electronic technology. They applied this knowledge while reading schematics. Students also developed skills necessary to evaluate logic circuitry like AND gates, OR gates, NOR gates and NAND gates using the truth tables for each.



Checking an electronic control unit on a chemical sprayer was one of the skill activities in the 1996 National FFA Agricultural Mechanics Career Development Event. (Photo courtesy of Joe Muller).

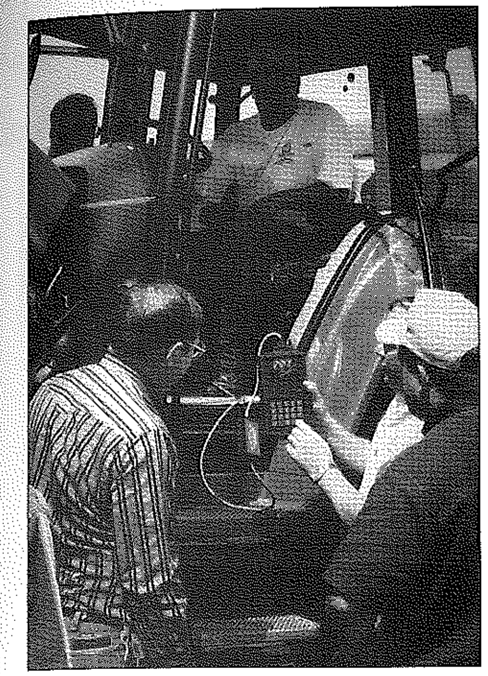
The cost factor of implementing a new course was a concern. We were fortunate to have in place 12 classroom computers, a plotter and several ink-jet printers. Thus, we were able to offer the course and use a limited initial budget to purchase instructional materials and electronic project kits from Radio Shack®. Students were able to use CAD and other software programs to draw schematics and simulate electronic circuits.

Our students gained essential electronics knowledge and skills necessary for entry-level employment and/or further education at nearby colleges. Our high school principal, Ricky Williams, was very impressed with student attentiveness and focus during class. I believe agricultural electronics was a success at Troup High School.

Making It Happen

It is one thing to simply say, "changes in the curriculum need to occur," assign a course name and develop or purchase quality instructional materials. For major changes or additions to the high school agricultural education curriculum to be successful and long-term, additional factors must be addressed (no rank order implied).

1. Felt need for curriculum change on the part of instructors; not just that you need to or must teach this.
2. Felt need for the information on the part of students enrolled in the courses.
3. Proper in-service education for existing instructors.
4. Adequate changes and/or additions to pre-service courses required for teacher certification.
5. Commitment from local administration and school boards.



Collaboration among university and agricultural business and industry personnel is a key to a successful in-service. Here, Jim Thompson, area service manager with New Holland North America, Inc., demonstrates the use of electronic diagnostic equipment. (Photo courtesy of Joe Muller.)

No one person, organization or group of individuals has full authority or control over all the factors. It takes a combined effort on the part of all stake-holders to make profound and lasting changes in the agricultural education curriculum that is actually taught. Teaching agricultural electronics is one way to make such a change. Why don't you consider teaching it in your curriculum?

For additional information on the student information topics that were developed or adding agricultural electronics to your curriculum, contact Joe Muller at Instructional Materials Service, Texas A&M University, 409-845-6601, or via e-mail (j-muller@tamu.edu).

"As educators, we must ask ourselves, "Are we adequately preparing our students for these careers?""

Table 1

Units and Topics of Instruction for a Semester Course in Agricultural Electronics

A. Basic Principles of Electricity, Magnetism and Electromagnetic Induction
   1. Electricity and How it is Generated
   2. Applied Mathematics Review
   3. Applying Ohm and Kirchoffs' Laws
   4. Resistance and Capacitance in Electrical Circuits
   5. Applied Magnetism and Electromagnetic Induction

B. Operation and Safe Use of Tools and Mechanical, Electrical and Electronic Test Equipment
   1. Agricultural Mechanics Safety and Laboratory Management Procedures
   2. Safe Use of Hand and Power Tools
   3. Safe Use of Electrical and Electronic Measurement and Test Equipment
   4. Desoldering and Soldering Electrical Connections

C. Electron and Hole Theory of Current Flow as Related to Semiconductors, Electronic Components, Integrated Circuits and Microprocessing
   1. Operation and Use of Semiconductors
   2. Operation and Use of Transistors and Integrated (what?)
   3. Operation and Use of Photonic-Semiconductor Components

D. Principles of Operation of Electronic Sensing, Measuring, Controlling, Actuating, Processing, Displaying and Data Storage Devices
   1. Use of Electronic Impulse Signals to Transfer Information
   2. Operation and Use of Sensors, Switches and Transducers to Generate Electronic Impulse Signals
   3. Operation and Use of Impulse Signal Conditioners, Microprocessors and Data Storage Devices
   4. Operation and Use of Actuators and Displays
   5. Operation and Use of Radio Wave, Laser and Fiber Optic Equipment

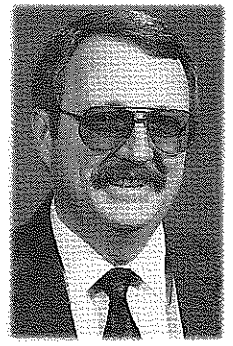
E. Integration of Electronic Sensing, Measuring, Controlling, Actuating, Processing, Displaying and Data Storage Systems in Various Agricultural Applications

F. Applying Appropriate Schematics, Manuals, Troubleshooting Techniques and Test Equipment to Analyze, Install, Diagnose, Service and/or Repair Electronic Equipment
   1. Utilizing Wiring Diagrams and Schematics as a Tool in the Installation, Service and Repair of Electronic Equipment
   2. Installing, Serving and Repairing Electronic Equipment

G. Career Opportunities in Agricultural Electronics

Theme Article

Quality Agricultural Technology and Mechanization In-Service



By Michael K. Swan and Steven Zimmerman

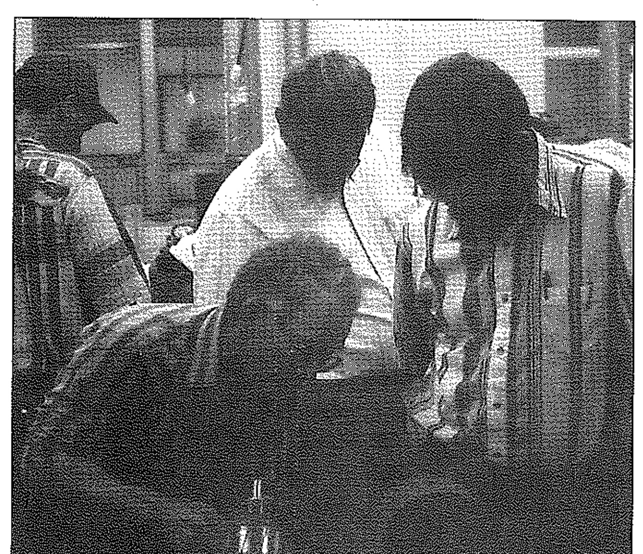
Dr. Swan is an associate professor and Mr. Zimmerman is a research associate of agricultural and extension education at North Dakota State University, Fargo.

Quality curriculum is one critical factor in making agricultural education programs effective. A key goal is providing quality in-service and professional development to strengthen and upgrade our programs. Achieving this goal will require us to think differently when it comes to improving curricula adjustments and promoting basic skills.

In North Dakota, our goal was to enhance our agriscience programs through modifications to curriculum and to improve teaching techniques used to deliver the materials. The process started during the 1990-1991 school year as a result of our secondary teachers' curriculum committee meeting. A proposal was presented during the summer months. Instead of being told what was to be offered, they were in the driver's seat and were able to make the decisions regarding what was going to be offered for credit and non-credit. They were also asked to design a 5- to 10-year plan for the topics to be covered.

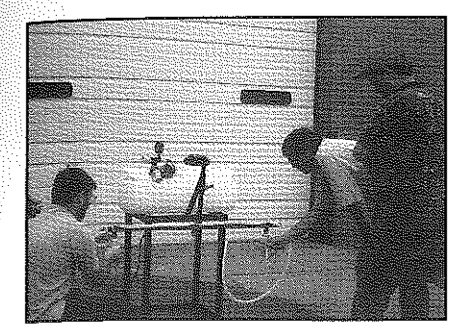
As teacher educators, we may not concur with everything a curriculum committee has to say, but we should agree that we cannot afford to ignore the importance of secondary instructor input. To a degree, we are doing the same thing Bill Gates does at the Microsoft Corporation. We provide our clients with what they want, when they want it, where they want it and from whom they want it. If this is done properly, they will come!

The first step for the secondary curriculum committee was grasping the idea that they were really making the decisions regarding what the offerings were going to be and who was going to be teaching each section or unit. The next step was to develop a timeline in which these programs were going to be presented. This group decided to team with secondary teachers from Minnesota the first year and have a four-day session on agriscience mechanics. The teachers identified two people to coordinate the activities, one from North Dakota and one from Minnesota. The first year, we offered teaching small engine theory with computers, MIG welding, plasma cutting and electric motors. We used technical college instructors, University of Minnesota faculty and North Dakota State University faculty as instructors for the units. During the first year activities, we had 60 teachers participate in the in-service program.



Teachers completing an electric motor evaluation activity. (Photo courtesy of Michael K. Swan.)

The four-day format fit with what we wanted and the time an agriscience instructor could be away from the community and still maintain a summer program of activities. Over the years, we have presented a wide variety of topics with a very diverse teaching force. The teachers of these individual sessions are chosen for their expertise in a specific area or field and for their teaching abilities. No teacher was asked to present more than one topic in any one year. We have been able to spread the teaching load over many different teachers in order to recognize specific teachers for their strengths. The final format for the workshop offered in the summer of 1996 is on the next page. The Professional Development Seminar has been offered at Beulah High School since 1993 with total support of the two agriscience instructors, the administration and the local school board. It has become an annual event in Beulah and several business leaders look forward to our courses each summer to the point that a number of them attend our evening barbecues and socialize with the out-of-town teachers.



Teachers completing a sprayer calibration activity. (Photo courtesy of Michael K. Swan.)

During each session, the instructor distributes the laboratory or classroom activity so each instructor goes home with six to eight completed activities to integrate into their curriculum as they deem appropriate. They also leave the seminar having gone through each activity and constructed all of the models used in each activity.

We have found that instructors attending these sessions leave exhausted, but with renewed excitement from the seminar's activities. This is an excellent activity which is a benefit to all involved in teaching and learning. The only limitation we have had in designing these programs has been our own imagination. Instructors for each session have been fairly easy to secure; don't forget to look to extension educators as well as business and industry partners when identifying session instructors. They love to be asked and have a great deal to offer our programs and teachers.

Agricultural Mechanics in Agricultural Education, continued from page 4

Conclusion

Which of these three views of agricultural mechanics and its place in the agricultural education curriculum is closest to your view? I can only answer for myself, but I tend to support the third view. In my opinion, this approach to agricultural mechanics instruction makes sense for at least two reasons.

First, agriculture is becoming more technologically sophisticated. Computers, electronics, global positioning satellites, variable rate technology and a host of current and emerging applications with a basis in the physical sciences attest to this basic fact. Because of this, new skills and understandings are necessary if our students are to pursue meaningful careers and/or further education in agriculture. Second, enhancing students' science and math skills continues to be a priority for policy makers and citizens on the local, state and national levels. An agricultural mechanics curriculum emphasizing the hands-on science- and mathematics-based study of agricultural technology can make a significant contribution to achieving important school (and national) goals for education.

The articles in this issue of *The Agricultural Education Magazine* deal with the role of agricultural mechanics within the total agricultural education curriculum. As theme editor, I invite you to read each article and consider its meaning for you, your program, and, most importantly, your students. Then, decide for yourself which (if any) of these three views most nearly reflects your view of agricultural mechanics and its place in the curriculum.

References

Joe G. Harper and Michael S. McManus, "Strategies and Techniques for Teaching How Things Work," *The Agricultural Education Magazine* 64, 9 (1992): 5-7.

Agricultural Mechanics: Its Place in Our World, continued from page 5

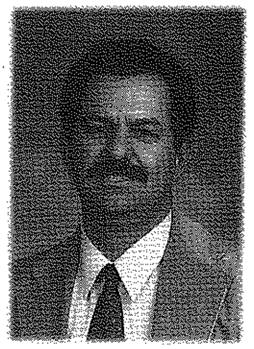
> *"In our quest to enhance agricultural curricula by raising fish, growing fast plants or experimenting with recombinant DNA technology, we have failed to realize that there is still a need for mechanics in agriculture programs."*

skills. There seems to be a continued lack of emphasis in this area of instruction on the university level, where student teachers are not always encouraged to enroll in mechanics classes.

In our quest to enhance agricultural curricula by raising fish, growing fast plants or experimenting with recombinant DNA technology, we have failed to realize that there is still a need for mechanics in agriculture programs, and there is a way for women and men to be successful in teaching this laboratory experience. Although the need for teaching major tractor engine overhauls and building stock trailers may be becoming obsolete, a general knowledge in mechanics is still important. Agricultural mechanics is still a very valid component of the total agricultural education program. We need to be careful to provide curriculum for all our students, from college preparatory to the ones on the school-to-work track. Our goal as agricultural educators should be to provide instructional balance that meets the needs of ALL our students.

Theme Article

A Visual Model For Agricultural Technology Education



By Carlos Rosencrans Jr.

Dr. Rosencrans is an assistant professor of agricultural and extension education, New Mexico State University, Las Cruces.

The need for change in agricultural mechanization education in secondary agricultural education programs is well documented in the literature (Eighmy, 1995; Shinn, 1995; Laird, 1994; Buriak, 1992; Osborne, 1992; Slocombe, 1986) and often discussed in agricultural education circles. That there is a need for change in agricultural mechanization education is not disputed; how to go about making changes is the challenge.

When any curricular or program change is undertaken, clearly a well-thought-out plan and course of action to initiate the desired change is necessary. Curriculum models are useful to explain and to make visual the interacting pieces of the curriculum and its processes and can be used to illustrate the needed revisions to a curriculum and program of instruction.

Visualizing the Future

The Curriculum Model for Agricultural Technology Education (CMATE) was developed to do just that. It can be used to formulate change within agricultural technology education programs, providing a plan and course of action for agricultural educators to follow. The components of the model are not necessarily new to agricultural mechanics/technology instruction, but putting their organization into a visual plan can assist educators in implementing the models within their programs.

The student in agricultural technology education is located at the center of the model. Education should be focused on the student and the student's needs, thus the model reflects that by placing the student at the heart of the model.

What Do We Want Students to Learn?

The large rectangular box entitled "Curriculum Inputs and Outcomes" encompasses input areas of instruction as determined by desired curricular outcomes within an institution's mission and philosophy. The eight distinctive components of curriculum identified in this model that should be incorporated into every subject area taught include:

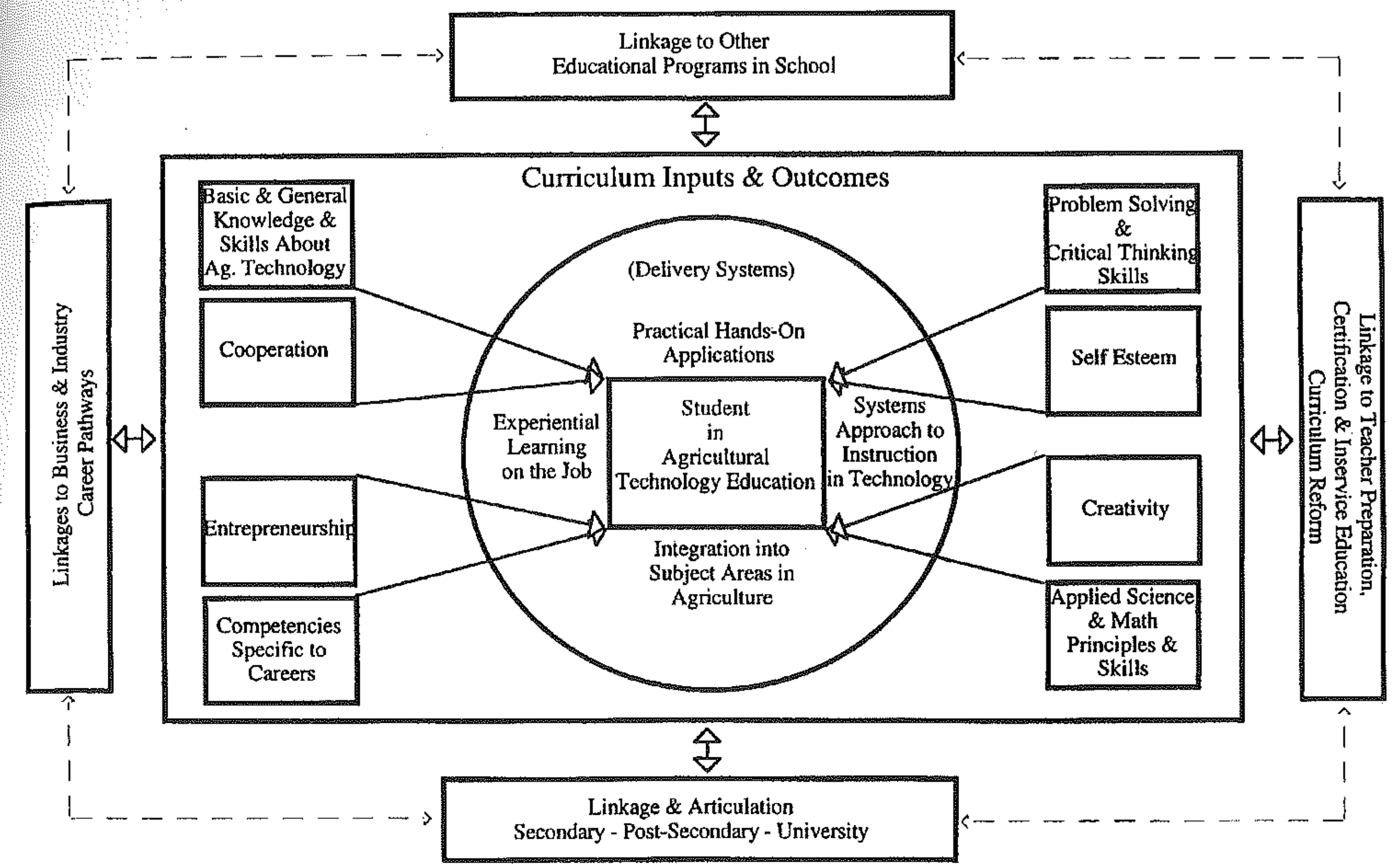
1. Basic and general knowledge and skills about agricultural technology
2. Cooperation
3. Entrepreneurship
4. Competencies specific to careers
5. Problem-solving and critical thinking skills
6. Self-esteem
7. Creativity
8. Applied science and math principles and skills

The curriculum input, basic skills and general knowledge about agricultural technology involves instruction in a wide range of information about agricultural technology. Additionally, students will develop an awareness of the relationship between technology and other areas of agriculture, as well as other areas of general education. Cooperation and entrepreneurship both focus on the development of interpersonal skills. Small group projects define the spirit of cooperation and are excellent learning situations in which to develop these skills. Competencies in specific career areas continue to provide the opportunity for a variety of hands-on learning experiences. Problem-solving and critical thinking skills help students make well-informed decisions. Self-esteem and creativity both focus on the development of personal skills. Applied science and math principles and skills involve teaching the "how" and "why" of the way things work. Students learn the science, physics or mathematical principles behind a concept, then the skills to apply those concepts.

How will we teach?

The delivery systems for teaching the curriculum in agricultural technology include:

1. Practical hands-on applications
2. Experiential learning on the job



Curriculum Model for Agricultural Technology Education (CMATE)

3. Systems approach to instruction in technology
4. Integration into subject areas in agriculture

Students must be given the opportunity to actually engage in learning through practical applications of the concepts learned. Designing and building appropriate projects would be an example. Experiential learning on the job is tied very closely to practical applications, with the emphasis on simulating the "on the job" aspect of the component. Lawn mowers could be brought in for repairs and/or maintenance; or in a greenhouse situation, ornamental plants could be grown for sale to the local community. Either example could be simulated using a business-type atmosphere. Apprentice programs within industry would be another example.

Using a "systems approach" to teaching involves presenting the interrelated concepts together rather than as individual units. Integration into subject areas in agriculture involves integrating agricultural technology throughout the agricultural education curriculum. A horticulture class offering instruction in operation and maintenance of small engine power equipment (lawn mowers, rototillers, etc.) used in routine maintenance of a landscaped area are examples.

> *"Blending the concepts, principles and skills from one subject area to the next combine to provide students with a basis of understanding the inter-relatedness and application of what they have learned."*

Who Will Help Us?

The linkages represented in the model reflect the supportive structures necessary for agricultural technology education to move forward. The structure includes linkages to:

1. Other educational programs in school
2. Teacher preparation, certification and in-service education, curriculum reform
3. Articulation with secondary, post-secondary and university levels

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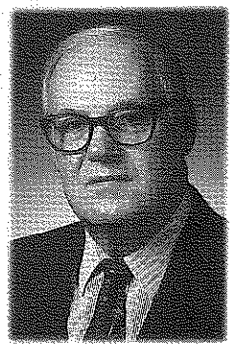
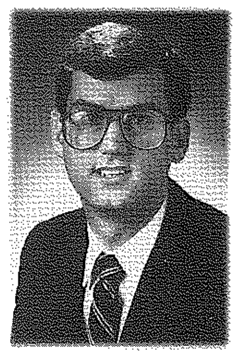
Theme Article

The National FFA Agricultural Mechanics Career Development Event: The First 25 Years





By Thomas A. Hoerner and Donald M. Johnson

Dr. Hoerner is a professor emeritus of agricultural education and studies and agricultural engineering at Iowa State University, Ames, and Dr. Johnson is an associate professor of agricultural education in the Department of Agricultural and Extension Education at the University of Arkansas, Fayetteville.

Introduction

In 1972, the first National FFA Agricultural Mechanics Contest was conducted at the Fort Osage Area Vocational-Technical School near Indepedence, Missouri. Teams representing 35 states participated in the contest which consisted of skill and problem-solving activities, and a written exam covering power and machinery, electric power and processing, and agricultural mechanics skills. The Danielson, Connecticut team, coached by Philip Hoyt, won top honors in the first national contest.

Twenty-five years later, the 1996 edition of what has become known as the FFA Agricultural Mechanics Career Development Event (CDE) was significantly different from the original contest. The 1996 CDE focused on the integrating theme of "chemical application," and consisted of individual skill and problem-solving activities, a written exam, and team problem-solving activities in machinery and equipment systems, industry/marketing systems, energy systems, structural systems, and environmental/natural resource systems. The North Shelby, Missouri, team placed first in the two-day event. (The national champion teams are listed in Table 1.)

Edward F. Carter of Firestone, left, congratulates Phillip Hoyt, center, and his first place Connecticut team after the first National FFA Agricultural Mechanics Contest. (Photo courtesy of Thomas A. Hoerner).

Table 1
National FFA Agricultural Mechanics Career Development Event First Place Teams, 1972 to 1996.

Year	Team
1972	Danielson, CT
1973	Worthington, MN
1974	Milaca, MN
1975	Hawley, MN
1976	Lancaster, OH
1977	Santa Rosa, CA
1978	Nephi, UT
1979	Pelican Rapids, MN
1980	LeRoy, MN
1981	LeRoy, MN
1982	LeRoy, MN
1983	Adams, MN
1984	Vancouver, WA
1985	Troy, MO
1986	Adams, MN
1987	Troy, MO
1988	Riceville, IA
1989	LeRoy, MN
1990	Rugby, ND
1991	Miles, TX
1992	Rugby, ND
1993	Manor, TX
1994	Carrington, ND
1995	Fredonia, KS
1996	North Shelby, MO

Purpose

The National FFA Agricultural Mechanics CDE has made significant contributions to the personal and career development of agriculture students, to the improvement of instruction in agricultural mechanics, and to the betterment of agricultural education as a whole. The purpose of this article is to briefly review the first 25 years of the Agricultural Mechanics CDE with special emphasis on the key people and events in its development.

Origin and Early Development

The first meaningful discussion leading to the present National FFA Agricultural Mechanics CDE occurred at the 1967 Northeastern States Agricultural Education Seminar. During the seminar, Frank Anthony (Pennsylvania), Joe Gribouski (Maryland), James Pope (Maryland), and Thomas A. Hoerner (Pennsylvania) met informally to discuss the possibility of promoting the development of a national FFA contest in the area of agricultural mechanics. Tom Hoerner summarized the meeting in a written report which was submitted to the National FFA Organization.

The possibility of a national contest was discussed further at the 1967 winter meeting of the American Society of Agricultural Engineers (ASAE). Tom Hoerner presented the idea of a national contest to the ASAE Education and Research Committee (ER-35), a committee consisting primarily of teacher educators in the area of agricultural mechanics. After considerable discussion, the ER-35 committee decided not to "support the idea of a national agricultural mechanics contest as a group, but would encourage individual committee members to continue work on the idea if they so desired." Again, Tom Hoerner submitted a written summary of this meeting to the National FFA Organization.

From 1967 to 1971, the idea of a national agricultural mechanics contest continued to be discussed, but no formal action was taken. Then, in May 1971, the National FFA Organization convened a consultant committee to further explore the idea and make recommendations to the National FFA Organization. Robert Seefeldt of the National FFA Organization served as facilitator and Tom Hoerner (by then at Iowa State University) served as secretary for the committee.

Table 2
Superintendents of the National FFA Agricultural Mechanics Career Development Event.

Superintendent	Institution	Years of Service
Thomas A. Hoerner	Iowa State University	1972-1975
Clinton O. Jacobs	University of Arizona	1976-1978
Billy Harrell	Sam Houston State University	1979-1981
W. Forrest Bear	University of Minnesota	1982-1984
Glen C. Shinn	Mississippi State University	1985-1987
Victor A. Bekkum	Iowa State University	1988-1990
Carl Reynolds	University of Wyoming	1991-1993
Leon G. Schumacher	University of Missouri	1994-1996
R. Dale Perritt	Stephen F. Austin State University	Superintendent-elect

After considerable discussion, the consultant committee voted unanimously to support development of a National FFA Agricultural Mechanics Contest. The committee also recommended that the contest consist of a written exam, problem-solving activities, and performance skills drawn from the ASAE recognized instructional areas of power and machinery, structures and environment, soil and water management, electric power and processing, and agricultural mechanics skills. Tom Hoerner was asked to develop a contest proposal (with cooperation from the committee) to be submitted to the National FFA Organization.

Ralph Burchfield, left, of Bridgestone/Firestone congratulates Harold Eckler, right, and his first place North Shelby, Missouri, team following the 1996 National FFA Agricultural Mechanics Career Development Event. (Photo courtesy of Thomas A. Hoerner).

The proposal for the National FFA Agricultural Mechanics Contest was approved by the National FFA Board of Directors in July, 1971, with the recommendation that the first contest be conducted in 1972.

In recognition of his leadership in the development of the contest, the National FFA Organization recommended that Tom Hoerner serve a four-year term as the first contest superintendent. (Table 2 lists the names, institutions and years of service for individuals serving as contest superintendents).

During the 1971 National FFA Convention, Tom Hoerner (Iowa) and Roland Espenschid (Illinois) were asked to visit two schools in the Kansas City area that were possible sites for the national contest. The first school visited was the Fort Osage Vocational-Technical School near Independence,

...continued from page 22

The National Agricultural Mechanics Career Development Event: The First 25 Years, continued from page 21

Missouri. Hoerner and Espenschied were so impressed with the Fort Osage facilities and the enthusiasm of the staff (Kenneth Smith, director; Robert Garten, assistant director; and Walter Kennon, guidance counselor) that, without even visiting the other school, they recommended Fort Osage as the site for the first National FFA Agricultural Mechanics Contest. This decision initiated a cooperative relationship between Fort Osage and the Agricultural Mechanics CDE that has lasted for more than 25 years.

Bridgestone/Firestone—Corporate Sponsor

In 1972, another long-lasting cooperative relationship was established when the Firestone Tire and Rubber Company (later to become the Bridgestone/Firestone Tire and Rubber Company) agreed to sponsor the Agricultural Mechanics Contest as a special project of the National FFA Foundation. In 1983, Bridgestone/Firestone, working with Forrest Bear (Minnesota), contest superintendent, increased their support by establishing a scholarship program for contest participants. Since 1984, through the generosity and support of the Bridgestone/Firestone Trust Fund, more than 240 individuals have received scholarships totaling approximately $150,000. In addition to financial support, more than 40 Bridgestone/Firestone personnel have been actively involved with all aspects of the contest from planning to judging to equipment set-up over the past 25 years.

Other Industry Supporters

In addition to Bridgestone/Firestone, the National FFA Agricultural Mechanics CDE has benefited from the enthusiastic and generous support of more than 100 companies. Especially noteworthy has been the support of Briggs & Stratton, Deere & Company, Case-IH, Smith Welding, Dayton Electric, General Electric, Square-D, Stanley Tools, Deutz-Allis, Makita, Hesston, Sperry-New Holland and Skil Corporation. These companies have provided essential support by furnishing the equipment and personnel necessary to ensure that the CDE remains technically up-to-date.

The National Agricultural Mechanics Committee

Since its beginning, the National Agricultural Mechanics CDE has enjoyed the support and hard work of a dedicated group of individuals known as the National Agricultural Mechanics Committee, composed primarily of industry representatives and university educators with interest and expertise in agricultural mechanization. Working under the direction of the event superintendent and associate superintendent, the committee plans, conducts and evaluates each year's event. More than 260 individuals have served on the committee during the past 25 years. Four committee members (Earl Baugher, Kansas; Forrest Bear, Minnesota; Billy Harrell, Texas; and Tom Hoerner, Iowa) have participated in all 25 CDEs, while 24 members have served 15 or more years.

Table 3
Individuals with 15 or more years of service to the National FFA Agricultural Mechanics Career Development Event.

- Earl Baugher, Kansas
- Forrest Bear, Minnesota
- Victor Bekkum, Iowa
- Mervin Bettis, Missouri
- Pete Braker, Arkansas
- Edward Breece, Illinois
- Stan Burke, Virginia
- Dean Byerly, Iowa
- David Cattron, Illinois
- Andy Cochrane, Wisconsin
- James Edwards, Alabama
- Roland Espenschied, Illinois
- Joe Gliem, Ohio
- Gale Hagee, Oklahoma
- Billy Harrell, Texas
- Verlin Hart, Oklahoma
- Harry Hoerner, Illinois
- Thomas Hoerner, Iowa
- Clint Jacobs, Arizona
- Fred Oomens, Wisconsin
- Carl Reynolds, Wyoming
- Tom Silletto, Nebraska
- Glen Shinn, Texas
- John Todd, Tennessee

Summary

Since its inception, more than 3,500 FFA members from 49 states have competed in the National FFA Agricultural Mechanics CDE. Over the years, the CDE has changed to reflect the increased technological sophistication of the agricultural industry. Yet one thing remains the same. As Dr. Tom Hoerner wrote in the booklet detailing the 25 year history of the contest, "The [CDE] was never planned to be a forum for winners or losers of a contest. All participants are winners because of their opportunity to compete on a level playing field with students from across the United States with similar interests and career aspirations. What this event has really been about has been the opportunity for more than 3,500 young people and their coaches and FFA advisors from 49 participating states...to compete in a quality educational event."

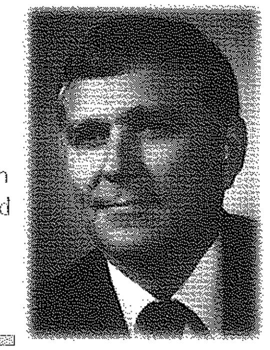
Reference

Thomas A. Hoerner, *The First 25 Years: National FFA Agricultural Mechanics Contest,* 1972-1996. Available from Dr. Thomas A. Hoerner; 2824 Ross Rd.; Ames, IA 50015

What Do You Know About Music and the FFA?

By Gary E. Moore

Dr. Moore is a professor of agricultural and extension education, North Carolina State University, Raleigh, and is historian for the American Association for Agricultural Education.



Music has been associated with the FFA and the New Farmers of America (NFA) since the inception of both organizations. Go to the head of the class if you can answer the following music-related questions. The answers can be found on page 25.

1. In 1930-31 the FFA had a national song-writing contest for the purpose of selecting an official song. The song selected as the official song was:
   A. Hail the FFA
   B. I'm in Love with a Boy of the FFA
   C. Future Farmers of America
   D. It was decided not select an official song

2. Starting in April of 1931 there was a 15-minute monthly FFA radio program broadcast by NBC as part of the NBC Farm and Home Hour. The time was later extended to one hour. Music for the FFA program was provided by the:
   A. National FFA Band
   B. Sons of the Pioneers
   C. U.S. Army Band
   D. Salvation Army Band

3. The official FFA March is:
   A. The Future Farmer March
   B. Marching to Kansas City
   C. The March of the Farmers
   D. There is no official FFA March

4. In the early days of the FFA, various states would bring FFA bands to the national convention. At the 10th national convention, three states were represented by bands. Which of the following states DID NOT have a band at the 10th convention?
   A. Texas
   B. Missouri
   C. Iowa
   D. Utah

5. Since small states didn't have FFA bands, it was suggested that a national band made up representatives from various states be organized. In 1947, a 120-member band made up of FFA members from across the nation first appeared on the stage of the national convention and has existed ever since. This band has been frequently called:
   A. The All-American Band
   B. The Mail Order Band
   C. The Blue and Gold Band
   D. The Plowboy Band

6. A number of state FFA choruses provided entertainment at the national FFA convention during the early days of the FFA. The success of the national band led to the development of a national chorus in:
   A. 1948
   B. 1956
   C. 1963
   D. 1965

7. The New Farmers of America had a national music-oriented contest. The name of this contest was:
   A. Song Writing
   B. Band
   C. Instrumental
   D. Quartet

8. The NFA published a songbook. Which of the following songs IS NOT found in the song book?
   A. The NFA Creed Song
   B. NFA Boys are We
   C. Old NFA Spirit
   D. I'm in Love with a Boy of the NFA

9. The national spokesperson for the FFA alumni is a country and western recording artist. This person is:
   A. John Mellencamp
   B. Ty England
   C. LeAnn Rimes
   D. George Strait

10. A popular country song had a verse about the 4-H and FFA taking a field trip to a farm and uncovering a covered-up still. This song was:
   A. Chug A Lug by Roger Miller
   B. Drinkin' Champagne by George Strait
   C. Beer and Bones by John Michael Montgomery
   D. Cheap Whisky by Martina McBride

The answers to this quiz are located on page 25 of this issue.

Author Guidelines

for The Agricultural Education Magazine

The Agricultural Education Magazine is a magazine specifically designed for teachers of secondary agriculture programs. The Magazine is published six times per year and articles are contributed by agriculture instructors, agriculture students in secondary and post-secondary programs, agriculture teacher educators, agricultural industry professionals and education specialists.

The Agricultural Education Magazine reaches a national audience, so we seek articles which emphasize and demonstrate practical teaching, laboratory exercises, FFA training and activities, and textbook uses for the classroom. We hope to provide insight from teachers to teachers of practices that work effectively in the agriculture classroom, laboratory and student organization.

Potential authors are encouraged to review back issues to note how topics are covered and how articles are written. The articles are not generally research articles, but practical application materials. Articles accepted for publication are selected on the basis of:

- their relevancy to the profession and to the theme of the issue in which they are to be published
- originality
- readability
- soundness
- timeliness
- viewpoints

Authors are also encouraged to contact the theme editor of the issue for which they wish to submit an article. As a general rule, articles submitted to the editor by the theme editor are given publication preference, although some unsolicited articles submitted directly to the editor are published.

How do I prepare my manuscript?

- Double space your manuscript for ease of editing. Set all margins at one inch.
- Use capital and lower case letters in Times New Roman, font size 10.
- Do not number pages and print on only one side of the page.
- Use minimal special formatting (bold, italic, etc.).
- If you have an electronic copy of tables and/or graphs, include them in the text where you want them printed. Provide an explanation for any and all tables and graphs included in the article. If you do not have an electronic copy of the table and/or graph, indicate their placement in the text and include the actual table/graph on a separate sheet. Make sure the copy is clean and crisp as these items will be scanned into a computer and placed as graphics.
- Include a current head-and-shoulders photograph of all article authors to be published with your article. Be sure that the name(s) of the author(s) are written on the back of their individual photographs.
- Cite references in the text in parentheses with the author's last name, followed by the date of publication, e.g., (Williams, 1996). If a direct quote is used, also include the page number where the quote appears in the original publication: e.g., (Williams, 1996, pg. 276).
- Cite all references used at the end of the article in a references section according to *Merriam Webster's Collegiate Dictionary, Tenth Edition.*
- Give your article an interesting title and use subheadings to identify changes in topics and add visual interest to the article.
- Include photographs suitable for publication with captions and the name of the person who took the photo so proper credit can be given. Candid photos of activities are preferred.
- Include your name, address, telephone number, fax number and e-mail address in a cover letter to the editor or theme editor. If there are questions regarding your submission, we may need to contact you. If your manuscript is selected for publication, you will receive a complimentary copy of the issue in which it is published.

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- Send three hard copies of your article to the theme editor or the editor to whom you are submitting your article.
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Theme editors for each issue are published yearly in The Magazine along with their addresses, telephone numbers and e-mail addresses. If you wish to submit an article on a specific theme, the theme editor should be your first contact.

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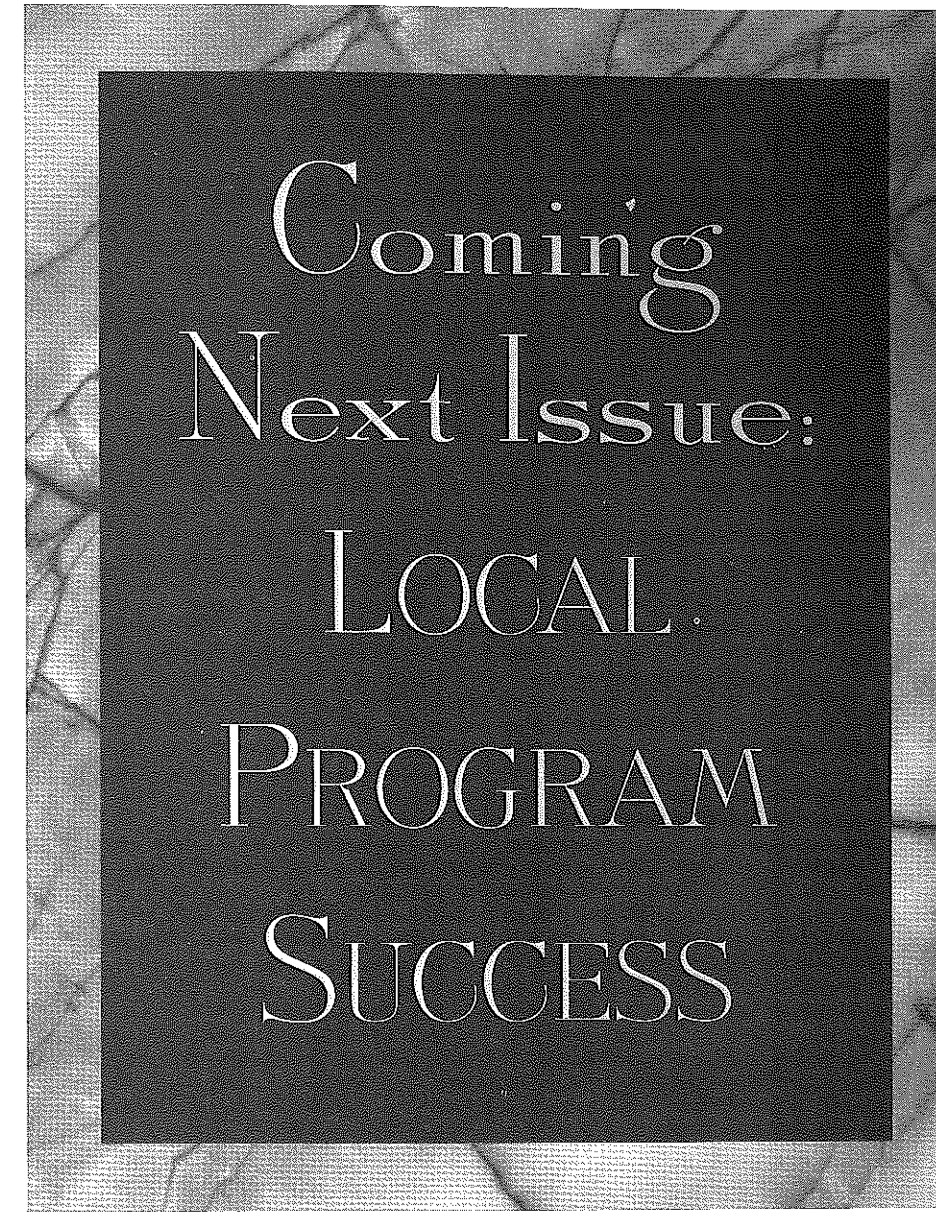

Here are the answers to the quiz published on page 23 of this issue of *The Agricultural Education Magazine.*

1. The decision in 19[illegible] was to not have an official song but to take several of the songs submitted and put them in an FFA songbook. However, the convention delegates voted to award $[illegible] to Bertha Fleenman and Ralph Sarager of Arizona for the song "Hail the FFA."
2. The U.S. Army Band provided the music.
3. The Future Farmer March, written by Captain W. J. Stannard of the U.S. Army, was adopted as the official FFA March in 1930.
4. Iowa did not have a band at the 10th convention but Texas, Missouri and Utah did.
5. The band is called the mail-order band because members are selected on the basis of a taped audition that is mailed to the band director.
6. The national chorus was established in 1948.
7. The FFA had a quartet contest "to develop a greater appreciation for good music..." A number of state FFA associations, especially those in the South, also had quartet contests.
8. While "I'm in Love with a Boy of the FFA" is a real song there is no song titled "I'm in Love with a Boy of the FHA."
9. The National FFA Alumni spokesperson is Ty England.
10. Roger Miller sang Chug A Lug in the 1960s.

Such Are the Lessons in the Agricultural Mechanics Laboratory

A View from the Agricultural Mechanics Laboratory Egress Opening (Shop Door)

By Jim Sorensen

Mr. Sorensen is an agricultural education instructor, Kimberly High School, Kimberly, ID.

It's spring, so I am standing in the egress catching a few rays of radiant light from the outside while pondering the sublimities of life and watching kids work on the inside. I just turned 50 a few weeks ago, so I have had plenty of time to think about the future as well as the past. I'm betting that the future will look more like the past than many will want to believe.

One thing that I have noticed is that kids are getting tired of computers. They are tired of sitting at the keyboard and looking at a screen. I see computers going the way of the VCR. Many readers will remember when VCRs first entered the classroom. Do you recall the excitement from the students as well as the instructors? For the students, it meant something new; it was like having a guest speaker, or even better yet, watching television at school. For the instructor, it meant not having to thread the projector or fix the film when it broke. It meant bringing what happened yesterday into the classroom today. It also meant that one didn't have to worry about sending the movie back if one happened to remember to order it in the first place. Ah, yes, most importantly-INSTANT LESSON PLANS!

Tried to show a video lately? High school students have seen hundreds, if not thousands, of videos since pre-school. The magic is gone, so is the mystery, and so is the interest. I feel the infatuation with computers is headed the same direction. This doesn't mean that they won't have a place. They will be a tool just like the VCR, the pencil, and the ring compressor.

Now, speaking of the ring compressor (how's that for a segue?), where does agricultural mechanics fit into this picture? Well, let me pontificate for a moment. In my school, agriculture, art and physical education are the only non-computer, hands-on classes left. Home economics, woods, metal shop and crafts are long gone. Of course, there are still courses like physics and chemistry, but they aren't nearly as much fun since the state took away a lot of the interesting levers, gears, throwing devices and cool chemicals. Many departments probably still have some neat old military surplus machines that are big on heft, but rather short on safety devices. You know the type—the ones where one can watch all of the gears go whir. The kind with big motors that require lots of power. The kind that would make Tim Allen swoon. I suppose that there are those departments that have all C-N-C machines. Too bad! The kids don't know what they are missing.

Agricultural mechanics classes, properly presented by the teacher and absorbed by the students, teach most of the skills necessary for students to obtain employment. Agricultural mechanics classes expose students to critical thinking skills, the use of common sense, reading for content, practical mathematics applications, cooperative interactive skills and probably a lot more fancy educational stuff, the terminology for which I cannot recall. Agricultural mechanics classes are even outcome based. I know I should not bring this up, but agricultural mechanics classes are also fun.

Most importantly for both the teacher and the student is that agricultural mechanics classes are a time when a young person and an adult can work and spend some time together. It's one-on-one, hands-on interaction. Could this be why students and teachers both like these classes? Watching a student learn to weld, construct a project, work with wood or make a small engine run again is very satisfying. Watching a student smile when you tell them they have done a quality job—then seeing them come back to try to do better—is why some of us teach. This must be the same feeling that an elementary teacher gets when they see someone read for the first time.

Oh, oh, no more time for pondering. I hear screaming from the welding booths. It smells a little like burning sneaker with maybe a tinge of smoldering coveralls. Such are the lessons in the agricultural mechanics laboratory. Now, where in the world are the bandages?

Everything Old is New Again, continued from page 2

I think that just as long as we, those of us involved in teaching students interested in agricultural mechanics, care more about what the project does to the student than about what the student does to the project, as long as we include the "why" with the "what" in our curriculum and instruction, our programs will be relevant and successful.

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A Visual Model For Agricultural Technology Education, continued from page 19

4. Business and industry, career pathways

The linkage to other educational programs within the school itself is imperative. Blending the concepts, principles and skills from one subject area to the next combine to provide students with a basis of understanding the inter-relatedness and application of what they have learned.

Linkages with teacher education and curriculum reform are necessary to continually assess where the curriculum is and where it is going, and that those presenting the curriculum to students are knowledgeable about what is being taught and how it is being taught.

Linkage and articulation among educators at all levels—secondary, post-secondary and university—is vital to the development and implementation of a successful program in agricultural technology, as are communication and cooperation with business and industry.

In Conclusion: What Do You Think?

The CMATE model provides a visual plan and course of action for use in teaching agricultural technology education. The model includes curriculum inputs and outcomes, delivery systems for the curriculum inputs, and a support system of linkages with other educators, higher educational institutions and educators, and business and industry professionals.

This is not to imply that this model is all inclusive and should be adopted as a national curriculum model. However, it is a starting point from which discussion can begin on what a model for agricultural technology education should look like. What do you think? How well does this model fit your program? Let's talk...

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