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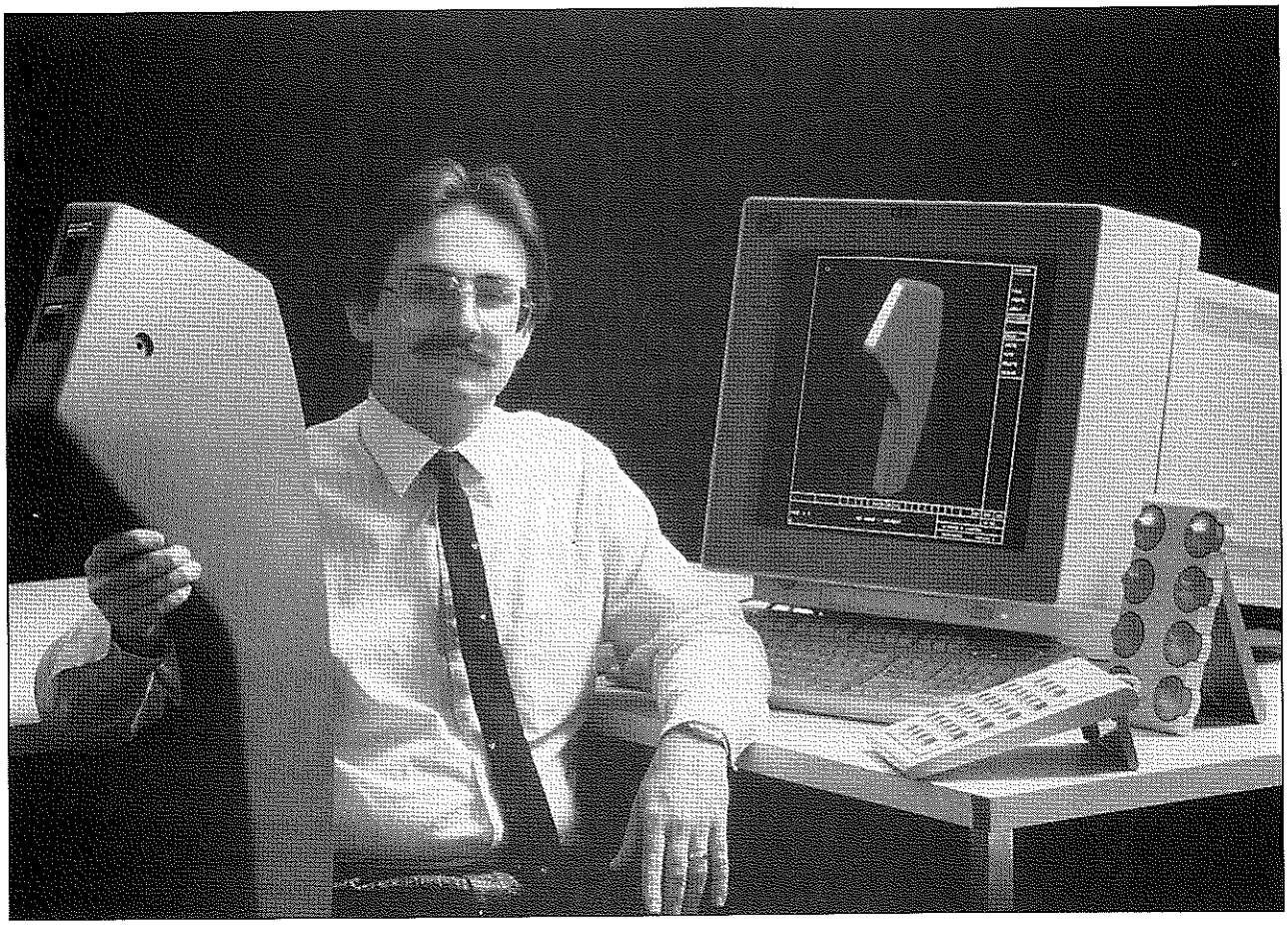

The Changing Workplace

THE
AGRICULTURAL EDUCATION
MAGAZINE

July, 1995 Volume 68 Number 1

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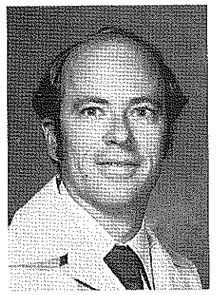
Pioneers or Settlers?



BY CARL L. REYNOLDS

Dr. Reynolds is a professor of agricultural education at the University of Wyoming, Laramie.

In thinking of the theme for this issue "The Changing Workplace", I am reminded that almost everything I've heard or read since the 1980's seems to have the word "change" in it. But, change is not anything new. We can all recall in our history, how the Louisiana Purchase in 1803 and the Lewis and Clark Expedition that followed soon after, paved the way for a major change in this country. People left their comfortable farms and homes to "go west" as pioneers to settle new land in Oregon or to find their fortune in California. Change today requires the pioneer spirit just like it did during the westward movement over a hundred years ago.

In his videotape "Paradigm Pioneers" Joel Barker (1993) spends considerable time explaining how the modern workplace requires people who think like pioneers rather than settlers. Pioneers today, just like our forefathers who traveled the Oregon trail, are quick to give up the familiar, old ways. They look forward to new technologies, practices, and methods. The settler, on the other hand, basks in the comfort of routine, security, and low risk.

An example is told about the Sony Corporation which, among other products, produces the "Walkman" which is so popular with our students today. The Sony people are examples of pioneers. When the first model of the Walkman was released and sales zoomed, Sony personnel set into motion the next change, a lighter weight, smaller unit. Not waiting for sales to slow or for competition to catch up, they improved the quality of the headphones as well. To make it even better, digital controls were developed. Now, the product is barely recognizable in comparison with the first model in quality of sound reproduction, compactness, durability, ease of use, and comfort. The Sony Corporation demonstrates the thinking of a pioneer.

Settlers are typical of the old factory worker. Learn a routine, stick to the prescribed procedure, and stay out of trouble with the boss. Dutifully follow the rules and never question authority. This description sounds much like what we see in some schools as well.

Modern corporations, business firms, and single owner entrepreneurs cannot afford to have settlers in their organizations. Everyone must change their way of thinking to that of a pioneer. People start a new job excited, energetic, and wanting to make a contribution. But, after the newness wears off, they drop into a daily routine and become excited only on Fridays. They lose their commitment to change (Senge, 1990).

Not only in corporations, but also students in school follow a similar pattern. The young first grader faces the prospect of school in the same way the pioneers turned their backs on St. Joe, Missouri and looked forward to the prospect of going west. They excitedly come home and show their parent(s) what they learned each day. Do they maintain this pioneer spirit and excitement through all their years of public school?

Peter Senge (1990) says that we should maintain a healthy learning organization. The changing workplace requires that we promote continuous learning and adaptability to change. Dealing with change is one ability we must teach our students.

Our students must learn that change causes discomfort and frustration (see Figure 1). It also causes us to constantly be in a learning mode so that hopefully we reach levels of productivity and quality higher than ever before. At the time change occurs, the human reaction is to feel more discomfort initially, but as time progresses and we begin to respond positively to change, the comfort level rises fairly soon. If the appropriate abilities are not learned, however, the change process can cause the person or organization to not reach the level prior to the change or it may require a long period of time to adapt to the change.

What then, are the abilities we should be teaching our students so that they will remain pioneers in spirit and willing to be lifelong learners? With the rapidly changing technology and amount of information accelerating as well, we must focus much more on the process and less on the subject matter being taught. The old model of analyzing the occupational task and learning routine tasks will no longer work.

In the changing workplace terms like systems approach, teamwork, empowerment, quality circles, holistic thinking, and statistical process control (Byham, 1992, Peters, 1982, →

EDITOR'S COMMENTS

The theme of this issue of The Agricultural Education Magazine is The Changing Workplace. Because the many contributions to this theme from the profession and the limited space available, the Editor has decided to forego his normal space for comments. Hopefully, this will allow more views from the profession to be published. The Editor's Comments will continue in the next issue.

Walton, 1986) are commonly heard at all levels from the assembly line to the board room. These terms should influence the way we teach our students. Take the systems approach, for example. Senge (1990) says that we should learn to solve problems by looking at the long term and in the perspective that other systems overlap and will be affected by some solution to an isolated event. For example, the systems that are involved in a confinement livestock structure are interrelated: a change in the ventilation controls for a swine farrowing house or greenhouse may very well have an impact on the heating system and humidity controls as well.

The Essential Competencies

The Secretary's Commission on Achieving Necessary Skills (SCANS, 1991) reports five essential competencies required by employees. They are "workplace know-how" abilities that we must teach our students. They are:

1. Identify, organize, plan and allocate **Resources**,
2. Work with others, **Interpersonal**,
3. Acquire and use **Information**,
4. Understand complex interrelationships, **Systems**, and
5. Work with a variety of **Technologies**.

Resources - Employers indicated a variety of competencies connected with resources. Their employees are expected to be able to select work activities based on goals and priorities, ranking them in appropriate order. Employees are then expected to allocate time, prepare and follow a schedule.

Employees are expected to be more involved in preparing and using budgets. They keep records of expenditures and make adjustments to achieve goals. They are also expected to allocate, acquire, and organize the materials to be used within the facility provided and perform these tasks in an efficient manner. They are expected to review the task, assess the skills of each team member, and allocate work responsibilities that best match abilities. They are expected to continually evaluate performance and provide feedback from the results.

Interpersonal - Rather than the old factory assembly line model of performing those required procedurized skills and no more, the employee today is expected to have well-refined interpersonal skills. The employee is expected to communicate with other members of a team, and to work together to solve problems to improve quality. Team members are expected to help each other learn continuously. They are expected to be thinking always of the customer's satisfaction. Leadership is an important trait; to facilitate the communication of the group, to negotiate differences, to work toward consensus. The worker is also expected to be able to work with a broad diversity of people regardless of gender, race, mental or physical ability.

Information - Workers of all levels will find themselves acquiring and using information at a rapidly accelerating level. They must be able to search for, retrieve, evaluate and select appropriate information. They must be able to organize and store what they have acquired or created. Interpreting and communicating information to others is important as well. These tasks call for the ability to use the computer to process the mass of information the worker is expected to master.→

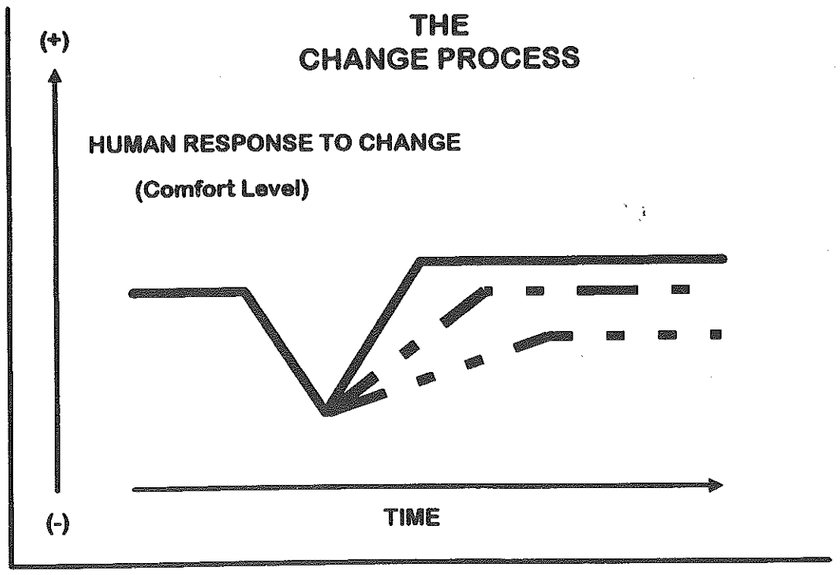


Figure 1. Human response to change

Systems - First the individual must understand a broad base of systems that exist in the work environment. The concepts and principles related to "how things work" must be acquired. Next, the complex interrelationships of various systems must be understood. A good example taught by many agricultural education instructors are the systems in a small gasoline engine. The ignition, compression, carburetion, lubrication, and cooling systems are each taught separately. Then all the systems are put together to explain how the engine runs. This pattern of instruction best describes what is meant by the systems approach. The student, after mastering an understanding of the principles of each system, is then better able to troubleshoot and repair an engine that is faulty. In some cases, the student even reaches levels where design ideas are suggested that would improve the performance of the machine.

Technology - There is no question that the ability to understand and work with a variety of technology is important. The worker must be able to understand, select, and apply the appropriate technology that best accomplishes the task. Calibration, monitoring, testing and troubleshooting, and solving complex problems involving technology have already become the new climate in the workplace. The ability to interact with all types of computerized systems is a given requirement for almost all workers.

The Basics Foundation

In education, the word "basics" has probably been one of the most commonly used word when talking about change. "We've got to go back to teaching the basics," many are heard to say. In the SCANS (1991) report summary, the basics foundation is mentioned as well. Employers clearly defined the basics they expected employees to have.

Basic Skills - Workers must have acquired a stronger foundation of reading, writing and mathematical skills. The ability to read technical reports, create reports, communicate clearly with fellow workers and/or customers, and perform mathematical functions, (such as statistical process control on computers) are the expectations for today.

Thinking Skills - The employer expectation is that employees are empowered to think for themselves, to generate new ideas, to develop creative ways to solve problems and most importantly, to be able to analyze a problem, solve it, and implement a decision without waiting for the supervisor. Workers need to have a broad perspective, to be able to "see the whole picture" and make decisions beneficial to the whole organization rather than focus microscopically on just their department. Workers need to have the ability to "know how to learn," perhaps one of the more important skills agriculture instructors can teach.

Personal Qualities - One of the major changes occurring at the present in the workplace is the focus of importance on the human relationship skills. In the old factory model, the assumption was that workers could be supervised to insure integrity, honesty, and that the supervision would insure a dutiful worker. Now, workers are empowered to "supervise themselves." The worker is given more freedom to set goals, allocate time and resources, perform the work with team members and self-evaluate the quality of the result. This expectation calls for an employee who has a high self-esteem, places high importance on being responsible, and maintains high standards of personal integrity, ethics and morals. The modern worker must accept empowerment willingly, must be able to manage one's personal abilities and set realistic goals. Finally, the modern worker exhibits empathy toward others, maintains a non-hostile environment around others, listens well and resolves conflict in a positive manner when it occurs.

Summary

The above lists appear to be a tall order for our schools to accomplish. But, if we maintain the process by which agriculture and the FFA is delivered, we can teach to all of these basic and essential competencies. We can teach how to handle frequent change, how to work together as team members, and how to take risks and attempt new ways and new things.

As teachers, we will be able to tell when our students are prepared for "the changing workplace." They will be talking about opportunities rather than barriers. They will excitedly talk about new experiences as adventures rather than express fears about having to do things differently. They will constantly be seeking a better way to do routine tasks. They will be exhibiting the characteristics of pioneers rather than settlers.

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About the Cover

Today's rapidly growing technology base is becoming an increasingly integral aspect of today's workplace. Employers and employees alike are recognizing this changing need for computer literacy and competency in a variety of programs. (Photo courtesy of David Goodwill.)

The Changing Workplace: A Manufacturer's Perspective

BY DAVID GOODWILL
Mr. Goodwill is manager, Organizational Effectiveness, North American Manufacturing, Case Corporation, Racine, WI.

This is an exciting time for those of us in manufacturing. As we embrace new technologies that enable us to design and produce better products to meet the ever-changing needs of our customers; we are realizing increased profitability and success in the marketplace.

New technology mandates that considerable changes take place inside our manufacturing facilities - changes such as revamping assembly lines, adding sophisticated quality-control testing equipment and installing the latest computer-driven production and inventory-control systems. More significantly, however, are the changes it demands of the people we employ. Today's profile of the ideal employee and the profile of employees through the year 2000 differ substantially from that of yesterday.

Employee Triangle

The need to find and retain this new breed of employee is a challenge for the business community. Add to this the fact that six to 10 years from now we expect a significant turnover in the current workforce due entirely to demographics, and our challenge becomes more acute. We will not be able to take advantage of technological developments without the right people to apply them. Your students are our future. Your role in preparing them to become contributing members of the workforce is no less challenging.

I like to view the factors that make up the ideal employee as a triangle. While each side can stand alone as a single line, the triangle forms when they come together. The three sides of my employee triangle are the social, the technological and the scholastic.

Social Side

People skills have long been a trait that employers look for in job candidates. The ability to work well with others and as a team player, is paramount to success in today's world. Leadership is another long-sought quality. That's not new, you say. No it's not. What is new, however, is that leadership no longer means simply overseeing others . Leadership in today's manufacturing world also means being able to lead yourself; to work independently; to alert others to better ways to do your job; and to stand up for what is right.

We've found that students who have been leaders in high school and college, as well as those who have worked while studying to help pay for their education, are better prepared to be reliable employees.

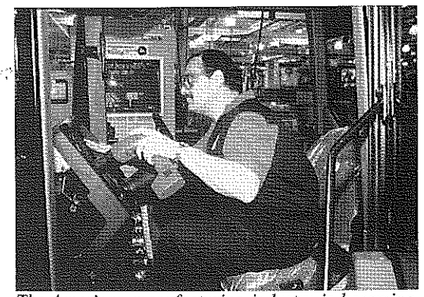
Companies like Case Corporation are shifting away from a traditional, supervisory organization structure and getting more into a team approach. We in business have discovered that employee empowerment is the key to group performance. By giving employees the leeway to make decisions, identify ways to do things better and implement them - in other words allowing employees to do their jobs properly - everyone benefits.

Ideal job candidates are those who are comfortable working in an empowered environment. They are comfortable being given instructions in the form of blueprints, written directions and/or diagrams and putting them into action. It's very exciting to watch teams of empowered employees come alive and solve problems.

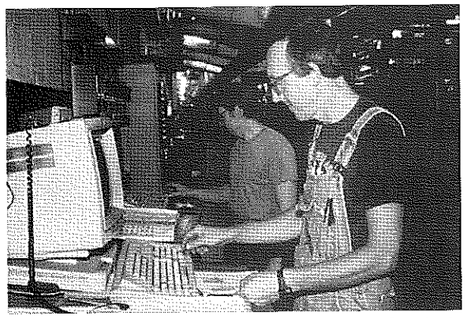
Strong Communications Side

Another aspect of the social side of the employee of tomorrow is strong communication skills. Candidates must be good listeners and good persuaders. In the past, employees' only exposure to customers was when they saw them touring the facilities. Today, our factory and product people, design engineers, advertising managers and others, meet regularly with groups of customers and dealership personnel to gather information that will help us improve our products.

A good example is what happened when workers from our cotton picker plant in East Moline met with farmers in the field. One of the workers noted firsthand a concern expressed by both dealers and customers. He went to the nearest Walgreen's and bought a Polaroid camera so he could take photos and →



The American manufacturing industry is becoming increasingly sophisticated in its assembly lines as well as heightened quality control testing and computer aided production systems. (Photo courtesy of David Goodwill.)



The world of electronic communication is one area of agriculture which today's agriscience curriculum can address. If teachers can work with students in the area of electronic communication, the students will be better prepared to enter the workplace. (Photo courtesy of David Goodwill.)

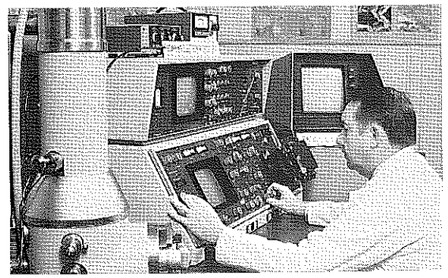
explain to his co-workers back at the plant. His factory team and the engineers worked together and rerouted a hose so it wouldn't be brushed loose by plants in the field. That's initiative, that's leadership, that's communication; and that's what we're looking for.

Technological Side

The technological side of the employee triangle is the most volatile side because it is influenced by constant changes in technology. Without a doubt, the students of today who want the jobs of tomorrow must be technically competent. That means, among other things, being comfortable around a computer.

Employees must be able to understand spreadsheet data bases as well as word-processing and graphics programs. As products become more technical and the manufacturing processes used to build those products become more automated and computer-driven, computer literacy is a must.

For instance, our Case IH MAGNUM tractors feature computer-controlled monitoring systems. Those systems must be assembled and tested on the line by competent workers who know how to use computers. Our quality control systems are computer-driven. Data is entered as the product moves along the assembly line. Any worker uncomfortable with a keyboard and a monitor is unable to perform his or her job.



Adaptability to new technological advances is becoming an important characteristic of the modern employee. (Photo courtesy of David Goodwill.)

Willingness to Change

Coupled with technical competence is a willingness to change. Current manufacturing processes are extremely complex. Manufacturing is a fast-paced environment and workers must be able to adapt. Just-in-time is the production philosophy. The days of setting up a tooling machine and making several months' supply of a component are gone. Now the machine is set to make a one- or two-day supply of that same component; then it's retooled to produce a different one.

Development cycles for new products have gone from periods measured in years to a matter of months. Fast response time to market conditions and demands is the most important competitive advantage for any organization. The most significant barrier for companies in achieving success is people who are unwilling to change.

One way for students to get technical experience is through co-op programs and internships with area businesses. Case offers both kinds of opportunities. Such "real life" training is invaluable and regarded very favorably by employers. Internships and co-op programs offer students a chance to get their feet wet while under the helpful wing of a staff member, as well as apply the principles and use the skills they learn in the classroom. With experience comes confidence. With confidence, success.

Scholastic Side

At first glance, the third line of the employee triangle, the scholastic side, appears to be the most tangible as far as identifying what should be included in any agriculture student's curriculum. From an employer's viewpoint, it is not as cut and dry. There's a real need for students to grasp the basics of reading, writing and arithmetic before they plunge into the world of electronic communication. I cannot stress that enough.

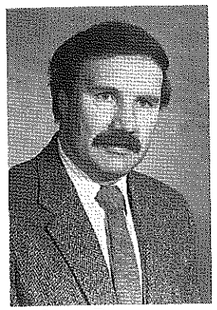
Good math and science skills at the high school level are minimal requirements. Ideally, mathematical and statistical skills would be achieved by college graduation. Few things in business operate with simple arithmetic these days.

Engineering is a very versatile education for someone aspiring to a career in manufacturing. The engineering student gains analytical capability and acquires a logical thought process that can be applied to many different jobs.

We recruit agricultural, mechanical and electrical engineers for our purchasing, marketing, human resources, engineering, manufacturing and technical sales departments. Many of our product managers have engineering degrees or dual majors in engineering and another discipline such as business or marketing. An engineering degree, combined with a background in crops, could lead to a promising career in product development or product management.

(Continued on page 19)

The Changing Classroom: Software That Helps



BY JERRY PAXTON
Mr. Paxton is an agricultural education instructor at Encampment, WY.

Much has been written about the changes taking place in agricultural education. Adapting to these changes has stretched the already strained resources of most schools. Modifying curricula to meet the shifting needs of the workplace has added to the burden. The multitude of instructional aids available to educators has provided some help in meeting these challenges, but it is often difficult to find just the right support materials to fulfill the requirements of the students. The addition of computers as instructional tools has certainly added a new and exciting dimension. Unfortunately, there is not a lot of software available that is useful, easy to operate and affordable.

It is no secret that the students we have today do not respond well to many of the traditional teaching methods. Most are a product of the "Sesame Street" era and seem to learn best if you can make it fun. Since I can't sing or dance and the Big Bird suit gets too hot, I use computers to help inject the "Fun Factor" into my instructional program. For several years now I have been using a program called "HyperCard" to help infuse some life into my teaching techniques. The program runs on most Macintosh computers and costs approximately one hundred dollars. HyperCard is a simple authoring program that was developed by Adobe Systems. It is understandable enough to allow students to write their own programs and provides the opportunity for the user to interact.

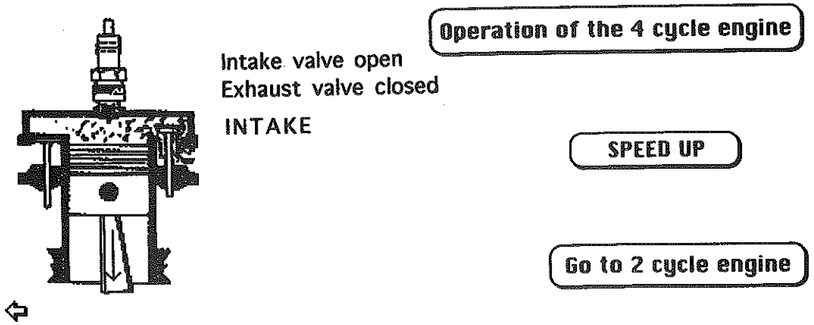
I use a worksheet to introduce students to the various capabilities of the program. By the time they are finished, they should have enough working knowledge to begin creating their own instructional programs. If you have access to a computer lab you can have an entire class working on HyperCard projects. I have found the program to be most useful in providing enhancement opportunities for accelerated students or as an independent study project for older students who get scheduled out of their regular agriculture classes.

A scanner is a useful item to have when working with HyperCard because it allows the student to incorporate pictures or diagrams into the program with a minimal amount of effort. It is not too difficult to add animation, color and sound to further the presentation.

Once you have helped the student decide on a topic for the instructional unit, they are usually able to proceed with very little supervision. I set a few basic parameters, such as a required multiple choice quiz at the end of the unit, but encourage the students to rely on their own creativity to develop a useful, interesting and educational product that can be used by other students.

The illustrations, accompanying this article, represent cards in different HyperCard stacks. The illustrations demonstrate the versatility of the program and should give you an idea of what the finished product could look like. The test cards for each unit my be designed to fit your needs. The format we use is multiple choice questions with a field to keep a running score. The final card records the scores and is set up so that students cannot change the results.

This particular software program has helped create a double win situation for me. It provides an opportunity for students to research and write useful curriculum materials, exercise their creative talents and contribute to our instructional materials library while sharpening their computer skills. When the units are finished, I can use them with individual students or large groups in a computer lab setting. They may also be used by hooking your computer to some type of projection device as a substitute for an overhead transparency presentation or a chalk board lecture. There is no doubt that the information age has brought new challenges to our classrooms but if we share our good ideas maybe we can not only survive but prosper. ■



Hypercard software can be animated to show moving parts and functions. It is interactive, requiring the student to click on the buttons to activate the animation. (Figure courtesy of Jerry Paxton.)

Technology Education for the Changing Workplace

BY JOE G. HARPER
Dr. Harper is associate professor of agricultural education at Clemson University, Clemson.

Keeping up with technology is no easy task. Being able to provide effective agricultural and environmental technology instructional programs for a changing work force is not an easy task either. Is technology in the workplace changing the way we teach? Are we experiencing fundamental changes in the way we teach, or are the changes we are experiencing only in the technologies we teach? Chances are that if we are experiencing changes in technology, we are also experiencing changes in the way we are doing business.

The changes in the technologies are much more visible than the changes in the way we teach. Many folks would contend that technologies improve our teaching methods and delivery techniques, but we will continue to teach based upon the same principles as we always have. This concept has some merit; however, it does appear that technology, especially in the workplace, is having impacts upon the ways we go about teaching.

Shifting Concepts

Agricultural and environmental technology education are founded based upon principles. These principles may come from the hard sciences/hard systems which follow physical laws, or the soft sciences/soft systems which follow social and ethical beliefs (humanistic principles). Principles fall along a continuum from the very simple to the very complex. They may be well-defined or entirely abstract. Agricultural and environmental programs are driven by a blending of these principles. Critical thinking and problem solving strategies are key to providing students opportunities to work effectively in the changing technology based workplace.

So what? What does this mean to you, your instructional program and your students? Basically, it means that you will need to provide more holistic, systematic approaches to teaching and learning which provide students greater opportunities to adapt to changing technologies in the workplace.

Principle Driven Instruction

Principle driven instruction implies that teaching and learning is based upon various principles, from the most basic through the very complex. Conceptually, the principles of innovative agricultural technologies may be classified in four broad areas:

Basic Sciences Principles - The foundations of science for agricultural and environmental technologies. The basic science principles which determine the ways the natural world works. Students learn these principles with the intention of sometime later applying these principles to solve problems and provide answers. For example, teaching students the basic chemical processes of how a wet cell battery works will help the students work more safely around these types of batteries.

Applied Science Principles - The application of basic science principles. Agriculture and engineering are applied sciences. These disciplines use basic science principles to solve problems and provide solutions. Students are taught the applications. When we teach problem solving, often times we are teaching applied science principles. Probably, a significant portion of your instruction fits this area. As an example, teaching students how to properly test and maintain a battery utilizes applied science principles. A more complex example would be teaching students how to maintain the starting circuit of a garden tractor.

Technological Systems Principles - The utilization of a variety of applied sciences to manage and/or evaluate relatively complex technological systems. Management systems are based upon these types of principles; e.g., Integrated Pest Management. Students learning these technological systems use models and expert systems strategies to design solutions and viable alternatives. For example, an irrigation system represents a technological system as it operates based upon a variety of applied science principles and applications. This type of instruction is somewhat advanced and requires knowledge and skills in a variety of areas. In order to be able to install, operate, and maintain irrigation systems, a worker needs to be knowledgeable in several areas, and be able to perform a wide range of skills.

Human Activity Principles - A value-based system of principles. Students learn to 'do what is right'. Reasoning, critical thinking strategies, communications, and holistic approaches to problem solving are the types of principles which are found in this classification. Teaching students to plan and implement a conservation program for a golf course would be an example.

In the conceptual framework of principle driven instruction, the students are taught the basic principles and then apply any of those principles to analyze and evaluate increasingly complex problems and situations in technical agriculture. →

Systems Thinking

Teaching students how to progress from the basics of science, through increasingly complex systems into very complex, holistic systems represents 'systems thinking'. Systems thinking allows us to be able to work with rather complex systems by being able to work with the subsequent subsystems and then being able to work with the complete system. Systems thinking allows us to be able to see a golf course as an interaction of a series of complex technological systems, into a complete human activity system. Holistic, or systems approaches to teaching and learning are being utilized to provide student opportunities to think critically about complex, multi-faceted problems and concerns. Couple this with the move from vocational only to science-based agricultural education for all, and it becomes apparent that a shift from competency-based, skill oriented curriculum and instruction to a principles-driven curriculum and instruction is more congruent with current thought. By linking principles, basic science through humanistic principles, with relevant applications in agriculture, we may reinforce and extend students' understandings and their abilities to identify and solve complex, higher order problems. We may be able to teach students to think.

Strategies for Instruction

From the foundations of principle driven instruction and systems approaches to inquiry, a series of specific instructional strategies can be derived. These strategies may allow students to think critically and develop problem solving techniques based on their knowledge of relevant principles.

Start with the basics - Design curricula which allow students to learn the basic principles and, in subsequent courses, be able to apply the basic principles. A natural progression needs to occur from the basic systems through the 'soft' complex human interaction systems.

Provide opportunities for students to apply principles - Laboratory instruction is a critical component of technology instruction for the workplace. We need to continue to teach students how to apply principles to solve problems.

Learning must be active - Technologies are active applications of basic principles. Instructional programs must provide students opportunities for active learning in laboratories, internships, case studies, and other activities in which the students are actively applying basic principles.

Utilize scientific inquiry - From the very beginning of instruction, all the way through the curriculum, instructional programs need to provide opportunities to think critically. The nature of the problems should become increasingly complex. We should not expect students to be able to solve complex problems unless they have had progressive opportunities to learn how to do so.

Utilize questions - As a specific teaching technique, questioning has to be a primary strategy not only in the classroom, but also in the laboratory, in assignments, and on all types of activities, including tests. Questioning techniques should allow students to inquire into the subject matter.

Use a variety of teaching techniques and strategies - Providing different applications of the same principles allows for better understanding of the subject matter. An explanation, followed by demonstrations, followed by student practice, followed by evaluation, allows for greater understanding through the varied insights.

Expect clear expression - Students who can explain their understanding and demonstrate applications to others have obtained higher levels of comprehension. Expect students to be able to express themselves clearly verbally, through written text, and demonstration.

Summary

Principle driven instruction should provide a progressive system of principles as a basis for agricultural and environmental technology instruction. Principle driven instructional techniques can force students to think critically, to solve increasingly complex problems, and to evaluate complex systems. A variety of instructional strategies may be utilized in principle driven approaches to technology based instructional programs. These techniques will better prepare students for a changing technology-based workplace. ■

COMING SOON

AUGUST
Promoting Integrity in Students and Instructors

SEPTEMBER
Innovations in Teaching

OCTOBER
Rural Education

NOVEMBER
Collaboration in Agricultural Education

DECEMBER
Cognitive Levels of Teaching and Learning

How is the Workplace Changing for Teachers of Agricultural Education?

BY THOMAS A. SILLETTO
Dr. Silletto is an associate professor of biological systems engineering and agricultural leadership, education and communications at the University of Nebraska, Lincoln.

We spend a great deal of time talking about the changing workplace for our students. We are concerned about the demands of the workplace placing more responsibility on us to teach basic skills, the ability to work with technology, teamwork, and problem solving to name a few. But what about the changing workplace for our profession, the teachers of agricultural education? A recent survey conducted in the state of Nebraska of agricultural education teachers sheds some light on this question.

The profession has endured considerable pressures caused by the threat of declining enrollments, sentiment that we don't need to prepare that many agricultural workers, reduced support from federal legislation, rapidly changing technology, and reduced visibility in many state departments of education. The pressures caused also by emphasis on adding new technology to the curriculums and shifting away from a production agriculture focus is a source of high frustration as well. What then have teachers done to change their workplace in responding to these pressures? A recent survey of Nebraska agricultural education teachers sheds some light in answering this question.

The survey included teachers having more than three years longevity at their present school and their careers extended from 5 to 27 years. The average longevity of the teachers was found to be 12.8 years, an increase above the average of 11 years found in a 1990 survey (Silletto, 1993). One fourth of the teachers developed new facilities while employed in their present jobs and about a third completed major renovations. The types of renovation included agricultural mechanics laboratories, as well as development of agribusiness, agriscience, computer, food science, horticulture and greenhouse, small animal, and soil and water laboratories which were identified as being important in Nebraska (Foster and Silletto, 1991).

Other renovations included adding offices or general improvement of existing facilities. In describing workplace changes made since beginning employment at their present school, the teachers displayed commitment to update programs, and reported several positive results. (The teachers also admit to having increased workloads!)

At the same time teachers reported they were changing their workplace, they reported a positive change in their student enrollments. They were asked to compare their enrollments currently with the enrollments in their program during their first year of teaching (see Table 1). Increases occurred in number of classes taught, semester vs. traditional classes, and in enrollment of other than agriculture classes taught.

Table 1
Comparison of average enrollment for first and present teaching year

	First Year	Present Year	Percent Increase
Number of classes taught	5.4	6.7	24.0%
Enrollment, traditional classes	44.5	45.2	1.5%
Enrollment, semester classes	27.6	46.3	67.7%
Enrollment, other than agriculture	27.0	30.9	14.4%
Total enrollment	57.9	76.5	32.1%

Development of Instructional Areas

In addition to describing laboratory areas developed, the teachers identified cooperative efforts with other teachers, listed other-than-school resources used and identified linkages developed with business/industry. Summaries for the types of laboratories follow.

Agribusiness laboratory development led to cooperative efforts with teachers of business and science and use of their laboratories and computers for agricultural education instruction. Other-than-school resources used included products, consumable supplies and loan of equipment as teaching aids. Business and industry linkages were developed with professional agriculturists and personnel from cooperatives, fertilizer plants, feed lots of FFA alumni and local merchants.

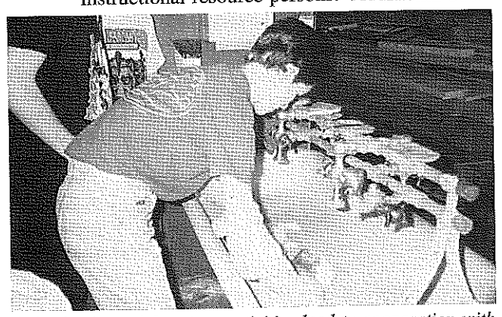
Agricultural mechanics laboratory development included cooperative efforts with industrial technology and mathematics teachers. Other-than-school resources used for required and approved projects included tools, equipment and materials provided by agribusinesses, lumber yards and mechanics' shops. Additional linkages with business/industry personnel led to identification of resource people to assist with instruction, provide use of their facilities and assist with procurement of metal, other project materials, small gasoline engines and considerable information and advice. **Animal science** livestock laboratory development efforts led to cooperative activities with →

science teachers. Non-school resource use involved activities at custom feed lots and feed lots of FFA alumni. Business/industry linkages were developed most often with local veterinarians, cooperatives or agribusiness personnel. Animal science small/companion animal laboratory development frequently included use of a portion of the agricultural mechanics laboratory as space for animal cages and work stations for related activities. No other-than-school resources were identified for use in the animal science laboratories. Area veterinarians served as resource persons and activities most frequently involved care and study of rabbits, chickens and fish.

Classroom laboratory development resulted in cooperative efforts with science teachers in several plant and animal activities such as identification and dissection. Computer activities included use of network programs, market update, record keeping and instructional programs. Other-than-school resources included instructional materials from the Department of Environmental Quality, portable greenhouses from nurseries and donations of house plants from the community. Development of the classroom laboratory also led to linkages with the State Game and Parks Commission and local businesses. Team-teaching activities were developed with florist company personnel. Educational Service Units provided technology equipment and computers.

As would be expected, the agricultural education teachers indicated that *Food Science* laboratory activities were undertaken in cooperation with teachers of home economics. Instruction was usually conducted in the home economics laboratory. No other-than-school resources were identified but several business/industry linkages were used to identify sources of food science instructional materials.

Land laboratory development efforts resulted in increased applied mathematics in cooperation with mathematics teachers. Other-than-school resources were identified as community farmers' fields and Natural Resource District and Soil Conservation Service District areas. They also provided equipment for land laboratory instruction and their personnel served as instructional resource persons. Additional business/industry linkages were developed with implement dealers, corn seed dealers, land owners and crop products supply companies. Linkages were also developed with community personnel who assisted in conducting corn test plot and variety demonstrations of various crops and trees.



Animal science laboratory activities lead to cooperation with science instructors and community members such as veterinarians. (Photo courtesy of David Barnard.)

Natural resources laboratory development resulted in cooperative efforts with science teachers and use of science laboratories for class projects. Other-than-school resources included use of state parks and buildings, and participation in garden club activities and bird watchers' association activities. Natural Resource District and Soil Conservation Service District field days and related activities also contributed to the instructional program. Business/industry linkages were developed with city, state and federal agency personnel. Class activities included plantings of trees and development of wildlife areas or wild flower plantings.

Plant and Soil Science Laboratory development was also enhanced by cooperative efforts with science teachers. Horticultural areas and greenhouses were included. Other-than-school resources were used extensively for transplanting and plant propagation as well as landscaping of homes or public areas. Business/industry linkages for plant and soil science instruction were developed with nursery personnel and county extension educators.

Program Impact

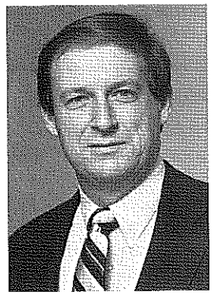
The teachers indicated that the changes to semester courses and instructional offerings such as biotechnology and aquaculture resulted in improved program image. Class structure changes from traditional to semester classes resulted in increased student enrollment and more diversity of students, even at schools having a reduced total enrollment. Disadvantages of semester scheduling were identified also. FFA activities were more difficult to coordinate and record book updates and conducting SAE activities were more challenging. The teachers also indicated that their workload was considerably increased, as compared to their first year of teaching. However, the program changes resulted in more options for students. As advisors, the teachers had increased contact with a greater number of students. One teacher also reported that program changes had contributed to saving the agricultural education program in the school, and contributed to considerable growth in enrollment.

Future Planning

The teachers reported specific plans for the future. Several included an intent to add greenhouses, aquaculture systems, wildlife facilities, small animal facilities, and classrooms as well as new laboratories. Some teachers indicated that plans were underway for a new agricultural education facility to be constructed as part of new school facilities. Program instruction plans included initiating more cooperation with other teachers, joint use of learning center/computer

(Continued on page 14)

Change R Us



BY MITZI PERRITT AND DALE PERRITT
Dr. Perritt is an assistant professor of human sciences and Dr. Perritt is a professor of agriculture at Stephen F. Austin State University, Nacogdoches, TX.

A lengthy discourse on coming to grips with "CHANGE," that phenomena that leaves us feeling like Wile E. Coyote after a race with the Road Runner, may do nothing more than provide us with a "blinding flash of the obvious." Tom Peters (1994) in his book, Crazy Times Call for Crazy Organizations, indicates that the word **change** is no longer a term with enough clout. He suggests the acceptance of the word **abandonment** rather than change as one of the biggest tasks we face going into the next century. In an interview with the former Vice Minister of Finance in Japan, the question was posed concerning the major factors important in buying and selling. He responded by stating that the factors are short-term, medium, and long-term. When asked to estimate the length of time for a long-term factor, he candidly responded, ten minutes. Some would conclude that an occupational area as steeped in tradition as agriculture would be somewhat exempt from the fast pace of change. In fact, nothing could be further from the truth. Business, industry and education within the field of agriculture have provided a raceway for new technologies that are changing the way in which we work. To illuminate some of the change that is taking place, this discussion focuses on one aspect of the agriculture industry and in fact, on one machinery dealership. Let's take a look at some of the change, **abandonment**, that is taking place at Fish and Steele.

Fish and Steele Equipment Company is the largest seller of John Deere utility tractors in the Dallas district. The Dallas district includes New Mexico, Southern California, Arkansas, Oklahoma, Arizona, Texas, and Louisiana. Mr. Alan Steele, owner and manager of the company shared some interesting insights into the changing workplace.

Question: What have you done to reinvent the way you do business?

"I would have to say the way in which I make decisions has changed significantly. When I entered the machinery sales business 20 years ago, we operated primarily with the cigar box method of management. At the end of the day, if we had more money in the cigar box than when the day began, we had a successful day. Today's management consists of instant decision making and extremely short turn-around on transactions. With John Deere's 'Farm Plan' we operate on a three day money plan. Funds generated from special orders or equipment sales are channeled back to us within three days allowing much more flexibility and a better cash flow. Operating in a compressed transaction cycle sometimes forces us to make decisions with incomplete information. This type of risk taking, however, is just part of the way the industry is changing."

Question: How has technology changed your job?

"No doubt, the biggest change in the way we do business is a direct result of technological advances. We spend $600 to $700 per month in long distance charges for the computer link with John Deere. I order tractors and parts, pay bills and receive dealer assistance from field technicians all via computer link. I am able to work at the office or at home with the same results. The down-side of technology may be that it is harder to separate work from home. I find that I have to plan time away from the job just as I plan my daily schedule at work."

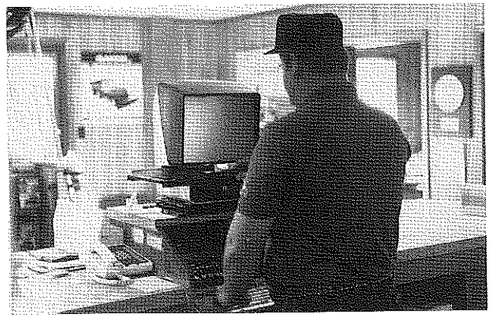
Question: How have your employees changed?

"When I entered the business, most of my line mechanics either grew up in an uncle's shop or learned from their dad or grandfather. Now, my salesmen and some of my line technicians have Bachelor of Science degrees in Agriculture. I encourage my employees to get advanced training or degrees. I realize I may lose them to a better job when they complete the degree, but I have enjoyed the services of a superior employee while they were working for me.

"Every employee must be computer literate and, in fact, every employee uses the computer in some form or fashion. Technicians use the computer to access schematics and other technical information needed for repairs. They also communicate with field service representatives via computer. I would estimate that currently 20% of the field representative's job is actually done at home by computer link. I suspect that this trend will increase significantly in the future."

Question: What do you expect from a new employee?

"I am looking for an employee that comes to the job with a good working knowledge of the machinery and equipment business. They need to know the difference between a plow part and a replacement part for a round baler. I want my employees to know what they are selling and I believe that is 'satisfaction.' Since I perceive that we are selling an intangible product as well as a tangible product, I think potential employees need to have good communication skills. My sales representatives invest a significant amount of time just visiting farmers. They must know how to speak the language of the man in the tractor → seat. They are instructed to never suggest to



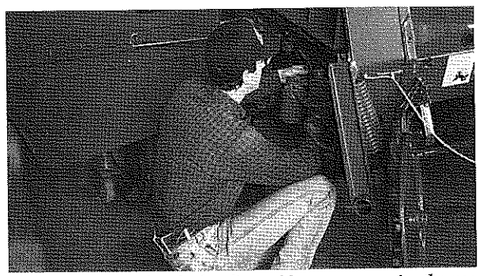
Older technology, used to locate parts for customers, will soon give way to an EPC (Electronic Parts Catalog) making it possible for farmers to access and order parts from the local dealer or main supplier. (Photo courtesy of Mitzi and Dale Perritt.)

the farmer that he purchase a new piece of equipment. That decision must be made by the farmer. We are just there to supply technical support and the 'tingle and wow' that is part of purchasing a new green tractor. If my employees do their part as effective communicators, then the product will sell itself. Communication skills, including being a good listener, are essential not only for the sales personnel, but also for the service manager and line technicians. When customers can explain their problems, be heard and have it fixed the first time, they are much more likely to go away satisfied."

Question: How have customers changed?

"Customers are better educated, expect more for their money, have less time to handle problems and in general must maximize their inputs. In the machinery industry, we are trying to maximize our customers' time in a number of ways. These efforts have certainly changed the way we do business. John Deere is currently piloting a 'home shopping' venture for its customers. When implemented, the Electronic Parts Catalog (EPC) program will allow a farmer to access the local dealership's parts inventory from their home computer, order a part, print the invoice and expect the part to be ready for pick up when they arrive at the dealership. Should the part not be available at the local dealership, it will be ordered automatically from the John Deere parts supply. This concept is a big change from the farmer who brings in the part and simply says, 'I want one of these.'"

To summarize some concepts about the workplace in agriculture, it would be safe to say there is an apparent pervasive attitude that doing things the way we used to do them — because that strategy once worked — is no longer valid. Changes in customer wants and needs, a renewal of conservative views in government and an increased desire on the part of industry to produce a superior product have driven **abandonment** home to the agriculture workplace. Words like specialization, professionalism and master of craft are being driven downward to the lowest levels of the work-force. Some change agents would suggest that we prepare for change by developing a systematic plan to attack our most sacred cows. As we prepare our students for the changing workplace, it might be wise to keep a list of cherished beliefs and occasionally run those through the combine to see if they are wheat or chaff.



Locating electrical or hydraulic problems may require the use of schematics from local service representatives delivered via electronic mail. (Photo courtesy of Mitzi and Dale Perritt.)

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HOW IS THE WORKPLACE

(Continued from page 12)

areas and increased use of "high tech" and biotechnology equipment. The addition of a school farm/laboratory was important for some teachers. Some teachers reported plans to update agricultural mechanics laboratories, add new welders and ventilation systems and also planned to introduce more module concept use of the existing laboratory areas. Some teachers will reduce "shop" space by renovation or redirect use of the area to agriscience activities.

Summary

A Survey of Nebraska agricultural education teachers was conducted to identify workplace changes made since beginning their present jobs. The changes for improved instruction were made by expanding laboratory activities, developing more cooperative effort with other teachers and using more other than other-than-school resources. In addition, linkages were established as a means of developing ties with business and industry. A major change to semester courses contributed to considerable growth in numbers of students. However, that change also contributed to more challenges in conducting FFA, SAE and record update activities. Positive results of the on-going process of changing the workplace were identified by Nebraska teachers of agricultural education in the form of increased student enrollment, increased program image and considerably greater job satisfaction; but for teachers, the changes also resulted in increased workload.

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Can We Keep Up with Technology?

BY GALE L. HAGEE

Mr. Hagee is an associate professor and coordinator of agricultural education at Cameron University, Lawton, OK.

7:03 AM, Wednesday, May 3, 1995, (in the middle of breakfast)

"Mom, for high school graduation, can I have my own E-mail address and a modem so that I can cruise the information superhighway? I'm certain I'll need those skills when I get a job."

Technology is increasing knowledge faster than most of us can apply it. Technology is defined as "all human activities involving the use of tools." (Horner, 1989). The computer, E-mail, internet, telecommunications, satellite linkages for education, research, and the work site, all part of the information superhighway, are readily available to anyone with a modem willing and able to subscribe. Technology is rapidly changing the workplace. We can only guess how the future workplace will evolve.

Just as agriculture is changing all around us, the workplace is changing too. The workplace is constantly evolving to meet the needs of today's' worker while providing the consumer goods and services demanded by the economy. Gazing into the crystal ball of the Greek goddess Demeter, tomorrow's job opportunities for agricultural students are going to be in situations other than traditional production agriculture. This isn't saying that America and the world won't need well trained and educated farmers. But only a few of today's high school students will become self-employed production agriculturists. Those who do, will need to be well educated and business oriented if they are going to survive as farmers. They will manage their farms via global positioning systems in pickup trucks or tractor cabs. Through the use of satellite relayed tele-communication systems the employees and staff of large farms and ranches will receive instructions and participate in team management activities. The farmers will manage larger farms with a staff of highly skilled technicians.

Modern agricultural businesses are changing to meet the needs of today's consumers by providing better products and services. (Photo courtesy of Gale L. Hagee.)

Did you notice the classroom of the future at the last FFA convention you attended? The future workplace will require unique job skills for success. Computer commands will run everything. Similar to industries with local area networks, the agricultural workplace will have a management control center accessing every component of the farm and ranch. The baler can interact with the tractor while the tractor operator communicates with the hired hand in the farrowing house concerning what futures transactions need to be made to protect the investment in next fall's fat hogs which were just born. At the same time, the irrigation equipment starts up to precisely fertilize and water a field previously mapped by a satellite 1100 miles overhead. Education will be viewed as ongoing with course work taken when needed. Communication technology will allow public high schools, vocational technical schools, community colleges, universities, and extension services to provide interactive learning anywhere, even in the agricultural business workplace. The job skills required in the future will include knowledge of robotics, computer automation, electronics, business strategies for capitalization, and communication and people service skills.

Business structures of the future will be flatter and leaner with fewer levels of supervisors and managers. Down-sizing of management and employees in industry will continue to be the name of the game. Predictions show that future job growth will be found in service oriented companies employing fewer than 50 individuals. Many displaced professionals will start their own micro-businesses, probably in rural areas where it is generally more pleasant to live.

The future will see companies filling needs for specialized services through subcontractors outside their business structure. Subcontractors capitalizing on team approach strategies will provide larger companies and corporations services that had been previously performed within the company structure. These teams will be made up of individuals who each have special technical skills and problem solving abilities. Contractual work opportunities will require these teams to be mobile and able to respond quickly anywhere within their assigned geographical region.

Black ink will continue to be the driving force behind the decision making processes. The workplace will become more holistic. Humanizing of the workplace will allow for more employee involvement in response to problems and concerns in managing and →

running the company. Flexibility at the workplace will allow the employee's schedules to better meet the needs of the other important things in their lives. Employee benefits packages will have the traditional fringe benefits of life insurance, paid vacations, and health care but also such amenities as health maintenance, recreational, and educational opportunities provided on site by the employer. In September of 1990, Money magazine asked the Gallup Organization to survey a sample of their subscribers to find out how they defined the American dream. Responses of subscribers identified the following as primary attributes of the American dream: 1. Rewarding work; 2. First rate education for children; 3. Competent, affordable health care; 4. A house of one's own; 5. A nest egg; 6. Occasional indulgences; and 7. A comfortable retirement. (Germer, p.5)

This list consists of realistic whole life concerns. Wealth, fame and career advancement are not included. Did the financially astute readership of Money magazine realize that money and power doesn't buy happiness? Surveys by other polling groups reveal that up to two-thirds of the people surveyed said they would like to lead a more relaxed lifestyle. Employees' desire to spend more time with family, pursuing hobbies and personal interests will encourage companies to humanize the workplace.

Due to these anticipated changes, flexible workplaces and schedules will become more common. The future will see 40 hour work weeks performed in four days, allowing for worker training or retraining one or two days per week. There will be more time for leisure activities. Working for a distant agribusiness employer in one's home in a rural area will be a more pleasant experience than commuting into cities.

In Carl Daniels' (1990) book, The Changing Workplace, five major changes seem destined to affect the future workplace:

1. The minimum wage will be raised.
2. The age at which children work will be lowered.
3. The earnings cap for social security recipients will be removed.
4. Child care facilities in the workplace and the community will be expanded.
5. There will be major shifts toward labor saving systems in the workplace and systems that do not seem economically feasible at the present time. (p. 22-23)

Some of these predicted changes have become realities in the five years since that book was published. Evolution in the agricultural workplace is occurring rapidly with over 200 jobs presently associated with agriculture. How many new employment opportunities will there be in the twenty-first century?

Government policy in the agricultural sector will strive to insure a safe and abundant food supply. There will be less governmental control of agricultural output. The EPA will continue to force the society to be environmentally conscious. The forces of supply and demand of the free market economy will have much more influence. Price supports and agricultural subsidies will be history. Standards and grades of commodities will become educational tools for marketing strategies of progressive agriculturists improving the quality of their agricultural output. More marketing will be based on grade and yield to meet the demands of the consumer for a more service oriented product bundle of attributes. The family farm will become business oriented competing against large corporate operations, much like those presently influencing the poultry, pork and beef processing industries. Is an earthquake in the making for the red meat and poultry processors of the magnitude that shook "Ma Bell"?

Salvation for much of agriculture, as many now enjoy it, will come from a stewardship approach such as LISA (Low Input Sustainable Agriculture) that use such practices as IPM (Integrated Pest Management) and no till farming. Successful agribusiness firms will find a niche that provides the products or services not found elsewhere. Non-traditional agriculture programs will encourage many producers to try new ventures in horticulture, exotic animals or wildlife. Centers for economic development in

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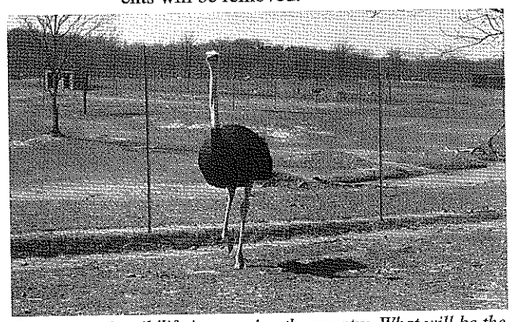
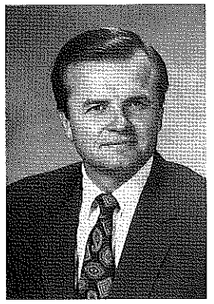


Raising exotic wildlife is sweeping the country. What will be the hot species in the 21st century? (Photo courtesy of Gale L. Hagee.)

Centers for economic development in rural areas continue to have an impact on traditional agriculture. Alternatives such as aquaculture allows for diversification and additional income. (Photo courtesy of Gale L. Hagee.)

Entrepreneurship as a Career Option



BY JAMES SIPIORSKI AND JERI MATTICS FREEMAN
Mr. Sipiorski is director of sales for Wisconsin, NorthStar Select Sires. Ms. Freeman owns and operates the Rocky Mountain Marketing & Communications public relations agency which specializes in agricultural education.

As large corporations have been downsized (right-sized, restructured or whatever term you want to use), small businesses have flourished. More than one million new businesses are started in America every year. While many of them fail, enough succeed to add millions of jobs to the economy at the same time that the Fortune 500 companies are losing jobs.

From fresh produce operations to turf and landscape services, the agricultural industry is ripe for entrepreneur enterprise development. Your students should consider becoming an employer rather than an employee as a viable career option.

Creating Entrepreneurs

In a recent survey released by The Gallup Organization, seven out of ten high school students said they wanted to start a business of their own. The survey indicated the primary reason for wanting to start a business was "to be their own boss," not to earn a lot of money.

But while students are interested in becoming entrepreneurs, most do not have the knowledge to take that step. The students' responses to basic questions on entrepreneurial issues indicated they are not ready to pursue their dreams. Students attributed their lack of understanding about starting a business to being taught little about how business works.

While some young people traditionally learn about entrepreneurship from parents and other family members who own their own businesses, others have no access to such knowledge or role models. Many simply do not perceive creating a job or a business as a valid career choice because all of their role models were employees, not employers.

As an agriculture teacher, you can help your students understand that one of their career options is creating their own job. In fact, they can create employment not only for themselves, but for others in their community. The rewards can be substantial, not only financially but in terms of job satisfaction and personal development.

In his book, Growing a Business, Paul Hawken writes, "A business shouldn't be something you do to live, but something you live to do". Many entrepreneurs agree. Often the most successful businesses develop from an avocation, hobby or other interest. Just ask Ben Cohen or Jerry Greenfield. Their ice cream company has become the stuff of entrepreneurial legends.

Several organizations have joined forces to assist agricultural educators in teaching entrepreneurship. The Center for Entrepreneurial Leadership, Inc., of the Ewing Marion Kauffman Foundation in Kansas City, Missouri, in partnership with the National Council for Agricultural Education, the National Vocational Agricultural Teachers' Association, the National FFA Alumni Association, the US Department of Education and the National FFA Organization have launched the Agri-Entrepreneurship Education Program.

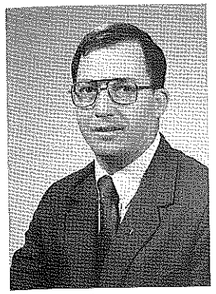
The program is designed to increase the amount of entrepreneurship being taught in local agriculture programs across the country. The program includes recognition of top students and chapters, inservice workshops, instructional modules and a national forum. The award applications were due in June with national winners being selected this summer and recognized in November during the National FFA Convention. Inservice workshops are being conducted in Alabama, Arkansas, Indiana, Iowa, New Jersey, New Mexico, North Carolina, Ohio, Oklahoma, Pennsylvania, Texas and Virginia this summer and will be continued next summer in additional states. If you're interested in attending an agri-entrepreneurship workshop, talk to your state supervisor.

You can help your students view self-employment as a career option by teaching the principles of entrepreneur in your classes. Start by reviewing the instructional modules sent to all agricultural education programs in May as part of the Agri-Entrepreneurship Education Program. They cover opportunity recognition, developing a business plan and marketing, and are designed so that you can incorporate individual lessons into your existing curricula.

To find out what others are doing in this exciting area and generate ideas for your program, plan on attending the National Forum on Agri-Entrepreneurship. The forum will be held Friday, November 10, 1995, as part of the National FFA Convention in Kansas City. It will feature an impressive slate of speakers plus the top national Agri-Entrepreneurship Education Program award winners. Watch for more details in the September issue of FFA Advisors: Making a Difference and in upcoming issues of *NVATA News & Views.*

For more information on this exciting new program or on teaching agri-entrepreneurship, contact Dr. Rosco Vaughn at The Council for Agricultural Education, 5632 Mount Vernon Memorial Highway, Alexandria, VA 22309-0035, (703) 360-8832. ■

What's Not Changing at the Agricultural Services Workplace?



BY JOE MULLER
Dr. Muller is an agricultural mechanics curriculum specialist in the instructional materials service at Texas A&M University, College Station.

The Bureau of Labor and Statistics, U. S. Department of Labor, rates the projected growth in the number of jobs in a particular sector of the economy as: more slowly than average; about as fast as average; faster than average; or much faster than average. In 1992, there were approximately 653,000 wage and salary positions in the agricultural services area. In the 1994-95 Career Guide to Industries, the U. S. Department of Labor estimated that there will be an additional 265,000 jobs in this area by the year 2005. This represents a projected 40.5%, or faster than average, change in employment opportunities in the agricultural services workplace. Much of this anticipated growth will result from the increased use of new technology and automated equipment in all areas of agricultural production, processing, and distribution. What entry-level knowledge and skills in the area of agricultural mechanization will students really need for immediate occupational placement and/or to prepare them for postsecondary education and advancement into salaried positions?

Regular attempts are made by various public and private agencies and organizations to quantify and update the lists of specific entry-level skills needed in each occupational cluster area. Instructional materials and job sheets are developed to cover each area. Vocational counselors review the information and tell students, "If you want to go to work in this area at an average starting salary of $??,??? per year, you need to take these courses. You should know this information and should be able to do these things the first day of the job". Vocational instructors (including me as a former instructor) take the materials, introduce students to a concept and skill, and try to create the need-to-know attitude. Next, we demonstrate a specific **how-to** skill several times. We then allow students to practice until they become as proficient as time and available training equipment in the laboratory or classroom will allow. We then check the item on their competency profiles and introduce another skill because the list is long and the semester is short.

As many of you, I began my professional career as a vocational instructor teaching agricultural mechanics courses in a high school. During the 1980s, I had an opportunity to work as a service manager for a farm machinery dealership before returning to education. Part of my responsibility was to supervise employees in the service department. You may recall that during this period digital displays, electronic sensors, circuit boards rather than bulky wiring harnesses, pointless ignition systems, on-board computers, etc., were being introduced on many models of agricultural equipment. At the same time, major technological improvements and changes were made in hydraulics, power trains, and other systems as well. The workplace was changing! With each load of new machinery arriving at the dealership came revised technical manuals, special tools, and high-tech diagnostic equipment. Fellow ***mechanics*** and I were perplexed, to say the least. How could we ever change? How could we understand and keep up with all this new technical jargon? Would we have to admit to ourselves, the boss, and to our customers that we did not know how to work on this "modern equipment?" Had technology run away from us? What was lacking in our knowledge and skills to be successful? Each of us had successfully completed our vocational training with the prescribed curriculum and had from two to 40 years of practical experience servicing and repairing agricultural equipment.

We soon realized a need for additional knowledge to work on this "high-tech equipment," but what was it and where should we begin? ***How about starting with the basic fundamentals?*** We did begin a regular in-house training program at the dealership. We came in early on our own time and our employer provided equivalent company time. We studied the fundamental principles of electricity, hydraulics, and power transfer, etc., as we went over the new technical manuals, system schematics, and diagnostic flow charts. Slowly but surely, the phobias of the new and unknown systems began to disappear. The ***new technicians*** (no longer just mechanics) were soon able to understand and explain, from a technical standpoint (yet in "layman's terms"), how generators had given way to alternators with external voltage regulators, how they in turn had given way to enclosed alternators with built-in solid-state electronic regulators, how each new electrical system or electronic sensor-control unit could be explained and diagnosed by applying the same basic principles of electricity and magnetism, etc. The size, shape, color, and appearance had changed, but not →

the fundamental principles of operation. We began to view each new model, modification, or added accessory not as a technological nightmare, but simply as an "improvement to the old" operating on the same principles.

Ten years later, I feel certain experienced service technicians, as well as recent graduates, feel just as perplexed as we did back then. Just look around at all of the new changes in agriculture: robots to plant and pick fruits and vegetables, total-confinement livestock operations, automated aquaculture systems, and laser-controlled land leveling equipment, to name just a few. Only a few years ago, during Operation Desert Storm, the military used satellites and global positioning systems (GPSs) to pinpoint the exact movement and location of troops and equipment. Today, GPSs and on-board computers are installed in tractors, planters, chemical application equipment, and combines. Instead of applying seed, pesticides, and fertilizers at an average rate over an entire field, rates can be automatically varied on-the-go based upon actual yield data, soil types, and soil tests to an accuracy of 100 square feet or less. What will it take to operate, service, and repair this equipment?

The intent of this article is not to discredit the knowledge and abilities of these individuals or to glorify the in-house training program that was implemented. By industry standards, all of them were considered "master service technicians," even before we started the program. My intent is not to downgrade the past success of our high school agricultural education programs either. Rather, I wish to draw from these and other experiences in education and agricultural business and industry to emphasize the importance of being able to relate back to and apply basic fundamental principles of physics, science, math, etc.

What seems to be lacking on our competency lists of knowledge and skills are: the ability to relate back to the fundamental principles of ***how come*** and ***why*** each system operates as it does; how different systems are interrelated; and the ability to be able to apply this knowledge to changing situations and applications. Historically, vocational education has placed less emphasis on teaching fundamental abstract principles and more emphasis on ***how-to, hands-on*** skills on specific systems and equipment. Perhaps we thought the higher-level cognitive knowledge was reserved for those students aspiring to go on to college and become engineers, scientists, etc.

How can we prepare students for this ever-changing workplace? Ask yourself this question. Are we utilizing new technology in agricultural production, processing and distribution, or are we just reapplying the same basic mechanical concepts and fundamental principles of science, physics, math, etc., to new and improved components and applications?

It is not suggested that we disregard the competency lists that have been generated in each occupational cluster area. It is not suggested that, as vocational educators, we take over the curriculum and roles of academic teachers and try to teach science, math, and physics, etc., to the point that our vocational students become "rocket scientists." Rather, I would like to suggest that as we teach the concepts and skills as they are listed on the competency profiles, we relate them back to fundamental principles of science, math, and physics upon which they are based. It will then become much easier for students to apply these principles to current and future applications in the workplace. According to the contextual learning theory, abstract principles such as these are best learned when they are related to real-life, hands-on applications and experiences. Let's try it! ■

The Changing Workplace

(Continued from page 7)

Career Examples

Each of our product lines has technical support people available to address potential problems. After-sales service is extremely critical when you are dealing with a product line such as ours, where its performance can directly affect the owner's financial success. It can cost a farmer thousands of dollars if he can't get his wheat off the field because his combine is down for repair. When a customer calls in with a problem, our product support people must have at their disposal a technical background, a mechanical background, communication and problem-solving skills, fast reaction time, and flexibility to drop whatever they're doing to help that customer.

Flexibility on the job also means a willingness to change positions several times in the course of a career. Students and employees alike should consider themselves multi-faceted. A typical career path might begin in manufacturing, move to quality control, then go to marketing and finish in purchasing. At each step new skills are acquired.

Your challenge as educators is to foster flexible thinking, independence, and problem-solving in your students in addition to instilling those much-needed skills such as computer literacy, reading, writing and mathematics.

The field of agriculture is one of the most vital to our country's prosperity. It deserves the best we can give it.

Editor's Note

Headquartered in Racine, Wisconsin, Case Corporation is the largest manufacturer and distributor of light- and medium-sized construction equipment in the world and the second-largest maker of agricultural equipment in North America. Case products are sold in approximately 150 countries through a network of about 4,100 independent dealers and distributors. David Goodwill has been with Case Corporation since November 1994. Prior to joining Case, he spent more than six years as a human resource manager for General Electric. ■

Agricultural Education: Responding to the Changing Workplace

BY FREDDIE L. SCOTT, SHERRY B. CLAYTON AND CLIFTON R. BRAKER

Dr. Scott is an assistant professor, Ms. Clayton is a graduate student, and Dr. Braker is a professor of agricultural and extension education at the University of Arkansas, Fayetteville.

After the turn of the century, the United States was in World War I. Agriculture was the largest industry and this country was dependent on agricultural production to support the war effort. The Smith-Hughes Act of 1917 was passed providing the funds to establish vocational agriculture education in all public schools. However, before the passage of this act, some schools were already providing education in agriculture.

The emphasis in agriculture at that time was production. Approximately 70 percent of the population was directly involved in agriculture and the easiest and quickest way to increase production in agriculture was to educate the public. The Smith-Hughes Act provided for education in the public schools for young people and for the education of adults.

Traditional programs in agricultural education continued in the public schools until 1963, when legislation was introduced to broaden the offerings. These included emphases in agricultural mechanics and other "off-farm occupations" (Vocational Acts of 1963). Agricultural mechanics became an important part of almost all programs. Agricultural power and machinery supported the crop production portion of the curriculum. Agricultural business strengthened all courses by adding the business and management aspect. These types of programs continued until the 1980's, when the Committee on Agricultural Education in Secondary Schools (1988) recommended changes in agricultural education programs. Some of the changes included the addition of agricultural literacy to public school curriculum and broadening course offerings to emphasize agricultural science.

Agricultural Literacy

In the United States today, a vast majority of the population, particularly young people, are two or three generations removed from real on-farm experiences. Their knowledge base concerning agriculture has greatly diminished. This problem has been identified as a lack of "agricultural literacy" or more explicitly, the lack of knowledge of agriculture by the general population (Committee on Agricultural Education in Secondary Schools, 1988). According to Williams and White (1991), many Americans have little or no knowledge of agriculture or the importance of agriculture to the life of the individual.

"Agriculture is not simply farming. It is in the supermarket, the equipment factory, the trucking systems, the overseas shipping, the scientists' laboratory, the house we live in, and much more. It has an effect on the air we breathe, the ground we walk on, the water we drink, and the food we eat." (Phillips, 1990)

Frick, Kahler, and Miller (1991) found that "The failure of our secondary schools and liberal arts colleges to teach even rudimentary courses on agriculture means an enormous majority, even among well-educated Americans, are totally ignorant of an area of knowledge basic to their daily style of life, to their family economics, and indeed to their survival." Reported in Idaho Farm Bureau News (1988), "We have people here in Idaho who don't know that milk comes from a cow, not the local supermarket. In places like New York or Los Angeles or Chicago you would expect that, but even in a state like Idaho, where it is fairly rural, we still have people who don't know where their food and fiber comes from." The two principle conclusions and recommendations of The Committee on Agricultural Education of the National Research Council's three year study (1985 to 1987) released in 1988, are that the focus of agricultural education must be changed and beginning with kindergarten and continuing through the twelfth grade, all students should receive some systematic instruction about agriculture. Two familiar programs that have been initiated are FFA's Food for America and USDA's Ag-in-the-Classroom. Food for America was one of the first national efforts to teach younger students about the business of food and fiber (Stagg, 1991).

With all the needs and opportunities before us to teach about agricultural literacy, it is time for agricultural literacy in the United States to take the lead in providing materials and expertise to teachers in the public schools. Schools need more staff personnel as well as a central source that could supply information and materials. A community resource specialist, for example, could find ways to provide the instructional material and activities needed by the school district to implement and update curriculum (Enderline, 1990). Most important to agricultural education departments, all elementary teachers should be taught how to incorporate agricultural literacy into their curriculum. A three hour course on agricultural literacy in the elementary schools should be part of the education core in colleges offering a degree in elementary education (Clayton, 1992). Teachers who have attended workshops on the economics of agriculture may reflect the information in their teaching (Wiseman and Wilson, 1992). →

Agricultural Science

The decade of the 1990's has seen many calls for reform in agricultural education in the Unites States. Parents, teachers, business leaders, and educational professionals have all asked for new and innovative approaches to teaching science and mathematics. Agricultural education programs are responding to this need by placing more emphasis on teaching scientific principles and concepts using agriculture education and natural resources. The Committee on Agricultural Education in Secondary Schools (1988) in its report, "Understanding Agriculture: New Direction in Education," states: "Teaching science through agriculture would incorporate more agriculture into the curricula, while more effectively teaching science."

Most states have revised the course offerings for the agricultural education program. The "buzz" words today include "science" and "technology". These words are included in almost every course title offered such as, "agricultural Science and Technology."

The National FFA Organization (1990) stated that agriculture and science are natural partners. A basic understanding of science is required for all secondary agricultural education students.

Nationwide, agricultural educators are giving priority to infusing science into the secondary agriculture curriculum. However, the emphasis has been on the biological and life sciences. One can find many activities, lessons, etc., relating biological and life science concepts to agriculture. Many activities have laboratory situations so students can actually see these concepts. One must not forget the physical sciences. According to Osborne (1992): "The current literature gives relatively little attention to agricultural mechanics instruction . . . Some believe that agricultural mechanics contradicts rather than compliments science-based curriculum revitalization efforts occurring nationwide."

Johnson and Braker (1994) presented sample science and mathematics learning activities for teaching agricultural mechanics. These activities were designed to enable the teacher to implement hands-on science and mathematics principles and concepts. These activities have been successfully used by teachers in Mississippi, Arkansas, Texas, and many other states.

Science and mathematics principles and concepts must be incorporated into the current agricultural education program. Teaching only agriscience is teaching just another science course. The need to teach agriculture is as important as previously presented. There must be a balance — not all science and mathematics and not all production agriculture — but a blend so that agricultural literacy will be achieved and science principles and concepts can be taught.

Summary

Agricultural education **is** a changing workplace. Agricultural education is firmly grounded in the science principles and concepts. Teachers should base instruction on these principles and their agricultural applications. Hands-on learning experiences are an essential of an agriscience based curriculum. Teachers will need a greater knowledge of science concepts and how to make application of these concepts. Teacher education programs will need to update their programs to teach beginning teachers this concept and to inservice current teachers. Making application of science principles will aid in teaching more young people about agriculture.

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Can We Keep Up

(Continued from page 16)

rural areas continue to have impact on traditional agriculture. Technology is the driving force in the way business and agriculture is performed. Therefore our students, teachers and policy makers must become technologically literate with a business savvy in order to compete in the global workplace of tomorrow.

4:35 PM, Wednesday, May 3, 1995 (getting home from school)

"Yes, child, go ahead and buy that modem thing if you think that is what you need to prepare yourself for the workplace of tomorrow."

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FEATURE ARTICLE

Agricultural Education in the United States: Teacher Gender and Ethnicity by Region and State

BY WILLIAM G. CAMP
Dr. Camp is a professor of agricultural and extension education at Virginia Tech, Blacksburg.

Since 1965, researchers from the Agricultural Education Division of the American Vocational Association have conducted an annual National Survey of the Supply and Demand for Teachers of Agricultural Education in the United States. The annual studies were conducted from 1965 until 1973 by Dr. Ralph Woodin, initially of the Ohio State University and later from the University of Tennessee, Knoxville. The study was continued by Dr. David Craig of the University of Tennessee from 1974 until 1984. Since 1985, Dr. William G. Camp from Virginia Tech has conducted the study except for 2 years when Dr. J. Dale Oliver, also of Virginia Tech, was responsible for the research.

This is the third in a series of reports to the profession on the results of the annual supply and demand study. For more details about the background of this ongoing study, and on the sources of the data, see the first article in this series, in the May, 1995 issue of The Agricultural Education Magazine.

Race/Ethnicity and Gender of Teachers

The following table presents data on the gender and race/ethnicity of teachers by region and state. The stereotypical view of the Agricultural Education teacher as a white male is certainly confirmed by these numbers. Gender was reported on 9,626 teachers. Of those, 8,640 (89.8%) were reported as males. Males made up 91.8 % of the teachers reported for the Central Region, 84.5 for the Eastern Region, 93.9% for the Southern Region, and 69.9% for the Western Region.

Race/ethnicity was reported on 9,512 teachers. Of those, 9,015 (94.8%) were reported as white non-Hispanic and 335 (3.5%) were indicated as African-American. Each of the remaining racial and ethnic groups accounted for less than 1% of the total. The Central Region reported 99.2% white teachers, Eastern Region reported 98.7%, Southern Region 91.3%, and Western Region 97.8%.

This is just the second year that gender and race/ethnicity data have been collected in this national survey. We found that teachers of agriculture at the secondary level are primarily white males. Only a minuscule number of our teachers are of native American, Asian, or Pacific island descent. Both racial and gender percentages are very regional. The general population patterns of the regions probably explain the racial/ethnic differences among Agricultural Education teachers. One might speculate that the larger percentages of males in the Eastern and Western regions reflect less conservative attitudes toward gender stereotyping than is prevalent in the Southern and Central regions. →

Table 1
Teacher Gender and Race/Ethnicity, by Region and State, September 1, 1993 [a]

	Total teachers	Males	Females	African American	White non Hispanic	Native American /Alaskan	Hispanic	Asian/ Pacific-islander
Central Region								
Iowa	217	206	11	0	116	0	0	0
Illinois	336	302	34	11	325	0	0	0
Indiana	241	228	13	0	241	0	0	0
Kansas	166	164	2	0	166	0	0	0
Michigan	144	113	31	2	140	0	0	0
Minnesota	203	193	10	0	203	0	0	0
Missouri	318	303	15	2	315	0	0	0
North Dakota	80	79	1	0	80	0	0	0
Nebraska	133	128	5	0	133	0	0	0
Ohio	524	475	49	0	520	2	1	1
South Dakota	87	78	9	0	86	1	0	0
Wisconsin	287	243	44	0	287	1	0	0
Region Total	2,736	2,512	224	15	2,612	4	1	1

Table 1 continued
Teacher Gender and Race/Ethnicity, by Region and State, September 1, 1993 [a]

	Total teachers	Males	Females	African American	White non Hispanic	Native American /Alaskan	Hispanic	Asian/ Pacific-islander
Eastern Region								
Connecticut	64	46	18	0	64	0	0	0
Delaware	30	26	4	1	29	0	0	0
Massachusetts	73	55	18	0	73	0	0	0
Maryland	66	44	12	5	61	0	0	0
Maine	25	23	2	0	25	0	0	0
New Hampshire	34	25	9[d]	0	34	0	0	0
New Jersey	72	48	24	0	72	0	0	0
New York	270	237	33	11	256	0	2	2
Pennsylvania	252	224	28	3	249	0	0	0
Rhode Island	10	10	0	0	10	0	0	0
Vermont	29	25	4	0	29	0	0	0
West Virginia	98	93	5	0	98	0	0	0
Region Total	1,023	856	157	20	1,000	0	2	2
Southern Region								
Alabama	372	369	3	55	317	0	0	0
Arkansas	259	253	6	14	244	1	0	0
Florida	402	334	88	14	380	0	5	0
Georgia	273	251	22	17	255	0	0	1
Kentucky	262	228	11	0	239	0	0	0
Louisiana	225	221	4	20	205	0	0	0
Mississippi	211	206	2	47	161	0	1	0
North Carolina	310	266	44	46	262	2	0	0
Oklahoma	447	440	7	0	419	27	0	1
South Carolina	124	119	5	24	100	0	0	0
Tennessee	237	226	11	9	228	0	0	0
Texas	1,450	1,393	57	20	1,366	0	64	0
Virginia	293	254	39	34	258	0	1	0
Region Total	4,865	4,560	299	300	4,434	30	71	2
Western Region								
Alaska	7	6	1	0	7	0	0	0
Arizona	71	61	11	0	66	1	4	0
California	547	41	29	0	67	0	3	0
Colorado	89	80	9	0	89	0	0	0
Idaho	85	82	3	0	85	0	0	0
Hawaii	32	31	1	0	4	0	0	28
Montana	74	71	3	0	73	0	1	0
New Mexico	79	75	4	0	70	1	8	0
Nevada	25	22	3	0	24	1	0	0
Oregon	112	104	8	0	112	0	0	0
Utah	69	67	2	0	69	0	0	0
Washington	256	25	231	0	255	0	1	0
Wyoming	49	47	2	0	49	0	0	0
Region Total	1,495	712	307	0	970	3	17	28
US TOTAL	10,119	8640	986	335	9,016	37	91	33

a Actual reported numbers included fractions since some teachers are employed part time. The data reported here are rounded off to whole numbers for ease in interpretation.

Look for This

In the next article in this series, data will be provided on the curriculum being offered in Agricultural Education programs in the US.

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