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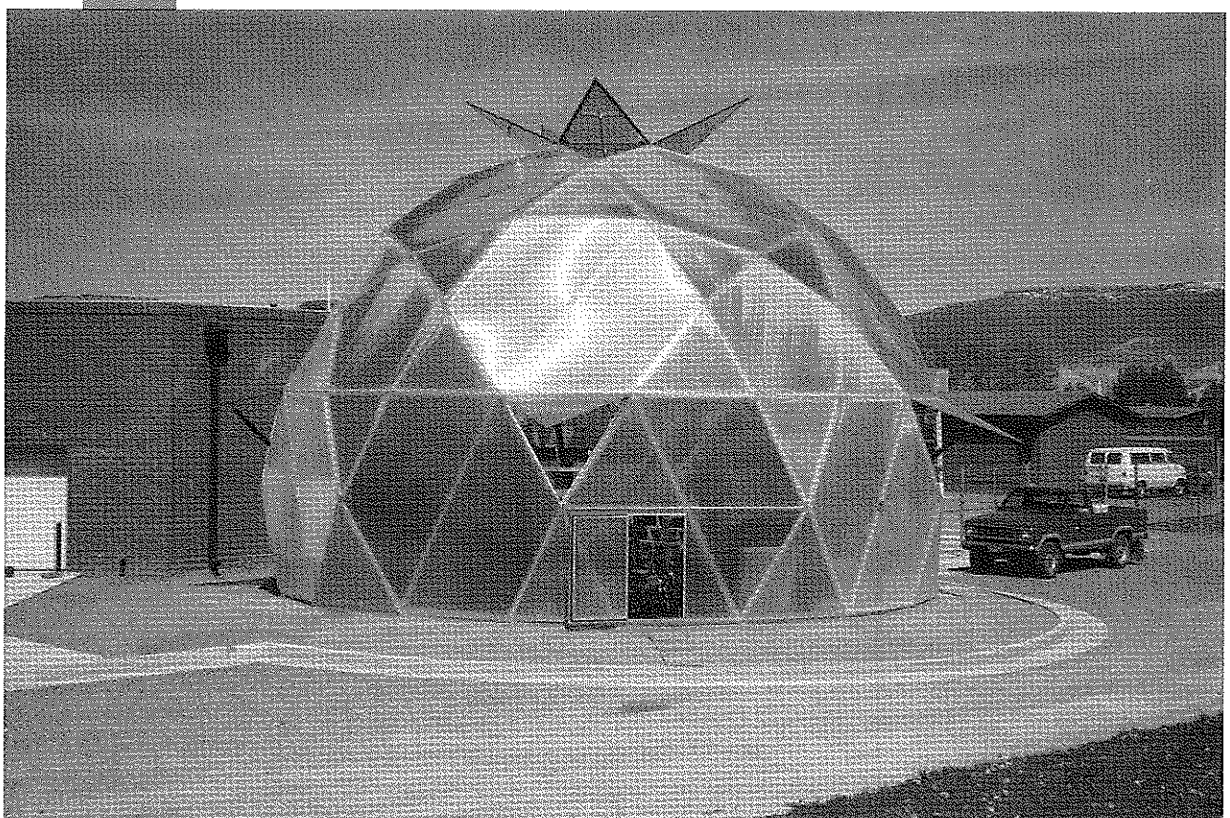

Land Laboratories

Urban Settings
Liability
Natural Resources Labs

THE
AGRICULTURAL EDUCATION
MAGAZINE

April, 1994 Volume 66 Number 10

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ARTICLE SUBMISSION

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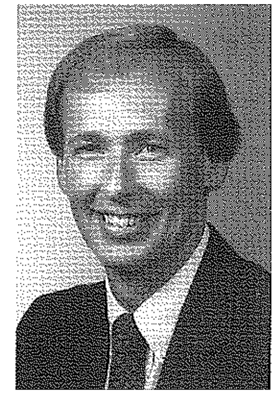
Stretching the Educational Value of Your Land Laboratory



BY ED OSBORNE

Dr. Osborne is associate professor and program chair of agricultural education at the University of Illinois, Urbana-Champaign.

The need for land laboratories to support instruction in middle school, secondary, and postsecondary agriculture programs is probably as great now as when school farms were commonplace in the early years of agricultural education. Originally, school farms were deemed an essential setting for teaching students the best practices for livestock and crop production, hoping they would then transfer these practices to their home farms. Of course, in those years all students had a ready opportunity to apply their learning at home. What was taught was narrow in scope by today's curriculum standards.

The ever-expanding agriculture curriculum of today, coupled with the lack of opportunity for application at home by a large majority of students, means simply that more and more opportunities for application and transfer must be provided at schools and colleges. This also means that the scope of these school-based experiences must be as broad as possible. To teach agriculture well, we must move beyond "talking about" agricultural topics in the classroom and making students generally familiar with the topics we teach. Learning in agriculture is not really complete until students have had the opportunity to practice, apply, and transfer their learning. Short of actual application at home, experiences provided by a well-conceived and managed land laboratory are the next best thing.

As you will see when you read the articles in this issue, the term "land laboratory" means different things to different people. Some define the land laboratory to include any laboratory, indoors or outdoors, that is located outside (detached from) the main school building. This definition would include greenhouses. Specifics aside, we can think of land labs as generally including any outdoor laboratory area that can be used to support the instructional program. But terminology is important as it impacts program image. "Land laboratory" is a more contemporary, encompassing term than "school farm," and it suggests a different set of experiences. Similarly, I cringe every time I hear teachers refer to "the shop." The "agricultural mechanics lab," which is what it really is, is a much more palatable and positive term to describe this essential lab area.

Experience is *personal participation* in an event. Experience goes beyond observation. Experiential learning (learning based upon experience) is finally getting its due, at least in today's educational rhetoric. Experiential learning has been a mainstay component of agricultural eduction since the early years. Yet, experiential learning is more than learning by doing — the motto of agricultural education. "Doing" itself is not sufficient; our students must be doing the right things. This means more than maintenance and low skilled labor. It means involving students in the entire scope of management and production activities for a given enterprise. And equally important, experiential learning must involve a combination of direct experience and guided reflection on that experience. Only when both of these elements are present does effective learning take place.

Genuine experience offers many advantages to our learners. When we provide students with high quality agricultural experience they will:

a. know how to respond to similar situations in the future (transfer);

b. better understand the problems and complexity of solutions in agriculture;

c. develop more self-confidence and less performance anxiety;

d. connect science principles with their applications in agriculture (but only if we explicitly teach this connection);

e. develop the kinesthetic sense necessary for effective psychomotor skill performance;

f. increase problem solving, communication, and interpersonal skills;

g. retain acquired knowledge and skill longer; and

h. develop greater interest in learning.

Finally, we must design and develop our land laboratories so that they offer the greatest possible diversity of agricultural experiences to students. A 40-acre land laboratory devoted entirely to a corn-soybean rotation provides only a fraction of the potential learning of this invaluable land resource. Diversity is the key to effective and efficient utilization of any land laboratory. Of course, enterprises contained on the land lab must complement problem areas taught in the instructional program. Consider the possibilities for dedicating areas of the land lab: small fruits, vegetables, grapes, fruit orchards, ornamentals, turf, trial gardens,

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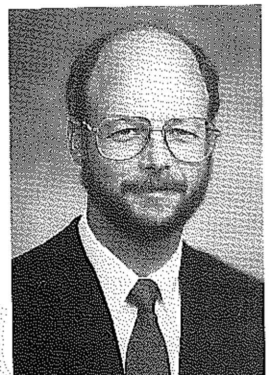
With A Little Imagination . . .



BY DAVID WHALEY

Dr. Whaley is agricultural education program chair at Colorado State University, Fort Collins, 80523.

Nothing happens unless first a dream
— *Carl Sandburg*

Recent issues of *The Agricultural Education Magazine* have reflected on the transitional state of agricultural education. The changes brought about in serving the needs of a greater heterogeneous student population, coupled with declining resources, increased academic workloads, and heightened demands for accountability have affected the people and programs of agricultural education. Further, the rapidly advancing technologies of the agricultural industry, in concert with the industry's urgent need for a competent and forward-looking work force, have presented educators with a mandate to examine and retool practices used to deliver existing programs.

Agricultural educators have long recognized that education is best delivered through a balanced instructional program incorporating the theory of agricultural principles learned in the classroom and the application of this theory with practice in laboratory settings. An important theorem of Dr. Charles Prosser (1949) states, "The environment in which the learner is trained should be as nearly as possible a replica of the environment in which 'he' must subsequently work." Yet, in these challenging times, educators are often faced with the difficult realities of finding opportunities for students to apply classroom learning in "real world" settings. Land laboratories, when effectively implemented, offer teachers and students the opportunity to enhance agricultural instruction. If one subscribes to the belief that all agriculture students deserve access to an appropriate education in agriculture, then the concept of the land laboratory should be employed in the instructional program.

Originally, the Smith Hughes Act (1917) helped to formalize agricultural training for boys who intended to return to their family farms. In that era of production-based training, educational land laboratories were most often designed to reflect the settings and practices needed to produce livestock and crops. Yet, the diversity of today's modern agricultural industry and personnel has helped to evolve a broadly accepted paradigm for land laboratories. The bio-dome at Delta High School in Delta, Colorado (see cover), is used by faculty and students to rear rainbow trout and grow hydroponic tomatoes, lettuce, and bedding plants. At John Wood Community College in Perry, Illinois, college students are assigned small research plots to study the effects of herbicides on corn and soybeans. At the Center for Agricultural Science and Environmental Education in southwest Washington, secondary students raise and release ring-necked pheasants and conduct bee-related research. In California, North Hollywood High School students design and install landscapes at the Los Angeles Zoo.

The success of any land laboratory experience is founded in the often repeated phrase "learning by doing." Through the application and practice of the agricultural principle or theory, learners are more thoroughly and competently empowered. Students are often brought to that "teachable moment" in a more direct and focused fashion. Carefully orchestrated instruction in land laboratory settings also enhances students' problem solving skills, abilities to cooperate and collaborate on group projects, and techniques to critically think through the decision process.

The authors in this issue have addressed a variety of pertinent issues concerning land laboratories. The use of land laboratories in urban settings, with students of diverse backgrounds and cultures, and in a litigious society are a few samples of the topics evolved through these articles. Throughout this theme issue there are basic convictions raised by the authors as they pertain to effective use of land laboratories:

1. Activities which involve the land laboratory must not occur serendipitously; they must be planned and they must be integral to the total curriculum. Long term and short term goals must be identified and implemented for the land laboratory. Teachers, administrators, advisory committee members, and other appropriate groups should be brought together to assess resources, decide capabilities and strategies, and implement relevant directions for the land laboratory. Despite the orientation of the instructional program, there must clearly be a complementary relationship between the pedagogical activities in the classroom and those that take place on the land laboratory. Instructional objectives should address outcomes that occur in all instructional settings, and these instructional objectives must be measurable.

2. The successful land laboratory experience envelopes the total educational community. Elementary, junior high school, postsecondary

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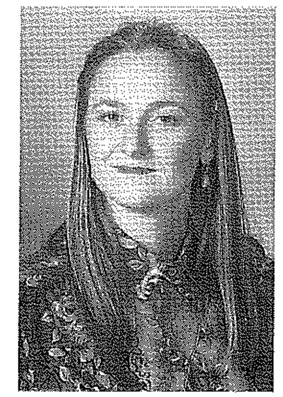
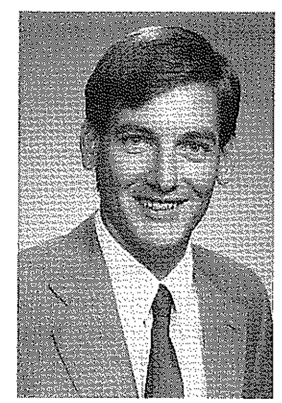
From Fallow to Fertile: Regenerating Inner City Resources





BY KIMBERLY SMITH-WONG & MATT BAKER

Ms. Smith-Wong is an agriculture student teacher at Chino H.S., Chino, CA. Dr. Baker is graduate coordinator in agricultural education at California Polytechnic State University, Pomona.

Student use of natural resources surrounding a school site can be a reflection of curricular activity within the classroom. Often teachers doing a good job (both in *how* they teach and *what* they teach) in the classroom also do a good job in utilizing land laboratories and natural resources surrounding the school site. The purpose of this article is to describe how land laboratory use is becoming increasingly popular in the Los Angeles Unified School District (LAUSD), the second largest district in the United States with a student population of over 641,000 students. LAUSD extends over 469 square miles. We believe that LAUSD is a good case study of how urban land laboratories are being used in secondary, junior high, and elementary programs.

Prior to discussing how land laboratories are being used in Southern California, it is necessary to briefly discuss educational policy issues influencing educational decision making. Historically, California, and particularly Southern California, rides on the crest of the wave of change in national education. Since the 1950s our society has been in transit to an "instant" lifestyle. We have focused on ends and not the means to the end. As a result, we are seeing a decline in perceived value of many essential skills and services. Worse yet, social stigmas have attached to these vocations. Educational policy in the late 1960s reinforced this trend by shifting away from tracking and vocational training to providing "equal education for all" (Noddings, 1992). At this time as the need for services increases, we are seeing evidence of consumers dissatisfied and distrustful of blue collar service providers. Yet, our way of life produces an ever-increasing demand for honorable, competent, skilled labor and service providers. And it should prepare and then reward them.

According to *Second to None: A Vision of the New California High School*, the new trend in education is to reinstate "curricular paths," in which students are provided more career orientation and planning in the secondary schools (California High School Task Force, 1992). Incentives are being established for the school and business community to work hand-in-hand to enrich student opportunity to explore different careers and benefit from concrete experience and guidance. Agricultural literacy (at all grade levels) and secondary agriculture programs are particularly well-suited for this, as we will show.

Though agriculture programs tend to be viewed as "traditional," such programs have actually been running models of the 1992 task force report recommendations for some time. These programs include supervised agricultural experience (SAE), record books (portfolio), classroom instruction (academic preparation), and individual career plans (student plan). Through the FFA, agricultural education has gone one step further, providing a system of rewards, recognition, and social activities that reinforce student achievement. Agricultural education has adapted with the times, coming up with unique urban programs to meet realistic needs and constraints of today's urban communities and student population.

According to Art Hanson, former agricultural education supervisor in the district, 20 years ago LAUSD had approximately 70 vocational agriculture programs. As a result of changes in educational policy and a multitude of other factors, the number of vocationally-oriented programs in the district has decreased dramatically. These other factors include: (1) continuing urbanization of the area, (2) a shift in local industry away from agriculture to technology-based business, and (3) limited school budgets. Today, there are only 11 such programs which qualify for state vocational funding.

Although the number of vocational programs has decreased, there is an increased interest on the part of secondary teachers in disciplines other than agriculture for providing their students with agricultural experiences. For example, in the heart of inner-city Los Angeles at Crenshaw High School, Tammy Bird, a biology instructor, wanted to provide her students with something to do after the social unrest in the spring of 1992. She wanted to give students an opportunity to be productive, to give back to the community, to give students a sense of self-worth, and to keep them busy and off the streets. She began a gardening project on an abandoned piece of land behind her chicken coop at school. She started with six students working in the garden on Saturdays and Wednesdays after school. With help from community volunteers, the group cleared and hauled away truck loads of weeds and debris and began to organically raise cabbage, collards, lettuce, broccoli, herbs, basil, thyme, and oregano. They sold their produce at local →

"Food from the Hood": Students and interested school and community leaders from Crenshaw High School unveil the logo for their budding organic gardening business. (Photo submitted by Rachel Mabie, University of California Cooperative Extension, Los Angeles).

farmers markets in and around Los Angeles. Under a student mandate, they gave 25% of the produce to the homeless. By the end of one year the group had earned $1500. The money was used to help send three of the student participants to college. Since October 1992, the gardening project has developed into a student-owned non-profit business that produces organic herbs and vegetables and is now preparing to market its own salad dressing on a statewide scale. Profits from the venture are destined to be used as scholarship money for 15 student participants each year, and they have created a logo and adopted the name "Food from the Hood" (see figure). Their efforts have attracted some very positive attention. In October 1993, the Los Angeles City Council awarded the group a $49,500 grant.

There are a number of other high schools in the LAUSD that are operating gardening projects on abandoned agricultural program land without the benefit of vocational funding. They are forced to rely on creative fund-raising activities and donations for their start-up expenses. For the most part, their garden projects are self-sufficient, thanks to sales of their produce at local farmers markets and on-campus sales.

There are a number of agriculture teachers in the district who are making use of land laboratories in a variety of exciting ways. Although most existing programs primarily emphasize horticulture, there is an effort to establish a magnet agricultural campus in Canoga Park. Steve Pietrolungo, the teacher at Canoga Park High School, has proposed that the magnet school focus upon agricultural and environmental education. Like the magnet school in Chicago, teachers in all disciplines would be encouraged to incorporate agricultural and environmental education into their curricula. The Canoga Park proposal would include two separate curricular emphasis options. One option in Agricultural Sciences would include instruction in the animal sciences, pre-veterinary medicine, and agricultural business management. The environmental science option would focus on the science of regenerative studies, as well as instruction in horticultural sciences. FFA and SAE would be stressed in the proposed program.

At North Hollywood High School, Bobbi Roderick is currently teaching students enrolled in the Zoo Magnet School, located on the grounds of the Los Angeles Zoo. Landscaping principles are taught using the zoo grounds as a learning laboratory. Her students have designed and installed landscapes in a number of animal exhibit areas, including the Shifaka and Orangutan areas. In addition, her students have established and organized a plant nursery for the zoo.

Lionel Slade, a vocational horticulture instructor, and his students at Locke High School in Watts are involved in a number of plant and landscape projects. Most recently, his students studied the effects of a number of planting mediums upon the hardening-off process of stage two and stage three bio-tissue *Ficus Saber* explants.

Although there are numerous programs operating in the district which support agricultural literacy, including the California Agriculture in the Classroom program, a discussion of only two of the programs will be included in this article. Elementary teachers are increasingly interested in life-cycle projects. Rachel Mabie, of the University of California's Cooperative Extension Service in Los Angeles, devotes most of her time to enhancing the gardening skills of elementary school teachers. The Gardening Angel program which she coordinates trains volunteers who work with elementary teachers in 35 schools, with 30 more schools on the waiting list. The focus of the program is to reinforce skills in math, science, and other disciplines. Ms. Mabie teaches her volunteers to utilize existing facilities. If land is unavailable, they will use anything they can get their hands on (from coffee cans to old tires) to teach students about gardening. The schools are →

A student at Canoga Park High School makes use of a wading pool to raise aquatic plants and fish. (Photo submitted by Steve Pietrolungo).

required to provide the funding for the gardening programs. Often this means that students and parents will sponsor bake sales or aluminum can drives to support the gardening project.

Another agricultural literacy program that is gaining popularity is sponsored by the 48th District Agricultural Association, coordinated by Carol Spoelstra-Pepper. The 48th District is funded by the California Department of Food and Agriculture. This program specializes in working with teachers in kindergarten through eighth grade. They offer 30 plant-related projects from which teachers can choose. Elementary schools, such as Belvedere and Hyde Park in Los Angeles, have used the projects to increase student agricultural literacy. A unique program component requires that schools assisted by the 48th District participate in an annual fair to display students' work in a regional shopping mall. About $18,000 was paid to student participants in the agricultural literacy fair last year.

Although agriculture is being used in urban settings as a valuable educational tool, it is not being used to its full potential, nor is it being given the priority that it deserves. The National Research Council study in 1988 strongly encouraged agricultural literacy in all grade levels. In urban areas, it is important that we adjust our curricula to meet the goals of agricultural literacy, as well as to provide vocational exploration, planning, and training where appropriate. As agricultural educators working in urban settings, we must enable our students with a basic understanding of the food and fiber system, including production, processing, and distribution of agricultural products. We have a responsibility to provide our students with the opportunity to develop an understanding of the historical, economic, and environmental impact of agriculture as well.

In order to accomplish these goals we propose eight points that could form a plan of action:

1. It is necessary for the stakeholders to develop both long and short term plans for the systematic implementation of agricultural literacy and education in agriculture. It is unreasonable to expect state and federal vocational funds to support all programs. Although the elementary programs mentioned in this article are funded by sources other than vocational funds, secondary programs such as the one at Crenshaw High School tend to be the forgotten programs.

2. Schools that have abandoned land laboratories and facilities must now reclaim and begin to utilize their land for experiential purposes. Land is a scarce resource in urban areas, and the land that exists is quickly being filled with portable classrooms to accommodate growing student populations.

3. Teachers and students must involve the community in the development of their agriculture programs to build a strong support base. If the community is involved, they will have a vested interest in seeing that their local agriculture program gets off to a good start.

4. The business community should be included in establishing creative SAEs. Due to the unorthodox environments and communities that we are discussing, we need to enlist the help of business leaders, local political leaders, and the local agricultural community to develop a curriculum that is relevant to the student population, in terms of career and postsecondary educational opportunities.

5. Secondary agriculture teacher involvement in land laboratory development for elementary and junior high schools should be used to enhance recruitment into secondary programs.

6. Magnet elementary school labs should be established in conjunction with high school land labs.

7. A system should be designed and implemented for utilizing itinerant agricultural educators. While it may be difficult to establish independent programs at each of the LAUSD high schools, it may be more feasible to assign an agricultural educator to work with teachers from various disciplines at two or three schools in order to produce a relevant program for each site.

8. A district-wide magnet agriculture high school should be established in order to meet the needs of students interested in pursuing agricultural careers.

It is absolutely essential that we as educators ensure that today's youth, particularly those in urban areas, are given access to an understanding of agriculture. Agriculture teaches environmental awareness, improves science education, and encourages critical thinking skills. It provides opportunities to teach business, marketing, and economic principles and fosters entrepreneurship and cooperation. One student at

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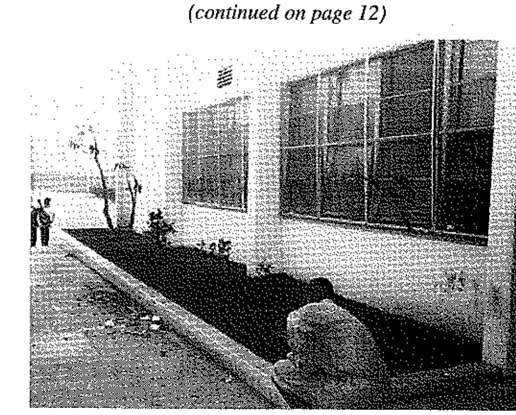
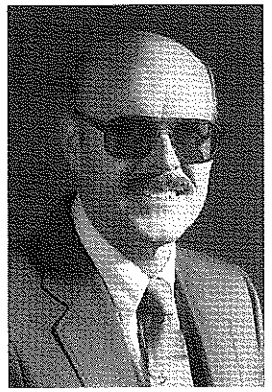


Students at Locke High School in South Central Los Angeles apply math skills measuring the area for a landscape at their school site. (Photo submitted by Lionel Slade)

THEME ARTICLE

Operating A School Enterprise In Agriculture



BY MARTIN B. MCMILLION

Dr. McMillion is associate professor of agricultural and extension education at Virginia Tech, Blacksburg.

Did the school administration doze out your Christmas tree plantation for tennis courts three years before the trees were ready for sale? Are the local business people unhappy because your fundraiser is cutting into their sales? Did the thieves steal the vegetables and the vandals use your land lab signs for target practice?

Certain policy questions must be answered in advance concerning school enterprises or even outdoor labs to maintain a successful educational or business enterprise in agriculture. Some policy questions concerning the operation of school enterprises and labs focus on:

1. providing capital finance;
2. providing labor requirements while keeping a balance between work and learning;
3. providing management and involving advisory groups in doing so;
4. making the operation compatible with the community and the curriculum;
5. staffing the school enterprise without neglecting other forms of SAE;
6. marketing products or services for best public relations; and
7. protecting school labs and enterprises from vandals and thieves.

Capital Financing

It is easier to get schools to provide indoor laboratories and greenhouses than land for farms, forests, or other outdoor labs or enterprises. Schools typically obtain land meant for school expansion which agriculture departments may use in the meantime. Teachers have learned the hard way not to put anything very permanent where other development is likely to take place. This problem can be prevented by the title (ownership) of the land being held by the FFA Alumni or the Young Farmers Association. Finances for land, buildings, and machinery may come from tax money, gifts, or from earnings by school enterprises in agriculture.

Providing Labor

A certain amount of hands-on experience is needed for each student, but excessive labor requirements should not detract from the learning objectives, especially during designated class time. Some students can be paid to work beyond the normal amount that each student is required to work. More mechanization and use of outside contractors reduces the amount of labor needed from students and teachers. Larger operations will require a hired manager. Weekend chores can be performed by a hired student. Sometimes school custodians have their duties broadened enough to be responsible for certain land lab activities.

Providing Management

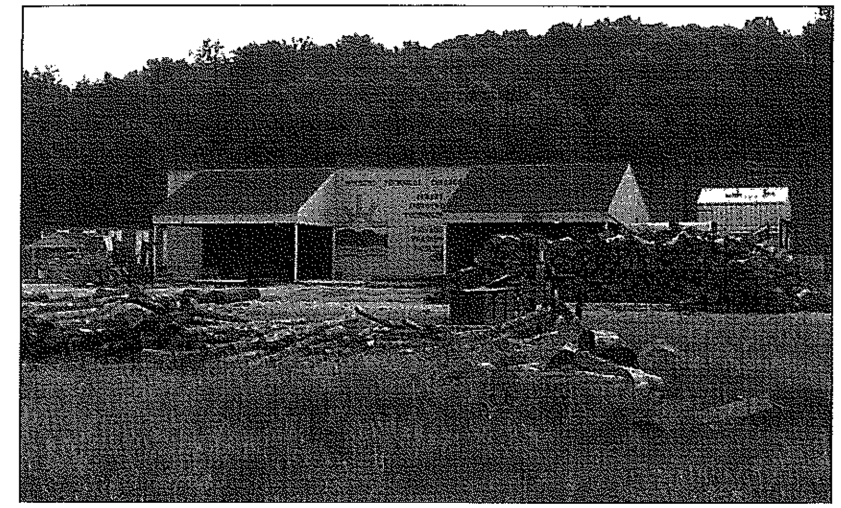
Smaller enterprises can be managed by the students with the help of the teacher. Larger enterprises require management assistance by a management team, which could include advisory council members, school board members, and such people as the county forester, soil conservation agent, and extension agent, depending on the nature of the enterprise. The teacher must be a key part of the management and policy group. If there is a separate manager for a farm or enterprise, the teacher needs to stay involved enough to coordinate the curriculum with the experience program.

Community and Curriculum Compatibility

School labs or enterprises are provided to teach the competencies needed and provide opportunities for supervised agricultural experiences. Generally the school land lab and the curriculum will have the same kind of agriculture as the immediate community. Consideration must be given to agricultural jobs that students migrate to outside the community. Also, the school farm will take the lead in introducing new but appropriate enterprises and practices.

Using School Facilities Without Neglecting Other SAE

There is a limit to how much a teacher can do. School facilities and enterprises are demanding, and if not managed well, can ruin the reputation of the teacher and the program. →



School sawmill at Hocking Tech, Nelsonville, Ohio.

Knowing this, the teacher often neglects other forms of SAE and sometimes, other parts of the curriculum.

A one-teacher department will have to keep the school enterprises small if home enterprises and cooperative education are not to suffer. All forms of SAE are useful, and the right mix must be used to give the total group of students the best preparation. Heavy reliance on school facilities when more realistic work settings are available to a high percent of the students is not desirable.

Marketing For Best Public Relations

Community support will decrease for the agriculture program if the school appears to be in substantial competition with the people in the community who earn a living providing the same product or service. The percent of the market share taken by the school must be low. If the school, for example, starts producing 80 percent of the flowers needed in a community having other flower shops, there will be repercussions. If the school produces and sells 15 steers in an area where thousands of steers are marketed, the percent is too small to be of concern. Suggestions for marketing for best public relations follow:

1. Take only a small share of the market.
2. Market within the school to students and staff.
3. Sell wholesale.
4. Sell beyond the community.
5. Don't take advantage of cheap or free labor and tax supported facilities to undersell others.

Protecting From Vandals And Thieves

Having somebody live where they can keep an eye on the facilities seems to be the best protection. A mobile home or other residence on school property makes this easier. Fences and gates are useful to keep thieves and vandals out. At least fences and gates keep out vehicles which are accessories to large scale theft. Electronic devices, such as alarms and automated lighting, are helpful. Watchmen and watchdogs can be used. Regular police patrol of the area can often be arranged. Placing identifying numbers on items helps with recovery and may deter theft. Strong community support and respect for the enterprise or facility can reduce vandalism. One teacher said, "every student is an unofficial deputy."

Horticultural complex, Metro Tech, Phoenix, Arizona.

Summary

Given the lack of opportunity at home for supervised agricultural experience programs and the limited number of training situations that can be found in businesses, it is more important than ever that schools provide facilities (labs and enterprises) for practical, hands-on experiences in as realistic a situation as possible. Attention to the policy questions and suggested answers in this article will hopefully increase the possibility of schools providing opportunities over a long period of time with the least amount of problems for the teacher and others. ■

Stretching the Educational...

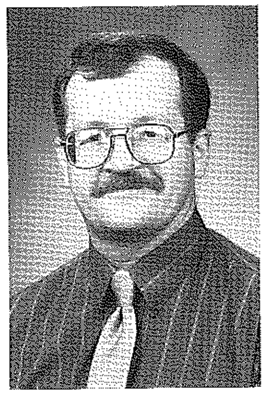
(continued from page 3)

variety demonstrations, arboretums, nature trails, ponds and streams, Christmas trees, forestry plots, field crops, native grasses, small animals, livestock, nursery stock, lathe house, and many others. But simply growing and raising plants and animals on the land lab is not enough. And certainly, allowing profit to be the driving force behind the land lab is inappropriate. A learning lab is an experimental lab. Equal, if not greater, emphasis should be placed on learning through experience *and experimentation.*

Rarely are land laboratory resources unavailable to a school. The resource may yet be untapped, but it is usually available. Land laboratories offer tremendous potential for effective learning in agricultural science, production, and management. Involving students in the full scale of activities associated with land lab enterprises can provide unmatched learning opportunities. Use your creativity, initiative, and knowledge about teaching and learning to stretch the educational value of your land laboratory. ■

THEME ARTICLE

Using A Non-Traditional Greenhouse To Enhance Lab Instruction



BY JERRY D. ALLEN

Mr. Allen is an agriculture teacher at Delta H.S., Delta, CO.

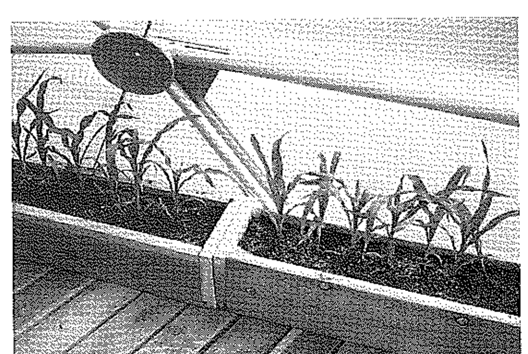
Four years ago, I participated in a tour of a 50 foot geodesic dome at Old Snow Mass Village near Aspen, Colorado — about 120 miles from where I teach agriculture at Delta, Colorado. This dome is an experimental project conducted by the Wind Star Foundation in which alternative sources of food production and self-sufficiency are studied. Little did I realize then that shortly thereafter I would be given the responsibility of setting up a course of instruction using a similar scaled down version of this geodesic "bio-dome." In January 1990, our high school's bio-dome was completed, and I was asked by my principal, Alvin Williams, to coordinate activities for all classes, including my Applied Plant Science, Applied Animal Science, and my beginning Agricultural Science classes.

During the last three years of teaching with this laboratory addition, I must conclude that this addition has been of great value to my program. Not only have the SAEP opportunities for non-traditional agriculture students been greatly increased, but the hands-on laboratory experience for all students has been strengthened as well. In this article I will simply describe some of the ways that a high-tech greenhouse can add to an agriculture program and share some insight and experience to increase fellow teachers' chances of effectively changing lab instruction methods to increase success.

The use of our bio-dome falls into three basic areas: SAEP enhancement, hands-on skill development in new agriscience areas of instruction, and applied problem solving dealing with plants and fish.

Five to ten students each year have been selected from applications to learn applied agricultural skills related to bedding plant production, aquaculture, hydroponic tomato and lettuce production, and applied marketing of these crops.

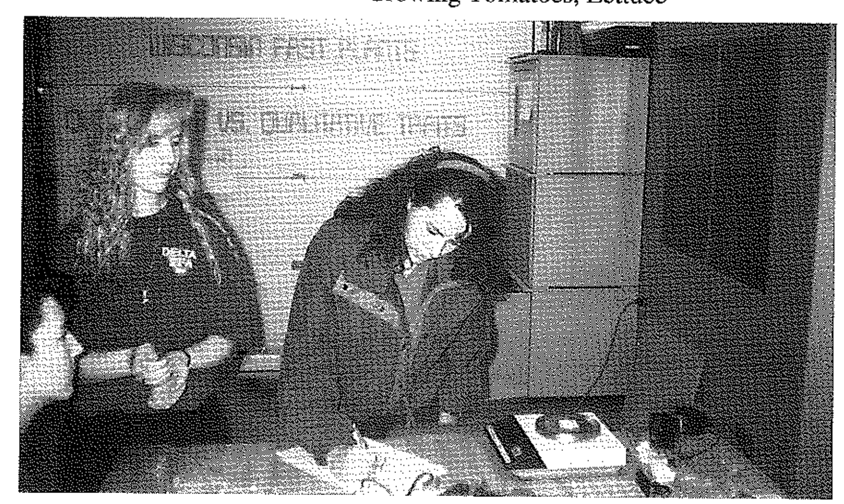
Our aquaculture capability consists of four 750 gallon recirculating tanks with RBCs rotating within each tank. An average of three students per year has managed and operated these tanks as part of their SAEP. Students are selected based on their interest and occupational objectives related to fish and wildlife. These students sign an agreement with the school with provisions for proper care and management of the fish grown in each tank. The student buys or obtains the fish (often they are donated) cleans the tanks daily, and is responsible for keeping daily records, such as feed intake, ammonia level, water temperature, and pH level. Students must submit a budget and a marketing plan for the fish crop. Students must also agree to allowing their fish to be used for class instruction and experiments relating to aquaculture production in Applied Animal Science and Applied Agricultural Science classes, as well as the biotechnology module in the Principles of Technology classes at Delta High School. The first year's students learned mostly by solving problems, and there were plenty of them. Several tanks of fish were lost due to diseases and parasites and water deterioration from floating feed breaking down before being eaten by the fish. Catfish and rainbow trout were tried, with the former being unable to adapt to a recirculating water supply and cold water temperatures. They succumbed to Ich, Columnerus, and leaking hydroponic solution. The latter, the rainbow trout, thrived after solving the feed and hydroponic problems with the help of a retired trout hatchery owner, plus the addition of a fiberglass roof under our upper story deck that kept water and soil media from contaminating the water in the tanks. This first years' crop was sold to the FFA for the main entree at our FFA Parent/Member Banquet. Last year's crop was sold to a local rancher for stocking ponds. The tanks are raising Brown Trout, Rainbow Trout and Prawns this school year, both through SAEPs of students and through an organized cooperative in my Applied Animal Science Class. The skills learned by all of these students through this type of lab SAE program are tracked in individual student folders, making students immediately employable in several aquaculture occupations. →



Crossing inbred lines of sweet corn teaches students the principles and procedures for developing a hybrid.

A second major benefit of a combined aquaculture, hydroponics, and traditional greenhouse is that of skill development of agricultural science class members through applied lab techniques. The following is a list of skills/competencies that our students have gained through using this lab format:

- Water Testing
- Plant Tissue Testing
- Hydroponic Solution Calibration
- Planting and Fertilizing
- Transplanting
- ID of Nutrient Deficiencies
- Watering by Plant Demands
- ID of Fish Parasites/Diseases
- Harvesting Vegetables
- Using Fish Waste as Fertilizer
- Propagating House Plants
- ID of Flowers and House Plants
- Raising Bedding Plants
- Growing Tomatoes, Lettuce



Applied Plant Science students weigh and record weight of pinto beans in an experiment involving phosphorus deficiency.

I believe that the best learning opportunities have been those that have been necessary to successfully bring the bio-dome into production — that of daily and weekly problem solving. These occur almost daily as they do on farms, hatcheries, and in greenhouses throughout the country. How students respond to these challenges gives them unique opportunities that really bring out the vocational slant of our program.

The first set of problems involved designing and building a facility that would most efficiently use the limited space that is inherent in the bio-dome concept. Students were divided into work groups that sketched their ideal floorplans to best use this space. Each group then reported their ideas within the three agricultural science classes. Science teachers at our high school were also asked to submit their best

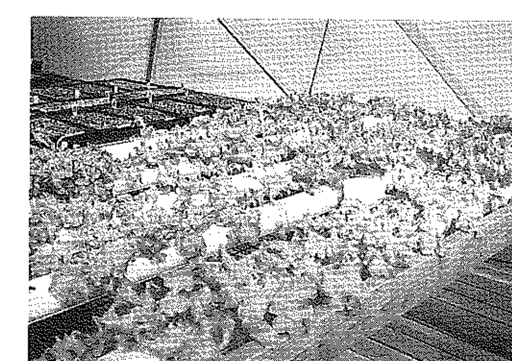
All of these Plant Science students live in the city with plant SAE programs in the bio-dome. These experiences enhance the opportunities of non-traditional ag students.

ideas. The best ideas were combined that would provide the seasonal and space requirements for aquaculture tanks and use of the lab for traditional and hydroponic horticultural techniques by the entire school population, including the agriculture students.

Designs were drafted by students for a raised redwood deck, a low-cost bag culture hydroponic tomato system, an NFT hydroponic lettuce system, and traditional horticulture tables for propagation, grafting, and bedding plant production. All classes cooperated in building each of these components, using our BOAC committee format as the main organizing mechanism. In this way, students were able to plan and follow through a basic integrated plant/fish environment that would be the most flexible for future and present projects.

Even though this first year was extremely successful and productive, there remain problems to be solved on at least a weekly basis. Students have had to troubleshoot many problems, such as leaks from hydroponic trays, plugged nutrient siphon valves, whitefly infestations, Tobacco Mosaic Virus, high ammonia levels in fish tanks, and trout jumping out of their new pond environments. Often the solution is short-term or temporary, but it usually stimulates creativity (such as strawberry pints to keep fish from being siphoned on the cleaning tables) to permanently fix the problem.

One of the most obvious problem-solving opportunities this lab format provides is that of



Hydroponic lettuce tables are supplied nutrients from fish tanks directly below the deck in this bio-dome set-up.

planned individual and group plant and fish science projects. Students who are taught the eight step scientific problem-solving method can design experiments that solve problems they encounter on their home farms, fish ponds, or specific problems from members of the community. An example of each of these is:

- The Effect of Various Levels of Salinity in Irrigation Water on the Development of Durum Wheat;
- How Nutrient Density of Various Ponds and Lakes Affects the Growth Rate of Bluegill; and
- The Effect of Potassium on Ear Tip Development of Olathe Sweetcorn.

Each of these labs adds to the students' body of knowledge about real-life situations. Labs also stimulate students' interest and motivation about agriculture, especially concerning traditionally boring research labs done in 20 minutes in their chemistry or biology classes. Students see direct application of their research.

All in all, this laboratory has provided an abundance of learning opportunities for all students in the high school, but especially for students interested in areas of agriculture other than cows, sows, and plows. Keep three items in mind to use this type of lab format: 1) trust your students to create, make mistakes, then fix them; 2) use community resources for demonstrations, consultants, and advice; and 3) copy or steal the best ideas from the best resource — another agriculture instructor. ■

With A Little Imagination . . .

(continued from page 4)

students, and adult learners can effectively participate in land laboratory opportunities. Further, land laboratories provide settings for closer collaboration and integration of academic and vocational education programs. At the Woodlin School in Woodrow, Colorado, biology students participate with agriculture students in conducting plant tissue culture experiments in the agriculture program's greenhouse.

3. Successful land laboratories build bridges between the school and the community. In many communities, ownership and pride for the educational land laboratory are evident. There are numerous cases of community groups cooperating with the agriculture faculty and students by providing equipment and supplies, technical expertise, and marketing avenues for agricultural products. The emphasis on a careful public relations effort that visibly promotes land laboratory activities in a non-competitive fashion to the local educational and business communities is essential.

4. The agricultural educator, while maximizing the use of the land laboratory, must be cognizant of the greater liability risk faced when learners are practicing and applying content in a laboratory setting. Safety instruction is imperative, and participants must fully understand what is expected of them before, during, and after the laboratory experience.

The concept of the land laboratory is not new to agricultural education. From the earliest, production-emphasized programs in the 1920s to today's myriad of diverse program offerings, land laboratories have been recognized as prodigious components within the framework of the successful program. Successful programs produce successful students. The extent and variety of activities involving land laboratories are only limited by the imagination of the individuals involved.

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From Fallow to Fertile . . .

(continued from page 7)

Crenshaw High School was quoted by the *Los Angeles Times* as saying, "I thought it was 'dumb' at first . . . (but after a month) . . . I changed my mind." The student continued, "I get to see the whole process of growing, from beginning to end . . . I used to go into supermarkets and not think about where food came from, but my outlook's changed. Plus it's great to have all my brothers and sisters — and not just black, but everybody — working together for one goal" (Aubry, 1992).

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Risk Management for Liability in Operating Land Laboratories

BY ARTHUR L. BERKEY

Dr. Berkey is professor and coordinator of agricultural education at Cornell University, Ithaca, NY.

Teacher risk for liability in operation of land laboratories is not only significant, but increasing. Agriculture now surpasses construction as the most dangerous occupation, and many land laboratory experiences include activities with potential safety hazards. At the same time, fewer students enrolling in agriculture programs have background experience in operating machinery and equipment or working with plants and animals, which increases the need for laboratory instruction. This reflects the decreasing number of families operating agricultural businesses and strict labor laws regarding employment of minors by non-family agricultural employers. Additionally, the trend toward flexible agricultural curricula that offer students the opportunity to enroll in single, semester-long courses results in a wide range of student experience in a given class. Moreover, mainstreaming of students with disabilities — especially those who are mentally disabled, requires difficult teacher judgements between maximizing participation and possible injury to the disabled student and other students. All these factors contribute toward increased risk of teacher liability in the operation of land laboratories.

The basic principle for liability is that persons negligent, either by acts of commission or omission, may be held liable. Where more than one person or organization is negligent, compensatory and/or punitive damages awarded are allocated based on the judgement of the judge or jury as to the perceived degree of negligence and ability to pay. This means that whenever and wherever a teacher is alleged negligent, they may be sued for liability.

Gross negligence includes clear violations of school policy or applicable state and federal regulations. School insurance policies vary as to the protection provided teachers demonstrating gross negligence. Such negligence may also result in dismissal from the job.

In other cases, how a prudent person could or should "reasonably" be expected to act is determined by past practice, legal precedent, and the judgement of the judge or jury hearing the case. Further, our society has become more litigious, due in part to some members of the legal profession specializing in taking liability cases for a percentage of the award (without fees unless the case is won). The reality is that there is no guaranteed protection against being sued for liability.

Lack of a guarantee against liability suits leaves the alternative of risk management to reduce both the frequency and probable success of such legal action. Suggestions for effectively managing your risk are the focus of the remainder of this article.

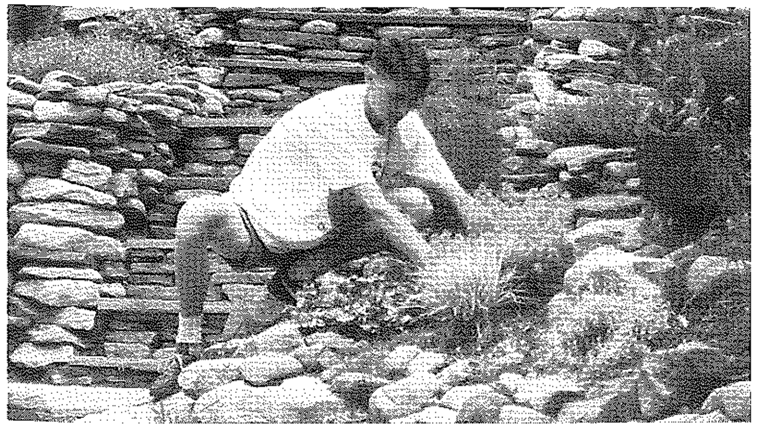
Be Informed On School Policy and State and Federal Laws

Ignorance of the law is not an acceptable defense. Teachers need to know and follow school policy and the state and federal regulations applicable to their agriculture program. Many states have adopted the standards of the Occupational Health and Safety Act (OHSA). State Department of Transportation (DOT) regulations for transporting students typically involve initial and periodic training of drivers, as well as vehicle inspections. Also, requirements for access by disabled students is specified in the American Disabilities Act (ADA). You should be knowledgeable about the provisions of your local school insurance policy. Requirements for management of hazardous substances, such as pesticides, are another important area of information.

Knowledge about students is also necessary, especially those with physical or mental disabilities that may affect ability to perform land laboratory tasks without injury to themselves or other students. Such information is available in school medical records or individual educational plans (IEPs) for disabled students.

School policies generally specify that only trained persons (e.g., the school nurse) may administer treatment unless the injury is life-threatening, such as severe bleeding. The treatment allowed by teachers may also depend upon whether the teacher has taken a certified safety course within a specified period of time. Dispensing any drugs, even over-the-counter painkillers such as aspirin, is generally forbidden. Know and follow school policy irrespective of your personal philosophy as an essential part of managing your liability risk.

[1] This article is intended for application to land laboratories broadly defined to include areas used for crops, woodlots, Christmas tree plantations, maple tree groves used for harvesting syrup, nature trails, parks and recreation areas, ponds, greenhouses, nurseries, and other purposes. →



The photograph shows an agriculture student at Tri-Valley Central School, Grahamsville, New York, planting ornamentals in a land laboratory. (Photograph taken by Beth Spencer, Tri-Valley agriculture teacher.)

Provide and Document Safety Instruction

Continuous direct supervision is difficult at best in land laboratory instruction, especially where a variety of different activities is taking place simultaneously. For example, a conservation class at an area vocational center might include several student groups 100 yards apart felling trees, students digging with a backhoe, and others leveling with a bulldozer. The class could not be held if constant teacher supervision were a requirement. The reality teachers face is that some risk of liability exists in most instruction involving land laboratories.

Reduce the risk of providing each student safety instruction to include a performance test prior to operation of any and all machinery or equipment. Documentation of such instruction should be included in lesson plans and by having students sign the test sheet, which should then be filed in their individual folder.

Maintain Tools, Machinery, and Equipment in Good Repair

Systematic maintenance is needed to insure that tools, machinery, and equipment in the land laboratory are in safe operating condition, as well as to reduce repair bills. Tools with loose handles, equipment with defective brakes and safety shields not in place, and students using chain saws without protective chaps are examples of negligence. Document maintenance by keeping logs and using daily pre-start-up safety check sheets completed by students.

Keeping safety equipment, such as safety glasses and gloves, readily available and in good repair is another area for management. Storage that both protects the equipment from damage and is convenient for student use not only minimizes maintenance costs but encourages student use and return.

Modifications to machinery and equipment to accommodate operation by physically disabled students should also be checked regularly, especially where such changes are temporary and require frequent adjustment.

Establish, Make Public, and Enforce Safety Rules

Establishing, publishing, and consistently enforcing safety rules for the agriculture program to include the land laboratory is an essential part of risk management for liability. A list of safety rules should be given to all students, and each should sign as having received and agreeing to follow the rules as a condition of being in the class. A copy of the receipt should be filed in the student's folder. Decals, color coding, and other signs as applicable are recommended.

In general, students will follow the teacher's example as to the importance of working safely. Lack of a consistent teacher example irrespective of the rules for the program may be cited as negligence.

Since no set of rules can cover every circumstance, safety consciousness should be the goal. The stages in safety development are overcautious, overconfident, and safety conscious. Students vary in their maturity and judgement to progress to the consciousness stage. Therefore, students should be allowed to perform tasks based on their stage of development.

Involvement of students is important in developing positive safety attitudes. Students can conduct inspections of the land laboratory and other work sites. Posting a class safety record maintained by students is another technique. Students may also work in pairs with one student serving as the safety monitor. A safety guide is required for the operation of some large equipment.

Repetition regarding safety rules and systematic visual inspection by the teacher may be necessary for immature and mentally disabled students. Teachers also have difficult decisions to make regarding the ability of some disabled students to safely participate in some land laboratory tasks, especially those involving operation of machinery and equipment that may pose hazards to the disabled student and/or other students. Manage risk by making conservative decisions to protect the well being of all students.

Manage Hazardous Substances

Management of hazardous substances, such as pesticides, is specified and restricted by law. Purchase, application, storage, and disposal are all regulated.

Pesticide certification is required for purchase and use. Although state laws may vary, it is advisable not to allow students to have access to or be involved in the use of regulated pesticides.

Obtain Personal Professional Liability Insurance

Personal professional liability insurance may be purchased for approximately $50 per year

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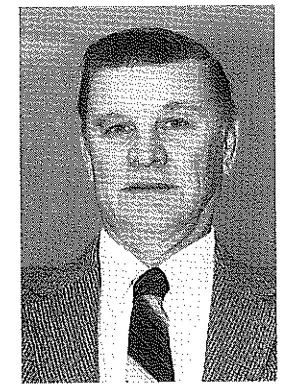
The Working Land and Water Laboratory for Natural Resources



By John Doumit & Joseph G. Cvancara

Mr. Doumit is an agriculture teacher at Wahkiakum H.S., Cathlamet, WA. Dr. Cvancara (shown) is professor of agricultural education at Washington State University, Pullman.

The area around Cathlamet and the service area of Wahkiakum High School is an area of high unemployment. There are severely diminished logging opportunities because of environmental concerns. There has been little opportunity for traditional agriculture, which has been complicated by severely reduced salmon runs on the Columbia River. Yet our agriculture program has received national recognition because of the creative use of a land laboratory and a series of cooperative links with community, school, and governmental organizations.

BOAC Gold and The John Doumit Story

This is a story about how an aggressive agricultural educator, an effective advisory committee, a strong school administration, a cooperative community, interested teachers, and parents effectively teamed together to develop a strong management program through the high school agriculture/natural resources program. This program will have lasting economical, educational, and environmental benefits to the district and community for years to come.

It all started with a diverse 80-acre school farm forest. This resource has had a tremendous impact on the entire school district's educational programs. The agriculture/natural resources FFA chapter was designated the major contractor of local logging operations. Professional loggers are hired as subcontractors. This arrangement provides hands-on training for students from knowledgeable professionals and funding to the chapter and school district. Students under the age of 18 who are working on a school sponsored project are then eligible for insurance through the school district.

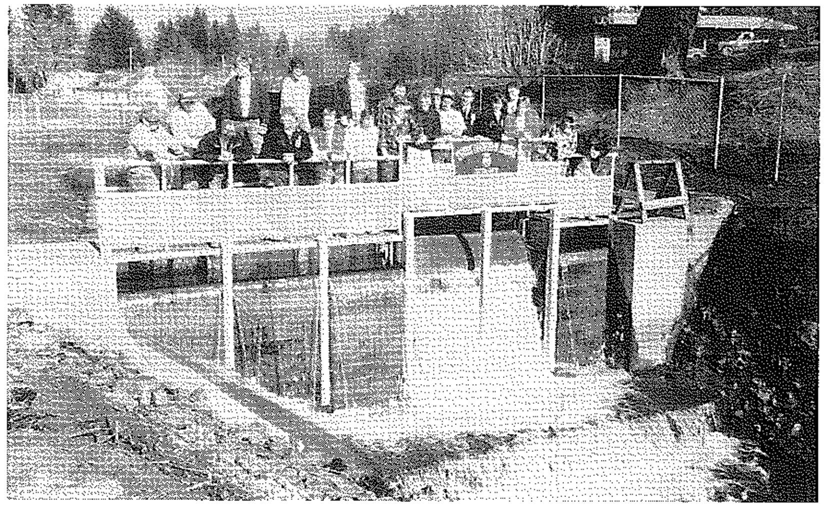
Opportunities for students are increased when working directly with local businesses. The FFA chapter is the major contractor on this logging job. The loggers are subcontractors. This helps with insurance and training for students under 18 years of age.

Proceeds from several logging projects have been used to purchase materials for construction of a 50' x 96' agriculture/natural resources building. The building, 90% constructed by students, has been an ongoing project over the past five years and is nearing completion. This fall a 48' x 60' activities center for the high school is being constructed, again primarily by students, with nearly half of the funding coming from forest operations. In addition to the obvious economic return the forest has provided, a wealth of science and recreational opportunities for all K-12 students in the district is realized. Environmental science, wildlife, water and soil studies, salmon enhancement, forest engineering, hiking, hunting, horseback riding, and wood cutting are just a few of many activities taking place on laboratory land.

The school forest is not the only natural resources laboratory used by the students. Other important resources have been developed in conjunction with community groups, such as the Department of Fisheries; city, county, state, and federal government agencies; local Granges; service clubs; and community businesses. In 1989, a 190-foot salmon rearing pond and dam was constructed on Birnie Creek, which runs through the town of Cathlamet. This also provides ongoing laboratory experiences for school students.

A total of 325,000 fall Chinook salmon were reared last year for release into the Columbia River. The economic impact of this project to the area economy could reach over a million dollars on an annual basis in years to come, according to data from the Washington State Department of Fisheries. Agriculture/natural resources students are also involved in spawning fish at the Elokomin Hatchery and subsequent rearing at the school's pond site. Feeding, water quality study, fish measurement, pathological tests, predator control, and tours for grade school children are activities associated with this resource. In addition, the rearing site is near the city sewer treatment ponds where net pens have been used to conduct science experiments with the salmon.

The development of a successful land laboratory is a complex, time-consuming activity. The agriculture/natural resources teacher is the key ingredient, and the responsibilities of the teacher can be separated into two major areas: (1) land laboratory development and (2) management of student development. →



Students and community members constructed this dam to create a 190' salmon rearing pond on Birnie Creek, which runs through our town. Planning and cooperation at school and in the community made this possible.

The teacher must be the initiating and driving force behind the ideas. Teachers must be enthusiastic about land laboratory opportunities and spread that enthusiasm to school personnel and citizens. The teacher's major responsibility is to make students realize that they are a vital part in the decision making process. Teachers must delegate responsibility to students for overall management of the land laboratory and oversee student action and decision-making processes and outcomes.

Conclusions

Many agricultural educators are in a unique position to take advantage of available resources in their local communities that may enhance their agriculture/natural resources programs. Sometimes these opportunities cannot be utilized because of lack of support by the school district or by the community in providing funding, class release time, or cooperation. More critical to most teachers is losing the support base of the community because they feel they cannot change the emphasis and image of their programs because of community pressure.

Those teachers who take advantage of available resources in local situations must take a proactive approach in meeting the opportunities and challenges that are available to them in the community. Such is the case at Cathlamet, Washington, a logging community situated in southwestern Washington state.

Environmental concerns are ever present in today's headlines. Science courses such as biology and ecology often focus on the cause and effect of environmental problems. Seldom does instruction in these areas provide reasonable and feasible solutions.

The Wahkiakum High School at Cathlamet has provided education that created an environment where students are deeply involved in feasible solutions to environmental problems based on the needs of the community, state, and region. The philosophy of the agriculture/natural resources program is to take advantage of opportunities to benefit students in the resource areas, whether provided in the school laboratory or in the community. Involvement in large-scale, important community projects creates far more opportunities and accelerates student learning. The responsibility and trust that are accepted by students have had an extremely positive impact on the whole community. The following statement from John Doumit sums it up very well. "We in agriculture are fortunate to teach a subject matter that can be adapted to community situations but also lend itself to many different teaching approaches. We are only limited by our imaginations to discover and utilize the natural resources available in our communities for laboratory experiences."

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Risk Management for . . .

(continued from page 14)

through the American Vocational Association, other teacher organizations such as the National Education Association (NEA) and the American Federation of Teachers (AFT), and many homeowner insurance policies.

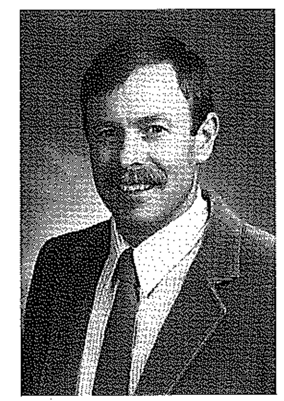
One half to one million dollars of personal liability insurance protection, which would be in addition to insurance carried by local schools, constitutes important protection for all agriculture teachers in the event negligence is alleged. Remember, most school policies are primarily intended to protect the local district, rather than individual teachers, from liability.

Summary

Any teacher alleged to be negligent is subject to litigation. Given the many contexts of negligence, the challenges inherent in operating land laboratories, and encouragement of lawsuits by some attorneys through a "pay only if you win" percentage basis, agriculture teachers operating land laboratories are at risk for liability. Management to minimize the risks includes: (a) being informed about local school policy and state and federal laws, (b) providing and documenting safety instruction, (c) maintaining tools, machinery, and equipment in good repair, (d) establishing, making public, and enforcing safety rules, (e) maintaining good housekeeping, (f) managing hazardous substances, and (g) obtaining professional liability insurance.

Operating land laboratories inherently involves liability risk — how the risk is managed makes the difference. ■

Dreams Becoming Realities: The Zuni School Farm Project



BY MARVIN MARTIN & TOM DORMODY

Mr. Martin is an agriculture teacher at Zuni H.S., Zuni, NM. Dr. Dormody is assistant professor of agricultural and extension education at New Mexico State University, Las Cruces.

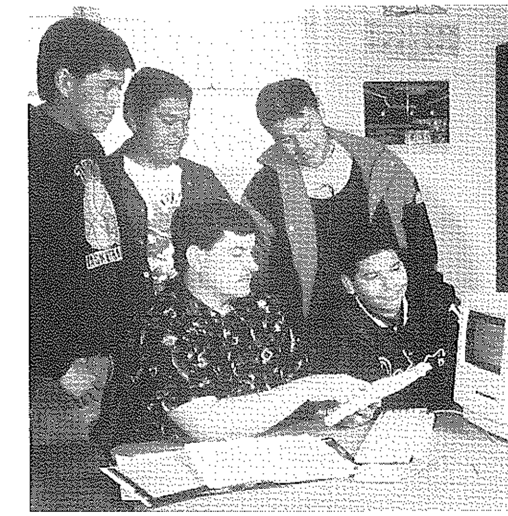
Background

Agriculture and land resource stewardship have always been a part of the cultural and religious heritage at Zuni Pueblo in New Mexico. However, since 1911, cultivated acreage in Zuni has declined from about 8,000 to below 1,500 acres. The movement of the Zuni people away from agriculture and a life on the land has prompted the Zuni Public School District to make the agriculture program at Zuni High School a key component in a project to reverse this trend.

In January 1989, the District signed a ten-year lease agreement with the Zuni Tribe for 25 acres of farm land. The land is being developed into a land laboratory as part of the Zuni School Farm Project. The project is an innovative educational program that integrates the academic subjects of math, science, and the humanities with agriculture, while maintaining a rich cultural context of Zuni heritage. Cooperative learning, experiential approaches, and performance-based assessment help bridge the gap between school and workplace or postsecondary education for the students.

The project curriculum allows for highly individualized student achievement. It allows students to set their own learning objectives and provides them with time to learn skills and concepts at their own pace. By mastering their objectives, students are able to perform these skills again. Through experiential learning activities on the farm, students should later be able to perform these skills outside a school setting.

The sheep breeding program teaches applied academics, management, and cooperation.



Some of the USDE funds were used to purchase computers for school farm recordkeeping, word processing, and other classroom applications. (Photo courtesy of Victor Espinoza, New Mexico State University)

The Zuni School Farm Project's use of an individualized curriculum has increased the importance of helping students use their minds well. By integrating academic and vocational education, everything learned in the classroom has an intellectual and work-related purpose. The program's first concern must be leading students to become thinking and working adults.

Obtaining Project Resources

Developing the school farm to tie classroom learning to practice has been central to the success of the project. The Zuni High School agriculture program was given a challenge: find the financial resources necessary to develop a working farm. Through coordination between the Zuni School Farm Project Director, the Zuni Board of Education, and district office personnel, the Zuni Public School District was awarded a $125,000 grant from the U.S. Department of Education's fund for the Improvement and Reform of Schools and Teaching.

Project Process

Development activities on the farm have provided students with their first real-life agricultural experiences. Between 1989 and 1992, agriculture students built fences, established irrigation ditches, and planted alfalfa. More recently they have constructed animal shelters, a hay barn, vegetable gardens, and have

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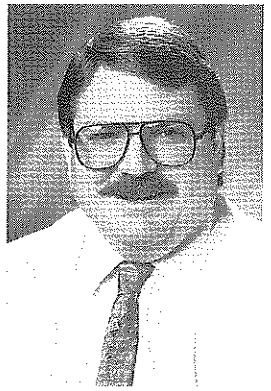
THEME ARTICLE

Small Scale Land Laboratories



By Kevin Tucker

Mr. Tucker is an agriculture teacher at Akron H.S., Akron, CO.

The concept of the land laboratory as a part of the agricultural learning process has been an essential part of agricultural education since the earliest instruction of young people to be successful farmers. The first school farm in the new world probably started with the Salzburger family school of Georgia, which in 1734 began teaching orphans to become farmers. The students lived on the farm and were taught "learning by doing", hardly a new concept to today's agriculture teachers. The Morrill Act, which set up the Land Grant college system, also used the "learning by doing" philosophy and encouraged students and teachers to develop their skills by using a hands-on approach.

The popularity of land laboratories and their use in agriculture programs has fluctuated over the years (Phipps, 1980), from being a necessary component of the curriculum to being considered a waste of time and money. D. L. Williams felt that supervised agricultural experience and cooperative vocational education programs had largely taken over the role of the land laboratory, thereby diminishing its value to the agriculture student (Williams, 1980). Our reliance on supervised agricultural experience programs seems to validate Williams' ideas, as the use of land labs decreased until the mid 1970s. At that time enrollment in agriculture programs changed from primarily "farm boys" to a diverse group of students, including students from urban and non-farm backgrounds. These "new" students needed practical, hands-on experiences that may not have been available to them in their home situation. The land laboratory gave these students the ability to explore agricultural practices and allowed them the opportunity to see firsthand how the nation's food and fiber were produced.

So what is the status of the land laboratory today, and how can the land laboratory be used to enhance student education and experience? I believe that by encouraging hands-on experience, we teach students the skills they need to compete in the world of work, at the same time building student self confidence.

In our move to a more science-based curriculum and laboratory activities, many teachers in Colorado have looked toward land laboratories as a way of delivering a thorough and complete method of teaching skills, as opposed to students reading about procedures or experiments in textbooks. The philosophy of the hands-on approach is as valid today as it was to the 1734 Georgia orphans' farm. Students need to see that the material presented in textbooks actually is true and has a working and practical use! The old saying "seeing is believing" certainly holds true for most secondary students, as well as many adults. For a student to see that fertilizers do work or that animals will eat certain feeds over others opens them to that "teachable moment", when what they have read or been told by an adult actually is true!

Many teachers shy away from the idea of the land laboratory because they feel that it will be too expensive or time consuming. In reality a land laboratory can be an easily built and inexpensive greenhouse or a small garden plot. The use of bottle biology and small aquariums can substitute for large cropping areas and aquaculture ponds. True, the scale might not be the same, but the scientific concepts of soils, seed germination, and plant growth do not change with scale. Likewise, the use of a rabbit hutch or other small animal rearing area can be utilized to teach animal science skills and student responsibility. Certainly these ideas will not completely substitute for working with cattle or other large animals, nor will they replace the need to teach agronomic skills, such as operating tillage equipment. They do, however, offer the student the opportunity of working with living organisms that may not be available to them in their home environment. It is also an avenue of developing a supervised agricultural experience for a student that may not live in a farm setting or be too young to secure meaningful agricultural placement.

So what is the definition of the school laboratory and can it be used to enhance student learning? The answer really lies with you, the teacher, and your philosophy of using hands-on experience. To me, a land laboratory is any setting out of the traditional classroom where skills can be taught using the resources of your area and community. The land laboratory does not have to be a large scale farm or ranch with expensive equipment or a working manager. It can be developed on school grounds, even in urban areas with little land and expense. Much of the equipment can be built in the agricultural mechanics lab by using commonly accessible materials and simple techniques. The business community is often willing to donate small items to help educational programs get started. Many of the suggestions for establishing →

and utilizing land laboratories can be used as incentives for fund raising for your local FFA chapter. Your land laboratory should be able to support itself once the initial investment in tools and equipment is recovered.

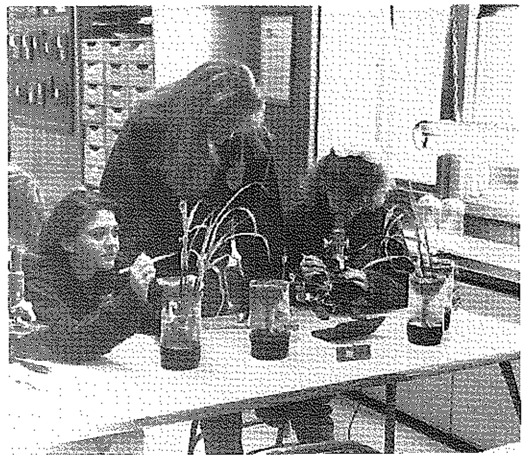
Greenhouses

Greenhouses can be misunderstood by many people. Many people believe that greenhouses can only be used to teach horticulture or greenhouse management techniques. Ranging from small, school-built cold frames to large, commercial-sized structures, these labs can be used for a variety of activities. Even in an agriculture program devoted to farming and crop production, a greenhouse can be a valuable addition. The use of greenhouses can offer the teacher a method of extending the seasons in which hands-on work with crops can be accomplished without regard to weather. In my community in eastern Colorado the growing season is short, and working with maturing crop plants or having good crop samples is limited to only a few months during the school year. Likewise, taking student field trips, or even planning trips, can be risky from October through April, when the weather can be warm and sunny one day and blizzard conditions the next! With a greenhouse most crop plants can be grown somewhat out of season and be used for demonstrations or experiments, regardless of weather or environmental conditions. Having the facility on school grounds also eliminates the need for costly and time-consuming travel.

The greenhouse laboratory can also be utilized to produce many plants that students may be aware of but have never seen. For example, my students are familiar with soybean meal used in livestock feed, but since soybeans are not grown in eastern Colorado, these students have not seen a soybean plant or a whole soybean! Cotton plants, rice, and other crops exotic to our area are other examples of this concept. Fertilizer, insect, and disease studies can also be carried out in the controlled environment of the greenhouse laboratory. Also, don't overlook the Wisconsin Fast Plants and Bottle Biology materials as sources of providing hands-on skills. Both programs offer an excellent method for teaching a wide variety of environmental, agricultural, and biological concepts.

Garden Areas

Small garden plots and landscape areas on school grounds are wonderful resources for teaching students techniques in planning and cultivating plants and garden crops. A garden area of 20x50 feet is considered a manageable size and can grow a variety of plants for consumption or sale. Many towns and cities also have community garden areas that students can use for SAE programs or experiments. Rototilling, amending soil, fertilizing, plant protection, irrigation management, crop planning, harvesting, processing, and marketing, while not on the scale of a large farming enterprise, can all be taught by using these small plots. Again, the scale is smaller but the concepts and basic plant science principles are the same.



Akron agriculture students using Bottle Biology for soils studies.

Students will tend to select vegetables for planting that are familiar. However, planting a garden is an excellent way of exposing students to foods of other cultures. Encourage them to try new varieties and experiment with new crops.

Designing and plumbing an irrigation system for small areas can also give practical experience to students interested in learning mechanical skills. Don't forget that gardens can be used as fund raisers for your chapter. Marketing and selling products should be a part of any good garden project.

Animal Science Study Areas

Animal study areas are always a challenge in that animals require constant care on a daily basis. Also, many communities will not permit large livestock, such as cattle, sheep, or horses, within city limits, or restrictions may be placed on the handling of waste. However, small animal raising usually does not cause concern among residents and school neighbors. Aquariums, rabbit hutches, and rodent production areas can be constructed cheaply and be easily maintained on the school property using a minimum of space and labor.

Aquariums can be substituted for fish ponds and holding tanks where the production of fish for human consumption is secondary to teaching water quality concepts. Measuring pH, nitrates, ammonia, and conducting other water quality measurements can be done cheaply and by the same methods that professional fishery managers use. One visit to a large pet shop specializing in tropical fish will reveal a wide array of water test kits and supplies for influencing water quality. Also, you will find a host of information on fish diseases and parasites, as well as treatments for these problems. Students seem to enjoy having aquariums in the →

classroom and will take responsibility for feeding and caring for the tanks. In some communities the production of tropical fish can be a profitable SAE program, and this avenue should be explored.

Rodent production is another area for the teaching of basic animal skills to students. Rabbit production has always been a good student project for teaching genetics, as well as for developing showmanship skills on a small scale. Rabbit cages can be cheaply built in the school using common hardware goods.

The production of other rodents is also possible in a small setting. While raising mice and rats does not appeal to everyone, there is a growing market for these animals by people who raise and sell snakes and other reptiles. Zoos and local laboratories also need a steady supply of rodents for use as feed and research animals. I personally know of a family in my county that produces well over 100,000 mice a year for sale. This family keeps accurate breeding records and uses selective breeding techniques to enhance production and litter size. They also have formulated special rations and have an ongoing health maintenance program. All of their production, packaging, and shipping is done in a space no larger than a small barn — about 20x30 feet!

Conclusions

When researching material for this article, I discovered that much has been written about large scale land laboratories and school farms. While these facilities are a wonderful and traditional way of offering agricultural education to students, in today's climate of tight budgets and environmental regulations, they have become impractical for many schools. These factors should not lessen our commitment to offering students the practical hands-on skills they need to be successful and for developing in students a sense of responsibility for caring for living organisms. Students enjoy working with their hands as well as with their minds, and small scale land laboratories can increase excitement, motivation, and success in educational programs.

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Dreams Becoming . . .

(continued from page 17)

established a sheep breeding program. Agriculture student numbers have steadily increased from approximately 30 to 50 students since the project began.

Funds provided by the U.S. Department of Education grant have enabled the Zuni School Farm Project to employ a full-time teaching aide/cultural advisor from Zuni who has been instrumental in integrating Zuni history and culture across the program curriculum. Funds were also used for student field trips, including the state and national FFA conventions. Livestock, equipment, and supplies purchased by the grant money have included sheep, poultry, computers, a truck, a swather, a tractor, implements for producing hay, and laboratory supplies.

In keeping with the interdisciplinary "Re:Learning" school restructuring program adopted by Zuni Public Schools, five teachers have met on a regular basis to work on curriculum integration and development for the project. They have found that using an interdisciplinary approach for teaching math, science, the humanities, and agriculture helps students make real-world connections to what they are learning. Seeing Zuni students become actively engaged in subject matter that historically holds true meaning and relevance for them has confirmed these teachers' commitment to the "Re:Learning" process.

Future Plans

The Zuni School Farm Project has several long-term goals, which when attained will result in increased learning opportunities. They include:

1. Developing the school farm so the program becomes financially self sustaining.

2. Using the farm as a district-wide K-12 agricultural literacy tool.

3. Developing the school farm into a demonstration farm for area farmers and ranchers.

4. Producing quality sheep from the breeding program to sell to area 4-H and FFA members for projects.

Project staff are continually pursuing funding through grant writing and other fund-raising activities to ensure the project achieves all of these goals. Eventually, the school farm could become a center for agricultural education at Zuni Pueblo.

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The Apex of Innovation

BY LARRY FISCHER & RICK EDWARDS

Mr. Fischer is director of agriculture programs and Mr. Edwards is coordinator of the agriculture transfer program at John Wood Community College, Perry, IL.

A prime example of innovation in delivering a community college agricultural program is currently underway in western Illinois. The unique cooperative effort between the University of Illinois Agricultural Research and Demonstration Center and the John Wood Community College Agricultural program is experiencing glowing success.

During the 1970s the University of Illinois was searching for a site for an agronomy research center in western Illinois, which would utilize native forested soil types. Since Illinois is known as the "Prairie State", major research efforts were already being conducted on these prairie soils at various other sites throughout the state. However, a limited amount of research was being conducted on native forested soil types, which are predominant throughout western Illinois. After careful review, a site of 278 acres was identified near Perry, Illinois, on which agronomy research and demonstration projects could be conducted.

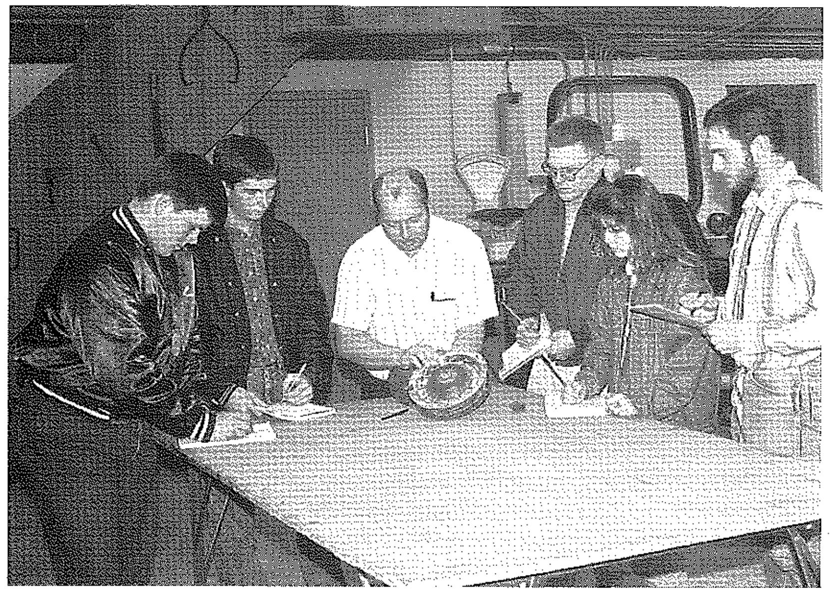
In 1974, John Wood Community College, headquartered in Quincy, Illinois, was established. The Community College currently encompasses all or part of nine counties in western Illinois. In 1978, when the search for an appropriate site for the University of Illinois Research Center was being conducted, the agriculture staff at John Wood Community College encouraged innovation toward cooperative efforts. Through the encouragement of a local resource conservation and development council, a unique, cooperative, programmatic relationship was developed between the University of Illinois and John Wood Community College.

The University agreed to provide three acres of frontage from their agronomy center to the community college building, which was constructed on this three-acre site. Furthermore, the University agreed to provide basic maintenance duties on the grounds of the three-acre site in exchange for the University being able to utilize certain portions of the JWCC building. Additionally, since the University Research Center needed additional labor requirements in the spring and fall, it was agreed that community college agriculture students would be hired on internships by the University to assist in conducting research experiments. This would provide an unique "hands-on" internship for various students who desired to work for the University in a research setting. The University also agreed to assign research plots to the community college for utilization in demonstration efforts designed and conducted by students as a part of their learning exercises. Additional areas of innovative cooperation between a Land Grant University in its research effort and the delivery of an agriculture program in a community college were developed which make greater use of resources at this site near Perry, Illinois.

In the mid 1980s, the University decided to establish a 191-acre Beef Research Center next to the Agronomy Center. It was further decided to expand the relationship with the John Wood Community College Agriculture Program. Now students are also allowed the opportunity to utilize the Beef Research Center as a learning laboratory and as an employer for their internship experience. John Wood Community College now has a beef certificate program which focuses upon expanding knowledge, competencies, and skills oriented to the cow/calf operation. The research center serves as a superb location for students applying knowledge learned in the classroom at a well equipped and modern beef cow research center.

With the Agronomy Research Farm, we have been able to work very closely in designing various demonstration and research plots. The demonstration plots are used to demonstrate principles taught in the soils, crops, and agricultural chemicals classes. A corn and soybean herbicide study is used to demonstrate 14 different herbicides or combinations. A check plot with no herbicide is used to show what kind of weeds are present. If a combination of herbicides is used, the single herbicide is applied on each side of the combination plot to →

Glenn Raines (in hat), Superintendent of the University of Illinois Agronomy Research Center, and Rick Edwards (far right), Agriculture Instructor at John Wood Community College, showing a group of students in a laboratory soils class different procedures of using a tensiometer and a soils probe.



Rick Edwards (center), Agriculture Instructor at John Wood Community College, explaining to students the operation of a planter owned by the University of Illinois.

demonstrate which weeds are controlled by which chemical. A corn population study has shown how two or three different corn varieties produce at four or five different populations. In cooperation with a local farm service company, corn and soybean stress wheels have been planted, as well as a plot with several types of corn, such as white, waxy, and pod. Some of the plots are hand harvested. A typical class of students can harvest these plots in a short period of time, whereas it would take a small research staff a full day or more to harvest. Some of the other demonstrations include the following: herbicide rate-tillage interaction, fertility, tillage, and manure rate. To complement the classroom instruction, several laboratory exercises are completed by the students. Some of the laboratory exercises include soil sampling, determining percent slope, establishing waterways, laying out contour lines for contour or strip crop farming, and determining compaction using a penetrometer.

For the laboratory exercises in the Machinery Maintenance class, students work with the research farm foreman to do the yearly maintenance and repair work on the machinery used at the research farm. This experience has been very educational for the students, as well as a time saver for the research farm staff. Many times an exercise which started out as preventive maintenance has turned into a minor repair exercise, which is really a practical experience for the students. The machinery maintenance exercises include changing oil and air filters, spark plugs, disk blades, and chisel points of blades. The students complete several exercises on calibrating spayers, small grain drills, corn planters, and dry fertilizer applicators.

As part of the Beef Management Program, students are required to complete a class in applied skills. The class is taught by the University of Illinois staff members. The students gain valuable experience by working alongside the University staff at the Beef Research Unit. By having students assist with seasonal as well as daily work, the staff has realized a trade-off of time savings between instruction and actually doing the work. A student is assigned one night a week during calving season to serve as "night watchman." Students assist with heat detection, conducting grazing trails, and calf weaning. The students do some of the pregnancy detection, artificial insemination, implanting, blood sampling, pelvic measurements, and newborn calf treatment and measurements.

This cooperative effort has been very beneficial for everyone involved. The students have given highly favorable evaluations of the classes which have practical "hands-on" learning experiences in the field laboratories. The classroom lecture is greatly enhanced by the valuable exercises completed by the students. The definition of a laboratory is greatly expanded in a setting such as we have at the JWCC Agricultural Education Center and the University of Illinois Orr Research Center.

Glenn Raines (in hat), Superintendent of the University of Illinois Agronomy Research Center, and Rick Edwards (far right), Agriculture Instructor at John Wood Community College, showing a group of students within a soils laboratory the proper procedure of testing soils.

The increasing focus upon public accountability of funds requires maximum cooperation to occur between agricultural agencies and organizations. The unique cooperative relationship occurring between the University of Illinois and John Wood Community College utilizes resources at the highest level for the maximum benefit of students and taxpayers. Only through increasing levels of cooperation can we hope to offer the highest quality agricultural education programs. ■

Agriculture Water Analysis Experiment

By Sheila Barrett & Lloyd McCabe

Ms. Barrett is an agriculture teacher at Fullerton H.S., Fullerton, CA. Mr. McCabe is regional supervisor of agricultural education, California Department of Education, Sacramento.

Background

Agriculture depends on water. Yet the quality of the water can vary depending on the source. The following laboratory exercise is recommended to be completed after the students have an understanding of factors that affect water quality.

Purpose

The purpose of this laboratory exercise is to have the student be able to differentiate and identify unknown water samples through observations and deductive reasoning.

Materials

Compound microscope, slides, cover slips, and 6 eye dropper bottles with water samples representing the following areas:

- Ordinary tap water
- Stagnant water from a pond
- Ditch water
- Livestock trough water
- Fresh pump water
- Lake water

(Teacher's note: Each bottle should be marked with a different number from 1-6. In addition, the water sources can vary depending on your area. If you do not have any of the above samples, you can substitute or create your own samples. To do the latter, obtain 6 small bottles with lids. Beginning twelve days prior to the experiment, fill one jar with a cup of water and a handful of lawn cuttings. Every two days make another jar of water. Continue to use the ordinary tap water as a sample.)

Procedure

Utilizing the microscope and deductive reasoning, answer the following questions for each sample bottle and determine its proper identity.

Number on sample bottle is: ________

1. Pick up the sample bottle and visually observe the contents.

   a. Is the liquid: (Check only 1)

   ____ Clear

   ____ Clear with floating objects

   ____ Partially cloudy

   ____ Unable to see through

   b. Are there any living objects in the bottle? ________

   c. If yes, are they insects, plant life, or both? ________

2. Place a drop of the sample on a microscope slide and carefully examine the contents:

   a. Are there microscopic animal life forms present?

   b. Are there plant life forms present? ______

   c. Draw one identifiable life form in the square.

Conclusions

1. Based on your observations, label each sample. (Hint: Stagnant water has a greater potential for algae growth and other water life forms.)

   _____ Ordinary tap water

   _____ Stagnant water from a pond

   _____ Ditch Water

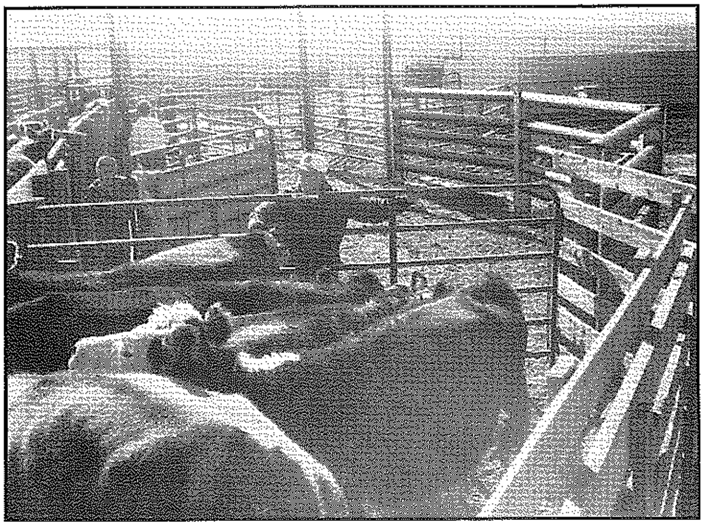
   _____ Livestock trough water

   _____ Fresh pump water

   _____ Lake water

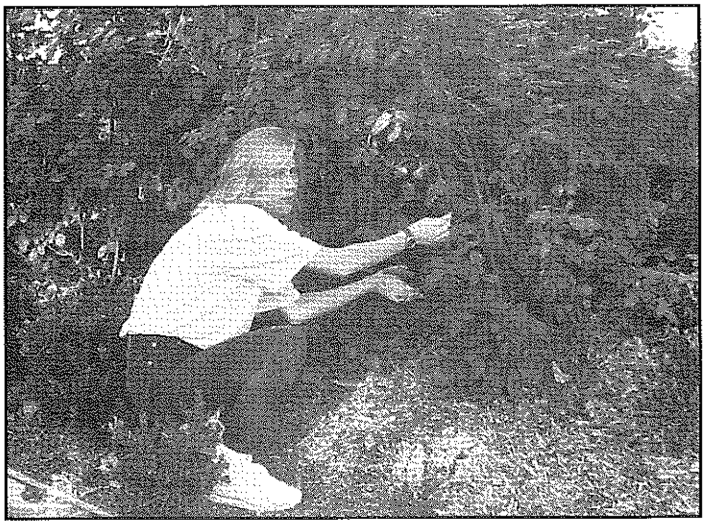
2. How did you come to the above conclusions? What rules did you apply to identify the samples? ■

Stories in Pictures



Marketing cattle produced on the land lab can be very rewarding for students. (Courtesy of David Whaley)

Many types of outdoor agriculture laboratories, such as this feed mill, can be used for instructional purposes. (Courtesy of David Whaley)



Land labs can be designed to include a wide variety of plant species. (Courtesy of Steve Pietrolungo)

Land laboratories provide many opportunities for application of technical skills. (Courtesy of Steve Pietrolungo)