Environmental Education Programs

Teaching Agriculture and the Environment
Community-Based Curriculum Development
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Teaching Agriculture and the Environment

A s teachers, we can have a profound effect on the students we teach. All of us can remember that one teacher who, for us, was able to spark our interest on a specific topic. The same holds true for environmental education. Teachers and the approaches used can be dangerous! There is much information about this topic on both sides of the scale that is not quite right. In addition, students can take extreme positions that border on hysteria when dealing with environmental issues. Some of these extreme positions can be found in the following statements: "Unfortunately, too many people believe that we need to wholeheartedly support production agriculture and all of its current practices, and to do any less is to remove farmers' freedom of speech." "In order to guarantee our food supply we should redistribute land and everyone should grow organic vegetables in their backyards.

Teachers of agriculture have the opportunity to teach students to understand the balance of nature, as well as the need for a reasoned approach to producing food. Using these strategies, teachers can find a variety of ways to teach so that a sustained food supply reaches the marketplace. In the following paragraphs and in this issue you will find a variety of approaches to teaching environmental education that will help you teach a balanced approach to this important topic in society today.

Opportunities Abound

Opportunities to teach about environmental education abound. In some parts of the country the interest in environmental education is phenomenal. At The Pennsylvania State University, the Environmental Resource Management (ERM) undergraduate degree has by far the largest enrollment of the College of Agricultural Sciences. Current enrollment in the college is nearly 3,000 students, with more than 300 of these individuals enrolled in ERM. Students at the secondary level have also shown a great amount of interest in environmental education. In recent years Pennsylvania agriculture teachers were able to lobby the Department of Education to include environmental understanding as one of the state-mandated 53 outcomes all students will attain. Being “green” and understanding its importance in the lives of youth is critical to being an effective teacher in the 1990s.

How Does Environmental Education on the Work in the Classroom?

Paul Hawkins in his book The Ecology of Commerce believes that we need to pass on the true cost of environmental degradation to the consumer. He believes we are postponing or deferring the true cost of environmental destruction. We’ve known for a long time the problems associated with silting in agriculture. Siltation is the single largest cause of water pollution in the U.S. Hawkins believes that consumers and/or farmers are each funded by the responsibility of this pollutant through taxes to remove it from the environment. The argument is sometimes given that farmers by their actions create the possibility of soil loss and are actually taking away the capacity from future generations to grow food. We know that soybean production causes the soil to loosen, and the lack of ground cover further promotes soil erosion and sedimentation. According to Hawkins, since soybean production is a threat to the environment, all of the produce resulting from this crop should be taxed at a fair rate to either protect the environment or to put the soil back into a productive state.

That is Hawkins’ position! Do you know what your students’ position is regarding sedimentation? Think about the learning and the stimulating discussion that could follow. Students on both sides of the issue could discover as much as possible about the true costs of sedimentation, use of current tax dollars, legal ramifications, costs of terraces, how to meet soil tolerance levels, no-till farming, farmers’ rights and responsibilities, the Conservation Reserve Program, benefits to society from food production, and who knows what else. It could be a one-semester project! Students could go wild learning about sedimentation. Wait a minute… it’s… it’s… it’s too dangerous. The students might learn too much. I wouldn’t try it. Stop, stop, don’t throw me in the briar patch!

Goals for Environmental Education in Agriculture

Students learning “true” information about the environment should be the goal of agricultural education. For too long we have promoted production practices because they were expectedly efficient. In the not so distant past, Midwest farmers plowed bean stubble in the

Zoos are a Natural Place to Learn: The Lincoln Park Story

The lesson in biology is not progressing as smoothly as you had planned. The students seem to be preoccupied and uninterested in this exciting and relevant topic. The plight of the wild animals seems to have increasing problems of overcrowding, habitat loss, species decline and extinction, not to mention environmental problems like drought, extreme defoliations, and pollution. You feel that children, as well as adults, need to be educated regarding environmental issues. The animals and plants that share this space with us are equally important, and each is fascinating. A zoo is an ideal place to study these concepts in an extremely engaging setting.

A trip to the zoo may be a bit different from what you were originally thinking. It’s nice and pretty, but what can the kids learn? Many zoos have education departments that offer teacher training, workshops, special tours, comprehensive science curricula, family activities, and camps that focus on the issues of environmental education and conservation. Zoos are no longer primarily focused on exhibiting animals solely for entertainment. A zoo is an excellent place to learn. Zoo education departments are involved in many types of outreach, as well as programming at their site. Outreach programs are especially useful when there is limited opportunity to visit a zoo because of location, money, or time.

Lincoln Park Zoological Gardens, located in the heart of Chicago, offers many ways to correlate school studies with zoo resources. A program titled “Zoo to You” invites the teacher to the zoo for environmental education training. Upon returning to the classroom, the curriculum program is designed for four lessons. The first two lessons focus on the concepts of adaptation and symbiosis. The third lesson is a visit to the classroom by docents (specially trained volunteers) and live animals to demonstrate how animals adapt to their environment. The fourth lesson discusses positive human impact on wildlife. The personal attention given to the class and the opportunity to meet animals up close provides a lasting impression.

Lincoln Park Zoo remains one of the last free zoos in the country and, therefore, has maintained of school and day camp groups visit throughout the year. Prior to each group’s visit (which must be registered through the education department), the Zoo-ology Action Guide, a packet of age-appropriate environmental materials, is mailed to the supervising teacher. Each folder contains pre-visit and post-visit activities, as well as an activity to complete while visiting the zoo grounds. While the visit to the zoo is an exciting experience, the continuities of pre- and post-visit lessons help to better sustain the messages of conservation.

Educational programming at the zoo includes after-school programs that are free to invited groups. These programs, “Zootrek” and “Animal Crackers,” are each funded by corporate sponsors and are designed to meet the needs of children attending federally-funded after-school programs. Each group is invited to the zoo for two separate visits that include activity stations and hands-on experience with zoo animals. The curriculum includes pre-visit and post-visit activities to provide an introduction and closure to the topics presented. The after-school program staff is provided with the pre- and post-visit activities, as well as additional follow-up activities and places to visit or call for further information. The students are provided with a workbook of activities and letters to keep their families updated on the information presented during each of the visits to the zoo.
Environmental programs are offered at the zoo to meet a wide variety of interests and ages. Family workshops, film series, field trips, and an adult lecture series occur in the fall, winter, and spring. The topics of these programs range from a class and tour on one species to broader topics like habitat conservation for the lecture series. The family workshops include parents and children learning together, while the lecture series features internationally known conservationists discussing current environmental issues and conservation programs. Classes allow children as young as age three to begin to explore the world and exotic habitats from much closer to home.

The summer season at Lincoln Park Zoo is reserved solely for the implementation of ZooCamp. ZooCamp is an in-depth environmental experience allowing children a three- to five-day close-up look at the zoo. Children that attend the various camp programs range in age from 5 to 14. The students are involved in hands-on experience with animals, touring behind the scenes and talking with zookeepers, and meeting other zoo staff, including curators and veterinarians. Challenging discussions regarding environmental problems and recent environmental successes, as well as the role of zoos, are discussed with each camp group in an age-appropriate manner.

Each camp focuses on a theme and involves the children in participatory activities and games that reinforce the message of conservation. Many times there is not one "correct" answer to the topics. Instead, children are asked to discuss and contemplate challenging issues. The parents and families of the children enrolled are encouraged to share the theme of conservation. Each day the children are sent home with a Parents' Guide that reinforces the theme and activities for that day. On occasion, children are given guidelines to recreate simple activities or are asked to complete an activity at home. Parents and families are invited to attend one additional hour of ZooCamp Open House on the final day of camp. During this hour, guests experience firsthand some activities, videos, and animals that had been a part of the previous camp days.

My personal experience at Lincoln Park Zoo, especially working with the ZooCamp program, illuminates the many benefits of including a zoo in an environmental education curriculum. A zoo offers a unique resource to observe animals and exotic landscapes throughout the world without the need to travel. Education departments at many zoos are involved in these programs, under different clever names, or programs similar to the ones described in this text. The resources available at a zoo enhance student learning. The motivation to learn is intrinsic and the enthusiasm is contagious. Why not contact a zoo in your area? Perhaps there is an opportunity for a joint educational experience with the science and agriculture teacher, or other combinations.

Environmental education may find itself in the middle. On the one hand, it is important that students in agriculture, forestry, and natural resource courses be well versed on environmental questions and possible solutions. In contrast, community concerns about declining agricultural land, lost forest industry employment, or limited commercial fishing might trigger severe public reaction to any environmental education.

What is the solution? What can agriculture teachers do that will maintain their professional integrity and yet be sensitive to community concerns with policies perceived to threaten livelihoods, the economy, social structure, and individual families?

Let Someone Else Do It?

A safe choice might appear to be to ignore sensitive community environmental issues in the curriculum and in interaction with students. Some might call this "burying our heads in the sand." Recent history has demonstrated that problems will not easily go away. A look at the early lack of public debate and action concerning the ozone layer and possible global warming because of the loss of rain forests and current major dispute addressing these topics clearly makes the point. Gangs, teen violence, and assaults on tourists cannot be swept under a rug. The local chambers of commerce and political leaders are not able to "keep the lid on" these major problems.

Environmental issues, too, will not go away. Sustainable agriculture, integrated pest management, biological controls, and non-point source pollution are examples of increasingly important topics in agriculture education classes. There is both the ethical and professional responsibility to equip students with the tools to ascertain relevant current facts and to develop problem solving/decision making skills on any sensitive issue.

Thinking About The Topics

Balanced community advisory input is as vital as it is to establish the need to study the topic(s) at this stage. A close relationship with school administration and awareness of established school policies is also a must. Potential community reaction should also be examined by these two groups. Criteria that must be met before going forward with the instructional program on sensitive community issues include: recognized importance of the subject matter to the education of youth; capacity to collect sufficient, scientifically-established support materials for balanced presentation; and the availability of community resources that can contribute to the educational program.

Commitment to publicly support the instruction of a sensitive subject is also needed from advisory and administrative personnel. This support will be needed if major community questions arise. It would also be very useful to have support from contentious individuals in the community. These individuals can assist in the accumulation of supporting materials and local resources appropriate to the teaching of the topics.

Addressing the Topics

One recommended method of addressing sensitive topics is to determine limited objectives for the educational experiences. The objectives might deal with pollution of one stream or the endangerment of one habitat, and they should be addressed both academically and operationally. When students have a chance to apply their knowledge and see the...
determine if the solution attempted was the proper one. The application of solutions requires field trips and student activity to prevent problem solving from becoming an academic exercise.

2. A second approach focuses on practices and attitudes (affective domain). This is the most difficult to present and to assure that the polarized feelings and commitments found in the community are dealt with fairly. It is in this area of sensitive subject matter that the controversy is most likely to arise. Studies of human behavior have shown that when someone takes the part of another or debates another’s position, the participant often changes attitude in the direction of the role they played. Thus, role playing is one suggested way of presenting both sides.

Formal debate among students or one minute oral presentations of conflicting positions may also help. The goal is not to “brain-wash,” but rather to give credibility to another’s position. Viewing of videotapes of the same event on different sides would also be useful, as would in-school forums of community members representing different attitudes. These can be used as part of in-school classes or as part of a program for a community group.

Evaluation immediately following the environmental presentations is very important. This should include evaluation of how well each student met the cognitive and affective objectives developed for the area. Testing of knowledge and demonstration of skills learned should be part of the process. Another very important part of the process is to determine students’ attitudes toward the environmental areas covered. These can be collected by interview or open-ended queries.

Reports of the evaluation results should be immediately shared with the advisory committee(s), school administrators, and parents in the community who show concern. If successful, other environmental and perhaps more controversial subjects might be tried. If the process didn’t work as well as hoped, this is the time to examine and revise the teaching process in part or as a whole.

Teachers of controversial subject matter can be reassured that they are operating responsibly when the “bans are all hosed.” Have I involved the community? What about parent/teacher associations? Advisory groups? Acquired all the latest scientific facts? Presented all sides? Developed a credible teaching approach? If yes, a teacher may rest easier as a responsible professional.

Sensitive issues are often the norm in the real world. Students must find out for themselves what may be no one correct answer, and that a shade of gray rather than black or white might be the best alternative. Given students the opportunity to develop analytical skills and apply their learning to benefit their community and environment should be central in any educational program.

Community-Based Curriculum Development: Partners in Teaching and Learning

Public education is continually being asked to do more with less resources. To reverse Dickens: “It is the worst of times, and the best of times." The worst of times in that expectations of education far outstrip available resources; the best of times because when the situation becomes this acute, it forces people in education and other professions and the community to pull together and create programs in much the same way that the fabled “stone wall” was created. This article provides a sketch of how an educational program was developed by a consortium of stakeholders (parents, teachers, environmental and agricultural groups) to teach school-age children about agriculture.

The Setting

With increasing frequency and urgency society is being called upon to make decisions about critical agriculturally-related issues, such as food safety, land use, and water policy. In order to make informed decisions the American public must have a basic understanding of agriculture and its role in our society and economy. Yet, several reports have found that most people’s knowledge of agriculture is inadequate. The participation of the University of California National Academy of Sciences report titled Understanding Agriculture—New Directions for Education, which concluded that most people do not have a clear understanding of agriculture. Authors of the report proposed the following definition of agricultural literacy:

An agriculturally literate person’s understanding of the food and fiber system includes its history and current economic, social, and environmental significance to all Americans. This definition encompasses some knowledge of food and fiber production processes and domestic and international marketing.

Ten years ago most thought and discussion about agriculture was confined to individuals and institutions directly involved in agriculture (Desmond et al., 1990). In the late 1970s and early 1980s public concern began to emerge when people noticed a broader interest in food, fiber, and land use related to the environment. These concerns, many with grassroots beginnings, spawned school-based curricula, such as Life Lab, Project Learning Tree, and Project WILD, that work upon recognized educational and environmental institutions such as USDA and Farm Bureau.

Another concern was that urban populations, particularly urban youth, were ignorant about how their food and fiber are produced and what factors are crucial to continued production. As a result, others programs, such as Agriculture in the Classroom, were developed to address this emerging educational need and interest in America’s agricultural heritage. The students assist in the National Academy of Sciences calling for a "national review of agricultural education" in 1989. One of the principal conclusions of the Academy report was, “Beginning in kindergarten and continuing through 12th grade, all students should be given systematic instruction about agriculture.” The report also went on to suggest that “much of this instruction could be incorporated into existing courses rather than taught in separate courses.”

Subsequent research (Braverman et al., 1991) indicated that while most school administrators felt that agricultural literacy was important enough to incorporate into the school curriculum, they were in a quandary as to where to fit it into the school day. The placement of the responsibility for agricultural literacy was problematic. Should it be part of the social studies curriculum? English? Science? Economics? Biology? What grade levels should be responsible for presenting agricultural literacy materials? The elementary school? Middle school? There were certainly more questions than answers.

Researchers from the University of California began investigating the perceived need of California public schools by surveying school administrators (Braverman et al., 1991). The survey results indicated that California educators believe agricultural literacy is an important element of a complete education and that it can be best incorporated at the 4th through 6th grade levels by integration into the science and social studies frameworks. The survey results matched an important lesson learned from the environmental education movement—environmental concepts are best infused into science and social studies as the most practical way to teach educational goals (Dissing, 1986). “The survey results matched an important lesson learned from the environ-

THE AGRICULTURAL EDUCATION MAGAZINE DECEMBER, 1994

BY ELLEN RILLA & RICHARD PERZED

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mental education movements—environmental concepts are best infused into science and social studies classes. The most practical way to teach educational goals,” other related studies (Pomerantz, 1980) indicated that educational programs have their greatest influence on developing attitudes toward environmental issues during childhood.

A Successful Model for Theme Immersion

In the summer of 1993 a local foundation agreed to fund the development of an agricultural literacy curriculum materials focusing on agriculture. The group’s change was to create and design materials “in” and “out of school,” while integrating science, technology, economics, social, and environmental needs and concerns.

The project, conceived by a small group of local educators, environmentalists, and ranchers (the stakeholders), would create a set of educational materials in English and Spanish for use in the 80 public and private schools in the county, based on the educational needs identified in the agricultural literacy surveys.

The project organizers’ primary goal was to “bring the community into the schools” with a focus on agriculture as a primary theme. In Marin County 45% of the land is tied to agriculture, and there is a need for Marin Agricultural Literacy Project (MALP), the consortium of stakeholders included ranchers, organic farmers, private and public school teachers, bilingual specialists, a foundation officer, college professors, parents, environmental groups, teams, and community members. Each had a contribution to make to the project: money, time, talent, classroom experience, or subject matter expertise. Each had an interest and commitment to the project. One of the greatest challenges facing this community-based group was how to best integrate experiences and activities that would promote agricultural literacy into classroom practices and do this in a manner that was meaningful, action-oriented, and in a format that teachers would use.

After reviewing several reports, including the Academy and Braverman reports, the group decided to use the California Science and History-Social Science Frameworks as a basis to create effective and usable curriculum materials that would have the greatest chance of success in local schools. They also decided to follow the Braverman study recommendations and incorporate agriculture into a thematic approach. The group interpreted “theme” as:

- local agriculture, including topics students could connect to and be interested in their lives with controversial political issues, historical questions, and environmental problems;
- broad, with many opportunities for questions/answers that relate to the overall theme;
- extended to the community with regional, national, and worldwide implications;
- having opportunities for agricultural education and increased respect for others; and
- having a variety of printed materials and other media available for student research.

Key Components of Success of the MALP Design Strategy

Checklists exist that define what is needed for a program to function as an effective instructional vehicle in schools, regardless of its theme or content area (Niedermeier, 1992). However, the experiences gained from this project illustrate how a group of knowledgeable individuals can go about creating and designing effective supplemental instructional materials. These guidelines are based on recent experiences of the MALP consortium and their evaluation of the process.

Build coalitions. Identifying and recruiting potential coalition members to help “build” the project is critical. Since the release of A Nation At Risk in 1983, the number of coalitions and partnerships in schools has increased from a few dozen to thousands. The coalition approach promotes involvement of external groups and agencies in developing a long-term ownership in the educational process (Hildreth, 1992). The MALP advisory committee (consortium) is made up of teachers, environmentalists, local ranchers and farmers (from organic to dairy), students, county agricultural groups, and offices of education. Faculty members from departments of education at university campuses help to ensure relevance and bring content expertise to the process.

Feedback from the MALP advisory committee indicated that they appreciated the use of interactive meeting techniques such as:

- facilitating meetings with group memory clearly recorded, techniques for brainstorming and prioritizing helped clarify the most important elements of the project goals;
- following up with minutes from the group memory to group members with action tasks clearly delineated;
- creating and following group ground rules by bringing to each meeting a list of topics and obtaining explicit agreement from group members for the agenda or direction we created; and
- keeping group members informed between meeting dates with brief update memos on project progress. Asking for group input in individual project tasks.

The above meeting process worked effectively, according to ongoing group feedback (verbal and written evaluations gathered after each session). All of the group management techniques described above are summarized in Doyle and Straus’ popular book How to Make Meetings Work and are based upon years of study about group problem solving and decision making.

Create clear goals and outcomes. Make sure that project goals, objectives and outcomes are clearly delineated from beginning to end and that goal statements are congruent with the activities content (Ramsey et al., 1992). For example, after our advisory group’s initial meeting, we posted project goals, objectives and outcomes at each subsequent meeting so that group members could refer to them.

Integrate current educational instructional strategies. Do your homework! Classroom teachers can easily see the difference between promotional and educational viewpoints when scanning materials. A neutral, non-biased viewpoint is essential. A great deal of time in MALP was spent reviewing the current state framework for science and social studies and reviewing other related regional and state educational frameworks, such as Project Food, Land and People; Life Lab; and Ag in the Classroom. A subcommittee of the advisory group spent two full days sessions creating organizational matrix and guidelines for MALP materials. The California Science Framework provided guidance for the “constructivist” model of learning, which considers direct, hands-on experience of the learner to be of prime importance. Many of the MALP processes follow concepts and learning elements described in Chapter 6 of the Framework.

Hire or enlist a credentialed teacher or educator consultant to write your basic lesson plans if you can afford it. In our experience it was easier to use a subcommittee of volunteers from the faculty to develop a professional to act as designer of ideas and have a consultant articulate the ideas in a lesson plan format. Our most creative activities were brainstormed in our design team sessions, followed by the writer articulating them in a consistent educational format. Another model is to conduct a teacher’s “writing workshop,” in which other teachers get together to write their lessons as well as theirs. This is one style of writing that enhances, or someone is responsible to edit the various activities and styles into a single, cohesive whole.

Include a realistic timeline of events and product due dates. MALP took two years to create 20 lesson plans, a teacher’s resource directory, loan library, and undergraduate videotape teaching aid. Because we had multiple products, we needed four separate but integrated timelines for each product. For example, the video-tape consultant was a member of the lesson plan design team so that the resulting tape would integrate concepts and ideas from the lesson plan guide. Since repeated field-testing is essential to the project’s success, project timelines should be planned around the school year. We found ourselves writing and field-testing in the middle of the summer when many of our classroom teachers were on summer vacation.

Use teacher input throughout. We found that involvement of teachers in every phase of the curriculum development project was a major factor in successful dissemination and use in local schools. From planning and writing, to field testing and evaluation, to in-service and distribution, teachers should be involved in the project. MALP was the teachers in the group who consistently acted as our reality check when activities became too abstract or difficult to understand.

Build a small substitute teacher find into your project budget. This allows you to make arrangements with that teacher so she or he can be used in your project. Remember, it will take at least one school year, if not two, to complete the process. Teacher continuity is clearly demonstrated. The process of involving teachers all along the way pays off a hundred fold as they become excited about “their” project, tell others of its progress, and build anticipation of its imminent arrival. By the time we had enough teachers had organized their own workshop for teachers workshops through local teachers in-service cooperative, we had a long list of teachers who were eager to sign up for workshops.

Actively provide teacher training and distribution of materials. Materials used by Malcolm Fortier (1987) indicated that short, frequent workshops for teachers with frequent follow-up contacts to short, frequent contacts keep teacher interest high and lead to greater use of materials. Work through your local office of education to offer teacher in-service workshops. Place materials in every school resource library in your area.

Epilogue

Has this style of supplemental curriculum development and dissemination been successful? So far, the results are promising.
Parting Shots

"shouts" to "hubs," both in terminology and context.

Collaboration - Can agricultural education (at all levels) break out of its traditionally independent, isolated mode into one of greater teamwork and collaboration? Does greater collaboration mean significant changes in methods and programs?

Problem Solving - Is problem solving teaching (PST) as effective or more effective in agriculture than other teaching approaches? Why don't teachers use PST more? How should PST be taught? To what extent do agricultural educators use problem-solving to improve their programs?

Agricultural Literacy - What should agricultural literacy programs look like at the elementary, middle school, and high school levels? What staffing and other resource changes are needed to meet the huge opportunities for agricultural education in the early and middle grades?

SAFE Programs - How should SAFE programs be modified to best serve our changing students? Should SAFE be required of all agriculture students? What are our expectations from students?

Special Needs Populations - What is our role? What is our unique advantage? What is our responsibility? What methods and programs are most appropriate?

Professionalism - What are our biases? Do we offend colleagues and others by our actions and/or our words? Do we "go along" with comments and situations that are unprofessional, or do we express our dissatisfaction and encourage positive change? Do we, both as individuals and as organizations, present a positive image for agricultural education?

All of these issues will continue to challenge us. Likewise, responses and solutions must continually be developed and revised as circumstances change. Look forward to working with colleagues in agricultural education to enthusiastically address issues in our profession. Thank you for the opportunity to serve as Editor.

References


Agricultural Education and Environmental Education: Collaboration for Global Sustainability

When plans are made for shuttle flight to the moon, preparations for food, air, water, and waste management are made for a finite number of people for a finite period of time. In other words, technicians in the space program must maintain sustainability for the crew members while they are in flight. The planet Earth is essentially a spaceship, with the inherent ability to provide its inhabitants with a degree of food, water, air, and waste absorption. In the space shuttle, population never changes. Inhabitants all have equal access to the food, water, and air. Additionally, the waste produced by its inhabitants does not contaminate any of the shuttle’s life support systems. The tragedy with the metaphor is that on space craft Earth, sustainability is continually subverted.

Authors such as Brown (1994), Daly & Cobb (1980), Ehrlich & Ehrlich (1991), Hawkes (1993), Meadows, Meadows, & Randers (1992), Orr (1992), Sachs (1992), and Young (1990) have written about global sustainability and the elements of humanity which are important factors in today’s unsustainability. Population growth (5.5 billion and growing exponentially), environmental degradation, consumption of resources (industrial, private, and municipal), loss of wildlands and species, and agriculture are repeatedly implicated in the above body of literature as the critical variables in the sustainability equation. Traditionally thought of as an issue of interest to environmental education, worldwide environmental impacts of agriculture and population growth make global sustainability equally vital to agricultural education. Agriculture’s role in this scenario simply cannot be understated:

Humankind’s struggle both to feed the population that has already surpassed the size of the Earth is one of the principal causes of environmental degradation, one that perhaps will be the most difficult to correct. But it must be

corrected if Earth is to be healed. Because of the size of the human population, the need for massive changes, and the way most agricultural systems are run, eating is one of the most ecologically destructive of all human activities (Ehrlich & Ehrlich, 1991, p. 193). Global sustainability implies a population that is significantly smaller than the population that exists today. This is the "brilliant" and "correct" metaphor for Earth’s survival. This is how humanity is meant to live in harmony with the biosphere. This is how we must live if Earth is to thrive. This is how agriculture is meant to be practiced. This is how we must practice agriculture if Earth is to thrive.

The point of this discussion is to emphasize the point that agricultural education, with linkages to environmental education, could foster an educational philosophy with global sustainability as its focus. This concept is beautifully described in David Orr’s book, Ecological Literacy (1992). The concept of ecological literacy and a discussion of its application to agricultural education was reprinted in Yavnik, Adams, and Breuning (1994). The purpose of this article is to detail some specific linkages between agricultural education and environmental education for those educators wishing to expand current agriculture education programs into programs which embrace sustainability as its goal.

Ecological Literacy: Shared Goals for Agricultural Education and Environmental Education

Agricultural education and environmental education represent a potential coalition of disciplines from which to begin developing ecological literacy. Kirtz (1990) claimed that agricultural education and environmental education are most appropriate, but they should be linked by incorporating environmental concepts into the vocational nature of agricultural education. This claim is supported by Orr’s (1992) notion that ecological literacy requires education for both the head and the heart. Additionally, Kirtz (1990) claimed that agricultural education and environmental education share many interests in terms of subject matter, e.g., soil, forests, water, wildlife, pesticides, and food production. There is a mutual interest of natural resources and agriculture in both disciplines, and stewardship is the common link between the two disciplines. Noting that environmental education was originally intended for environmental education courses, Kirtz (1990, p. 34) drew upon the North American Association for Environmental Education
elementary, secondary, and postsecondary levs-
el, and use nonformal (e.g., extension) modes
for all ages and educational levels.
Kirtz (1990) noted methodologies and skill
areas such as problem solving, decision making,
community development, citizenship, and stu-
dent project activities as examples of the com-
mom ground for agricultural education and envi-
ronmental education and urged teachers in both
disciplines to work cooperatively. This list of
frameworks illustrates how environmental educa-
tion and agricultural education could cooperate
to form a basis for ecological literacy.

An analysis of David Orr’s (1992) definition
of ecological literacy provides a framework for
creating ecological literacy from the existing
structures of agricultural education and envi-
ronmental education. Orr’s position that ecologi-
ca literate persons should be competent with
respect to where they live and how to live in
their place is consistent with the present capabili-
ties of agricultural education to teach both men-
tal and psychomotor topics. The diverse compen-
sia required for ecological literacy are best charac-
terized through the following goals for
ecological literacy. Orr (1992) asserted that no
student should graduate from any educational
institution without a basic comprehension of:
1. the laws of thermodynamics, (9) the basic prin-
ciples of ecology, (5) carrying capacity, (4) ener-
gics, (5) least-cost, end-use analysis, (6) how
to live well on a small place, (7) interrelated sub-
division, (8) appropriate scale, (9) sustainable agriculture and forestry, (10) steady-state economics, and (11) environmental philosophy and ethics.

Application of Environmental Education
Activities in Agricultural Education

The broad array of program areas comprising
agricultural education offers potential for
complimentary and accompanying activities and
complementary entertainment opportunities. Such a collaboration is evidenced with the incorporation of sustainable agriculture and natural resource education as cited by Cooper & Gamo (1991) and Marshall & Herring (1991). Regardless of what the incorporation of agricultu-
cultural education and environmental education is called, environmentalizing the agricultural education curriculum may be accomplished in part through the inclusion of the following types of
environmental education activities:

1. Leadership: Group dynamics, team build-
ing, and action realization experience (ASE) are
some of the leadership activities used in
environmental education with exciting potential for
agricultural education.

2. Natural History: Forestry, water study,
wildlife, ecology, geology, and soils are all areas of
interest to both agricultural education and
environmental education.

3. Geologic Time Walk: By converting time
into distance (e.g., one step equals one million
years) the study of local history, evolution, pop-
ulation growth, and agriculture can become an
exciting and dynamic activity.

4. Simulations: A simulated public hearing on
a locally relevant environmental/agricultural
issue, with students adopting opposing view-
point roles, provides a dynamic, integrative
activity. Agricultural, environmental, social,
political, economic, and even ethical issues arise
allowing students to discover how interrelated
these issues actually are. The key to success
with any simulation is to have students apply
relevant knowledge to a simulated problem.

5. Interpretive displays and programs:
Modeled after activities typical of environmen-
tal education centers, the concept of environ-
mental interpretation has many applications in
agricultural education. Students may research,
design, and build interpretive displays on virtu-
ally any environment/agricultural concept for
use in the school, local environmental education
center, fairs, and other appropriate settings. If
the school has the resources for the display, stu-
dents might even develop an environmental education
center on the school grounds. They can then
become environmental interpreters for elemen-
tary and middle school programs.

6. Mechanisms: Small gas engines play an
important part in many forms of environmental
management practices. Forest thinning, soil con-
servation projects, and wildlife habitat manage-
ment all rely on the use of machinery usually
powered by small gas engines. By having stu-
dents construct various nesting and feeding
devices, woodworking, and metal working have
dynamic applications. Additionally, construction
of alternative energy demonstrations (methane
digesters, solar water heaters, steam-powered
water pumps, and so on) is appropriate through
traditional agricultural mechanics techniques.

7. Greenhouses: A practice of sustainable
agriculture known as “permaculture” incorporates
plant and fish production in greenhouses.
Contemporary interest in recirculation systems for
aquaculture and hydroponics supports this concept.

8. Land Labs and Trails: Dependent upon
school facilities, students may become actively
involved in designing, developing, using, and
maintaining outdoor classrooms, environmental interpretation trails, and demonstration areas.
Organic agriculture, composting, plantation
management, wildlife habitat management,
pond construction, fencing, grazing, and soil
conservation methods are some examples of
practices which may be developed as demonstration
areas.

9. FFA Contests: The national forestry and
land judging contests are examples of mutual
interest areas between agricultural and environ-
mental education.

In Pennsylvania, state level aquatic resource
and wildlife contests add to this collaboration.

The environment at county, state, and national
levels offers yet another exciting potential for
agricultural students to become involved in envi-
ronmental education.

10. Sustainable Agriculture: Making agricultu-
er sustainable while maintaining maximum
yields provides a direct application of environ-
mental concern in agricultural production. Sustain
able agriculture is represented by a con-
tinuum of alternative practices, from the USDA
definition of sustainable agriculture through
organic agriculture to a discussion of “sustainable
agriculture.” Extending this concept of sustainable agriculture into the food distribution system incorporates the philosophy of “community
supported agriculture (CSA).” Danahay (1994)
demonstrates the application of CSA to
environmental education. This application is
also appropriate for agricultural education.

Whether incorporated into demonstration areas in
a land lab, student supervised agricultural
experience programs, or practiced on a school
farm, sustainable agriculture offers an exciting
and dynamic potential for collaboration between agricultural
and environmental education.

Conclusion

Agricultural education has adopted various
gons, including education both in and about
agriculture. Similarly, environmental education
has multiple roles involving both learning about
the environment and how humans impact the
environment. The issues of sustainability dis-
closed by Brown (1994) and others involve pop-
Environmental Science Teaching Materials

The environment and its protection has been referred to as a major issue in the 1990s. Americans have become increasingly conscious and concerned for the conservation of our environment (Heinrich, 1992). Increasing numbers of people have become aware of the limitations of our natural resource base and the long-term implications of environmental deterioration (Trinder, 1993). Furthermore, one state Senate has passed legislation for the establishment of a comprehensive environmental education program that includes the development of environmental curricula (Water impacts, 1994).

Environmental science has not been immune to environmental concerns. The agricultural industry, directly affected is affected by the environment through the use of natural resources in the production of food and fiber. Consequently, almost on a daily basis the media alleges misuse of our natural resources by agricultural producers.

While there are instances of environmental wrongdoing, corporate America and the agricultural industry have a vested interest in the conservation of the environment and are becoming more proactive in addressing concerns about the environment. Process employed in agriculture should develop a full appreciation for the interrelationship between agriculture and the environment. They should also employ a sense of stewardship reflecting a positive attitude toward maintenance of the natural resource base for future generations.

The interests of future generations will be best served by conscientious members of the present generation. Production policies and practices should reflect the long-term goal of environmental conservation, as opposed to the short-term goal of economic gain. Although economic viability is an important factor in the decision-making process of any business enterprise, for the security of our nation, and indeed our world, economic gains must be balanced with the objective of environmental conservation and preservation. Americans should be encouraged to develop (a) a broad knowledge of the interrelationships between agriculture and the environment; (b) an attitude of environmental conservation in conjunction with...
The Crossword Puzzle as a Teaching Examination Tool

By Glenda Brocker, John Hallman, and Ed Clemen

Mr. Brocker and Mr. Hallman are former graduate students in animal science at the University of Nebraska, Lincoln.

The following is a descriptive study, initially intended for the sole purpose of assessing interest in using a crossword puzzle as an examination tool. The decision to publish this information came as an afterthought, when it was learned that similar studies had not been published.

The crossword puzzle, although not a traditional tool for examination, may possess some unique qualities. It appears to be more than just a puzzle, and many students have found it to be an enjoyable activity. Furthermore, it is possible to use crossword puzzles to examine and evaluate student responses to the examination. Crossword puzzles offer the advantage of being able to assess student knowledge and understanding in a more enjoyable and less stressful manner.

Development of the Project

A national task force consisting of agriculture teachers, science teachers, teacher educators, and business/industry representatives met in St. Louis in July of 1993 to begin the process of developing a structure and defining the content of the Applied Environmental Science instructional materials. During the succeeding months, a working document and conceptual model (see Figure 1) were produced to guide the development of the project. The plans are for the Applied Environmental Science instructional materials to consist of an introductory unit (Unit A) and seven additional units (each consisting of two levels, B and C) in specified areas of environmental science.

The objective of Unit A, "Introduction to Environmental Science," is to introduce students to the concepts of environmental science. It was encouraged that students be conscious and concerned about the environment in which we live, recognize the need to conserve our natural resources, and begin to understand the interrelationships between agriculture and the environment. The introductory unit is comprised of a total of nine instructional plans in three topical areas.

Each instructional plan will include desired student outcomes, study questions, a content outline, possible teaching procedures, student activities, and a sample evaluation. The three topical areas are: introduction to Ecology, Human Relationships with the Environment; and Agriculture's Relationship with the Environment. Unit A can be taught as an independent unit or be followed with one or more of the level B and C units. The nine instructional plans were field tested during the fall of 1994 by selected secondary agriculture and science teachers across the country.

The level B units are currently under development and are to be structured to encourage students to investigate seven environmental areas. The seven environmental areas are: Identification and Management of Ecosystems; Management of Waste; Chemicals and the Environment; Soil Conservation; Land Use, Regulations, and Ordinances; Water Quality; and Air Quality.

The level B units will consist of instructional plans similar to the Unit A instructional plans; however, more student activities are being included. The student activities are being developed as independent activities that will allow teachers to use them separately from the instructional plans. The level B units will be field tested by secondary agriculture and science teachers during the fall of 1995.

The level C units will be structured as student investigations and will involve community-based, problem-solving activities. The structure will focus on identifying factors that affect the local environment and an analysis of what students can do to become better stewards of their...
Student performance on the weekly exams was consistently better throughout the semester when the exam was presented as a crossword puzzle. Furthermore, students tended to improve their success rate (percent correct answers) with the repeated exam format (i.e., exams 2, 3, and 4), whether the exam was presented in the form of a crossword puzzle or fill-in-the-blank. However, while the percent correct answers for the fill-in-the-blank remained below that of the crossword puzzle throughout the semester, students receiving the fill-in-the-blank format improved their mean score to a greater extent than when receiving the crossword puzzle (i.e., 16.4 versus 5.7 percentage units over the four-exam period, respectively).

Students given a crossword puzzle as a study guide to assist them in preparing for the next week’s exam had a mean percent correct score slightly better than those not given the study guide (78.6% versus 65.9%, respectively). The reasons for incorrect answers were not markedly different between those receiving the study guide and those who did not (i.e., misspelled words, 1.4 vs. 2.1; wrong answer, 17.2 vs. 18.4; and no attempt, 10.8 vs. 13.6, respectively).

A number of different instruments is typically used to assist students in the learning process and to assess their level of understanding of subject matter. While homework assignments, quizzes, term papers, group projects, class participation, and oral reports are all commonly used, a major part of the students’ grades is based on exams (Deiter & Pierce, 1991). Unfortunately, most exams are not viewed with favor by the student. The results of the present study suggest that students taking exams in the crossword puzzle format are significantly more successful at deriving the correct answer. The study further suggests that the reasons for incorrect answers relative to each exam format, misspelled words were not a major source of error with either format.

However, students taking the exam as a crossword puzzle are five to six times more likely to give the wrong answer, than are students of the crossword puzzle. However, students taking the exam as a fill-in-the-blank are more willing to attempt the answer.

One might conclude that several features of the crossword puzzle enhance student success at deriving the correct answers. Such features as knowing the size of the word gives direction as to the possible correct answer. In addition, after determining the correct answer to one segment of the crossword puzzle, the student is given this answer as another correct answer by inspecting letters from previous answers. The end result is more incentive to pursue the answers, resulting in more correct answers. However, if the student has no clue as to the possible answer, knowing the size of the word and/or specific letters within the word the student correctly did not encourage, and may have discouraged the attempted answer. This was evidenced by the increased number of unattempted answers with the fill-in-the-blank format. Also, in the introductory course, 23 of the 107 students chose not to do the crossword, compared to 11 who elected not to do the fill-in.

It might be concluded that the crossword puzzle effectively used as a teaching/learning instrument. This may be a result of many factors, including clues given by knowing the size of the word and/or by inspecting answers. Furthermore, the crossword puzzle format allows students to rely on a combination of verbal, visual, and kinesthetic skills to recall answers, while the fill-in relies on verbatim memory alone (Minniger, 1984; Bensent, 1993). It is suggested that kinesthetic memory associated with the horizontal or vertical placement of words and the act of entering letters one at a time may help in triggering the recall process. A report on student temperament/learning style and the use of the crossword puzzle has been published (Hallman, et al., 1992).

Throughout the course of the semester several students indicated that they enjoyed the challenge the crossword puzzle exams provided them. Thus, because the students found this exam format more enjoyable, they may well have experienced less test anxiety (Tryon, 1980) and greater success. Furthermore, several of these students actively pursued receiving, and possibly sharing, the crossword puzzle study guide as a means of improving their exam scores. The obvious lack of control in the distribution and use of these crossword puzzle study guides leads to the difficulties in assessing their value.

References


Environmental Science...

(continued from page 18)

environment. Teachers will be provided with activities that will enable them to lead students through an analysis and evaluation of local environmental issues. In addition, students will be presented with environmental problems from their local communities and encouraged to develop possible solutions to the problems.

Dissemination of the Project

After the instructional materials have been developed and field tested, a "train the trainer" workshop will be conducted. Workshop participants will be expected to network with teachers in their respective states and conduct teacher workshops on the effective use of the instructional materials. In addition, agricultural/natural resources teachers will be encouraged to network with biology and earth science teachers in using the instructional materials, therefore expanding the potential impact of the project.

The environment and concerns over its conservation are major issues facing citizens about to enter the 21st century. Individuals, organizations, corporations, and government agencies are calling for educational programs to increase awareness and knowledge of the environment and the conservation of its resources. It is the intent of the agricultural education profession, through the Applied Environmental Science Instructional Materials project, to provide materials to help teach students about the environment as we enter the 21st century.

References


Teaching Using The Forked-Road Problem

Agriculture students, and students in general, need to learn decision-making and problem-solving skills to effectively live and work in our changing society. Crnkilton (1980) stressed this importance by stating that it is more critical today for students to learn problem-solving skills than it has been in the past.

Teaching students using a problem-solving approach is not a new concept to agricultural education. However, from time to time there is a need to discuss, evaluate, and recommit ourselves to using problem-solving as a way of teaching. The purpose of this article is to discuss one of the most widely used problem-solving techniques.

Stewart (1959), and more recently Hodges (1991), concluded that teaching using problem-solving should be no different than the manner in which we solve problems and make decisions in our daily lives. Therefore, the way in which we teach students to make decisions and solve problems should model the decision-making skills used in everyday life.

Have you ever made a decision in which you had to choose between two alternative courses of action? What about making the decision to purchase an IBM or Macintosh computer system for your home or school? Agriculture teachers, even through the years have classified this type of problem or decision as a Forked-Road problem.

For years teachers have used the Forked-Road problem solving technique in their teaching. Examples include teaching students to select the appropriate welding electrode; to decide between using artificial insemination or natural breeding in a cattle herd; to select the type of grass to grow for a lawn; to select a construction project; to select between different livestock or crop enterprises; to select the best company for supplies; and to determine which FFA project the chapter should undertake. The examples that could be listed are unlimited.

However, the main criterion in a problem of this nature is that students have two alternatives to choose from in solving the problem.

In guiding students in solving a Forked-Road problem, the teacher must first lead students to a clear definition of the problem. In addition, the teacher and students should identify the two alternative solutions to the problem (see diagram of Forked-Road chart).

After the problem is clearly defined and the two alternative solutions have been selected, the "factors to consider" in choosing between the two alternatives need to be identified. In making decisions, managerial or otherwise, certain factors must be considered to make the decision. These factors should be identified with the help of students. Students may need time to gather and use resources in identifying these factors.

After identifying the "factors to consider," the facts and relevant information for each factor should be identified. This process is usually completed using the supervised study teaching method. It is during this process that students are actively using resources to seek the necessary data and information to make the decision (solve the problem) between the two alternative solutions.

In the final step, students should be guided in analyzing and evaluating the facts and related information to come to a conclusion to the problem. Based on the analysis and evaluation of the information collected, students should select the best possible choice between the two alternative solutions. While situations of students and the decisions to make (problems to solve) will differ, the procedures for selecting the most appropriate course of action can be transferred to similar situations and other topics.

The Forked-Road problem solving technique is not a new idea. It has been used by teachers as a teaching tool and by individuals in everyday life for years. One of our goals as agriculture teachers should be to teach students how to think, learn, and make decisions. The Forked-Road problem is but one of many tools in our teaching methodology toolbox that can assist us in achieving that goal.

References

Teaching Agriculture... (continued from page 4)

Fall and then made a number of passes over this same field in the spring because more corn could be produced per acre. Only a few still make this mistake. This process is too costly, not only because of the fuel and time, but also because of the destruction to the water systems of this country. We are continually learning how to do a better job of producing food in a more appropriate way. Therein lies the opportunity for our students. America's farmers are doing a better job of producing food in a more sustainable way. Does this mean that we sacrifice a crop because of a severe pest infestation? No, of course it doesn't. Our students need to understand the difference between measured, step-by-step approaches to solving our environmental problems and economic suicide. We need to view environmental education on a continuum. Today it is nearly impossible to pick up a farm magazine without seeing articles, advertisements, editorials, and farmers writing about a better environmental approach to production agriculture. This was not true five or ten years ago. Educators are making a difference.

Ultimately, our students need to understand that agriculture and the environment are not two separate issues, but they are one in the same. In order to do a good job of producing food and fiber, collectively we all need to do a good job protecting the environment for ourselves and future generations.
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