

## Agriculture and science teaching link

**Abstract:** *How can rural and urban youth, who grow up unconnected to the land, become better acquainted with agriculture—particularly sustainable agriculture? Using data from an earlier Leopold Center-funded pilot study (95-09), a cross-disciplinary-designed teaching packet about agriculture was created for use in Iowa high schools. The packet, which includes hands-on problem solving and demonstration activities, was introduced to 75 Iowa teachers at four professional development events in 1995 and 1996 (and received positive responses.)*

### Background

Appreciation for agriculture is a quality we will have to work to instill in our future leaders because more Iowans now grow up in urban rather than rural surroundings. How can we promote interaction between rural and urban dwellers so that they will work together for a strong and environmentally sound agriculture? A good place to start is the classroom, where there is much opportunity for additional effort in this area. High school agriculture and science teachers are important agents of change in shaping the attitudes of our future farmers and rural/urban citizens. If teachers are to be effective, they must use innovative educational tools and involve their students in real life, hands-on experiences.

A pilot study funded by the Leopold Center in 1994-95 (#95-09) generated suggestions on how to shape materials for science classroom use and create guides for team and student teaching. The need exists for a cross-disciplinary designed teaching packet about agriculture that can be used in Iowa educational settings.

Original goals of this project were:

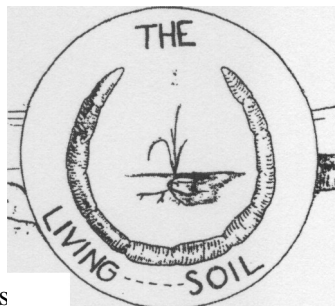
- 1) Based on the findings of the earlier pilot study, adapt materials to best fit the science classrooms and develop guides for team and student teaching with a completion date of June 30, 1996.
- 2) Introduce the revised materials to a minimum of 50 teachers via the Iowa Communications network (ICN) and ISU's new

Brenton Center facilities during the 1996-97 school year.

- 3) Carry out a project evaluation and publicize the results of the project by June 30, 1997.

### Approaches and methods

In July 1995, an advisory committee was chosen, including pilot study teachers, and Iowa State University (ISU) College of Education and Iowa Department of Education representatives. This group was to provide assistance in planning and carrying out the project. By September 15, they had developed a plan of work and a first draft of both student materials and teaching tools. A second draft of the materials was prepared by December



1 and was given to the advisory committee and other teachers for feedback. Plans were made for 1996 use of the ICN for inservice sessions. In June 1996, the newly minted educational materials were distributed to teachers and an evaluation instrument was prepared. An invitation to attend the ICN session was sent to Iowa science and agriculture teachers. This helped determine how many were interested in participating and a mailing list was generated.

### Principal Investigator:

Eldon Weber  
Agricultural Education  
and Studies  
Iowa State University

### Budget

\$18,000 for one year

## Results and discussion

A 52-page educational packet called *Agriculture-Science Link to the Living Soil* (including a guide for team and student teaching) was developed and evaluated. Seven members of the advisory committee helped analyze the results of the pilot study to determine how to best structure these materials. Among those participating in the effort were Stacey Newbrough, science teacher, Waverly-Shell Rock High School; Dave Briggs, agriculture teacher, Jefferson High School; Cheri Neilsen, math teacher, Wilson Junior High, Council Bluffs; Bernard Hermanson, science teacher, Sumner High School; Jan Wiersema, Cherokee High School; Barbara Licklider, College of Education, ISU; and Rich Pirog, Leopold Center.

The *Agriculture and Science Teaching Link Educational Packet* features hands-on laboratory and field exercises such as soil mixing with earthworms, plant response from earthworm activity, composting with earthworms, development of an earthworm farm, earthworm tolerance to chemicals, a day in the life of a microbe, what lives between your toes, tour of the underground, microscopic view of soil organisms, an experiment in symbiosis with soybeans, measuring soil organism activity in compost, analyzing the impact that ants have on soil mixing, and comparing soil organism counts at different residue levels.

The packet is well adapted to teaching skill building and has a linkage to the arts. It is of interest to all students regardless of whether

they have a strong interest in science, which will encourage the participation of women and minorities. Lessons are designed as stand-alone units, to supplement the Living Soil curriculum, or to be inserted into the *Exploring Soil Science and Sustainable Agriculture with Your Guide the Earthworm*—also funded by the Leopold Center.

The packet was adapted for high school and middle school students based on a team-teaching approach. Science teachers and students will hone their science expertise in laboratory methods and techniques. Agriculture departments will provide resources insuring coverage of "feasible farming practices and concepts." In team teaching schools, the two departments will complement each other in their approach, both at the high school and middle school levels. In urban schools where agriculture teachers are not available, farmers and agribusiness people will be identified to introduce the agriculture concepts.

The original objective of introducing the revised materials to a minimum of 50 teachers via the ICN was scaled back due to a reduction in funding and time allotted for the project. Instead, more than 75 teachers were exposed to the materials at the 1995 summer meeting of the Soil and Water Conservation Society, the Fall 1995 Academy of Science Convention, and the March 1996 Agri-Science Fair. Five science teachers and one agriculture teacher assisted in introducing the materials at these three events. Teachers also participated in a June 1996 ICN workshop, funded through the Leopold Center conference and workshop grants program.

Participating teachers evaluated the materials for effectiveness in team teaching, flexibility in adapting to a wide variety of learning styles, and in ease of use for high school students in teaching lower grade students. The format follows a design popular with science teachers, including hands-on problem solving and demonstration activities. Teachers had a positive response to the materials for classroom and field activities.

Science teachers attending the Academy of

**Earthworm artwork added appeal to the educational materials.**



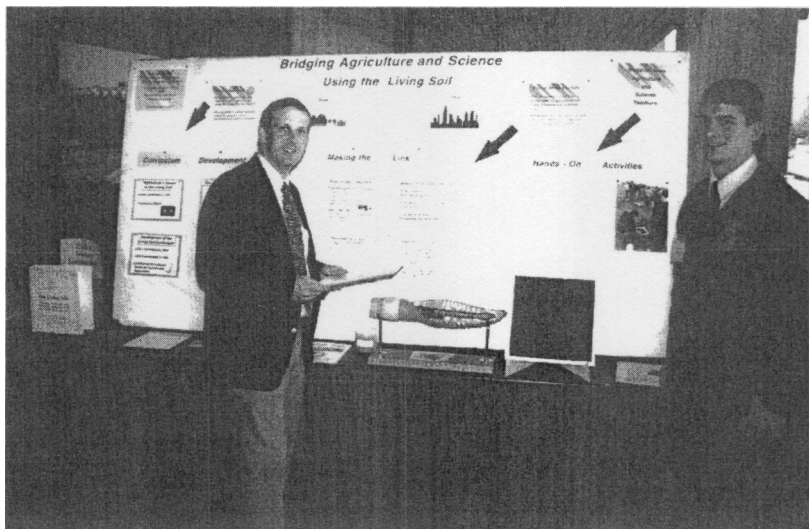
Science Convention, where the educational packet was introduced at two concurrent sessions, expressed a keen interest in linking soil biology to agriculture. This was seen as a special opportunity to help urban students gain a better appreciation of agriculture as they see how agricultural concepts are coupled with the living soil environment. Students could then see how improving the soil environment can be very profitable if farming operations are managed properly. (This concept is central to the *Living Soil Curriculum* materials.)

Agriculture and science teachers are experts at using lab and field exercises. The exercises chosen for this *Ag/Science Teaching Link* were designed to stimulate student interest and provide them with opportunities to use their higher-order thinking skills. Teachers agree that the most motivating educational experiences are created with live animals and plants. The earthworm, billed as nature's master tiller, has real potential for encouraging student interest in soil biology and plant growth. Traditional, as well as sustainable, agriculture practices need to be compared and analyzed to assess their impact on living soil organisms.

*Agriculture Science Link to the Living Soil* is being promoted through the Agricultural Education Materials Service (AEMS) distribution service in ISU's Department of Agriculture Education and Studies. The materials are also featured on the World Wide Web sites for the "Year of Water" and the Agricultural Education and Studies department. Copies are available for \$14 from the AEMS.

## Conclusions

Evaluations of the education packet covered several stages, including field testing by teachers from the pilot project. Other teachers were exposed to the materials and offered evaluations at the 1995 summer meeting of the Soil and Water Conservation Society, the 1995 Fall Academy of Science Convention, the March 1996 Agri-Science Fair, and the June 1996 ICN teachers workshop. Participating teachers liked the content, format, ease of use, and the adaptation of the educational packet to the most popular learning styles of the students.

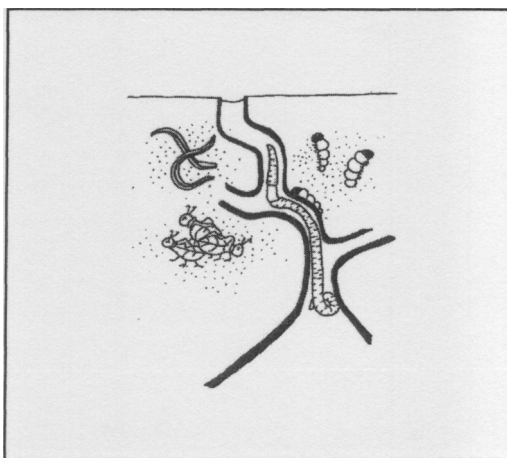


## Implications

The success of this project suggests further opportunities to adapt sustainable agriculture materials to the science classroom, as well as to other academic disciplines such as math and language. Future linkages of the Leopold Center to agriculture and science teachers could be cemented with a new teacher professional development program incorporating sustainable agriculture topics into a year-round program.

A new Professional Development for Agricultural Education program is being created with the State Department of Education, the ISU Agricultural Education and Studies Department, and the Iowa Vocational Agriculture Teachers Association. This initiative could be broadened to include science teachers and sustainable agriculture topics.

**Dave Briggs (left) of Jefferson High School with Living Soil display at March 1996 Agri-ScienceFair.**



For more information contact Eldon Weber, Agricultural Education and Studies, Iowa State University, Ames, Iowa 50011; (515) 294-0893; e-mail [eweber@iastate.edu](mailto:eweber@iastate.edu).