Food And Agriculture Careers In Technology And Science (Facts) Student Symposium: Meeting The Challenge Of Research And Education

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Abstract

We need viable research programs in agriculture, particularly those that concern food and nutrition research. Several organizations have recognized and encouraged change in agriculture research and education. The National Council for Agricultural Education recently expressed the need to examine ways to improve agricultural education. The USDA Agricultural Research Service, Beltsville Agricultural Research Center (BARC) sponsors the Research Apprenticeship Program, which provides an excellent opportunity for high school students to gain research experience through summer employment. This article describes a student symposium developed by BARC to establish a stronger link between research and education and encourage students to pursue undergraduate training in agricultural sciences.

Introduction

Viable research programs in food and nutrition research will depend upon well-trained scientists and technical support and upon how well we encourage today's students to pursue careers in research and science. Scientists will be needed to conduct research in food safety; diet, nutrition, and health; biotechnology; environmental issues; food engineering, processing and packaging; and, the molecular basis of food (Research Committee of the Institute of Food Technologists. 1993).

Various organizations have recognized and encouraged change in agricultural research and education. The National Research Council specifically recommended a role for the U.S. Department of Agriculture (USDA) in broadening, redirecting and enhancing the quality of education in the agricultural sciences (Natl.Research Council, 1988a, 1988b). Increased funding for "agricultural research in biotechnology, alternative agriculture production methods, food safety and nutrition, alternative uses of farm commodities, development of high-value products and water quality..." has been recommended (U.S. National Commission on Agriculture and Rural Development Policy, 1989). The Food and Nutrition Board recommended that the USDA offer summer training programs for undergraduates at its five Human Nutrition Research Centers (Food and Nutrition Board, 1994) .

The USDA, Agricultural Research Service (ARS), Beltsville Agricultural Research Center (BARC) sponsors the Research Apprenticeship Program (RAP) for high school students. RAP provides an excellent opportunity for students to work during the summer with research scientists in all five BARC institutes. However, there was no formal mechanism for students to connect the work of science with education.

Symposium Purpose and Planning

To establish a link between scientific theory, its practice and education, BARC developed the "Food and Agriculture Careers in Technology and Science (FACTS)" Student Symposium. Its purpose was to show the vast array of sciences and technological fields in agricultural research to high school students and teachers. Students were encouraged to pursue an undergraduate education in the agricultural sciences. Teachers were encouraged to expose their students more to the opportunities available in the field.

School district representatives from nearby counties in Maryland, Virginia, and the District of Columbia were invited to join the FACTS planning committee. Other committee members were from the USDA's Beltsville Human Nutrition Research Center, Plant Sciences Institute, Office of Civil Rights, Personnel Office, and Office of Technology Transfer and from the NASA Office of Technology Transfer.

The school district representatives' input was particularly important for recruiting students and teachers and for making decisions on:

- how to present information that would encourage student participation in FACTS. *A FACTS poster presented someone at a computer, the Food Guide Pyramid, and various graduated cylinders rather than a barn, crops, and animals (Figure 1).*
- how to accommodate schools/students that had to leave early because of school regulations, sports, school dismissal times or employment. *FACTS was a full day activity, but early departures were accommodated.*

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• how to introduce students to the agricultural sciences as an in-class pre-activity. *A video tape on agricultural research was provided to each school district by the ARS National Visitors Center.*

• awarding certificates of achievement to students attending the symposium.

The ARS Public Information Office arranged media coverage and prepared the FACTS materials (i.e., flyer, brochure, pre-registration form and poster) with input on content and design from the planning committee. Each participating school district's public affairs person was contacted to determine the media to target. Information packages and a media advisory focusing on students, education, research and technology were prepared.

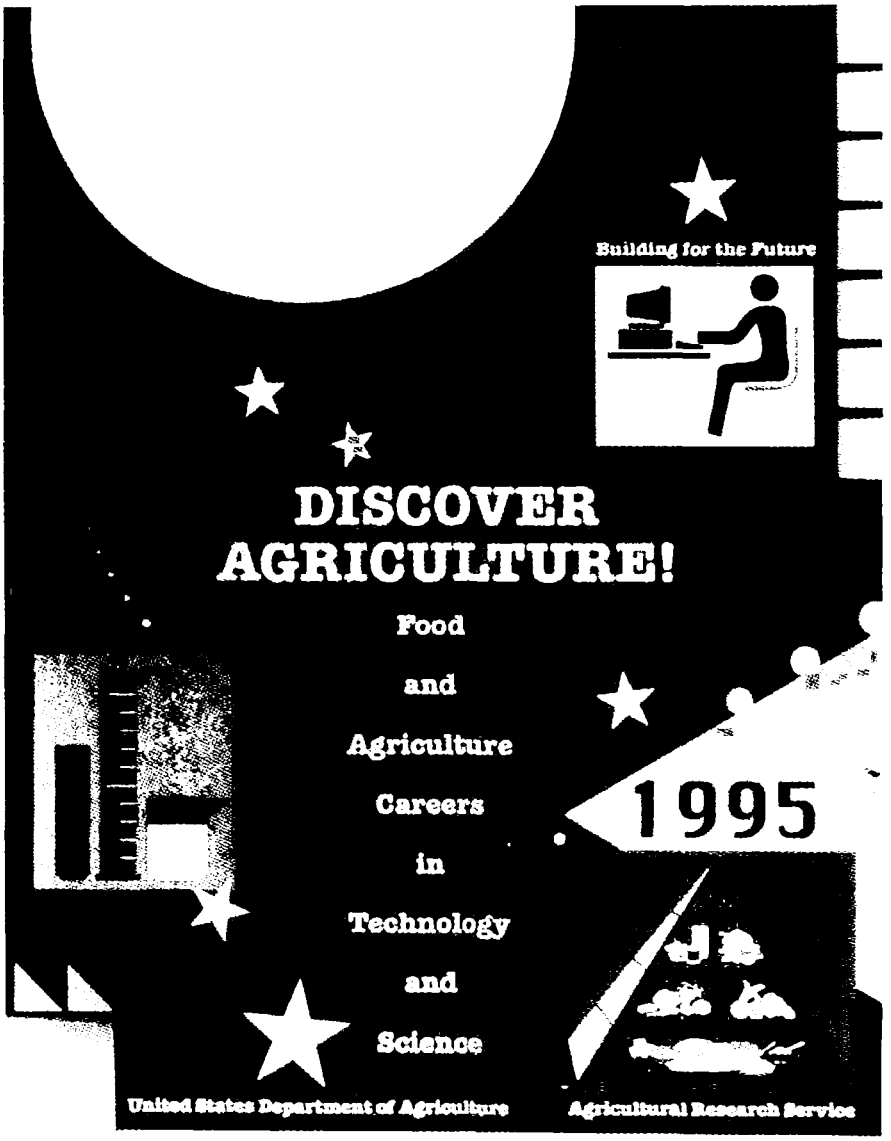

Figure 1. FACTS Student Symposium 1995 Poster

Media coverage on the day of the event was impressive. A local cable news network and two of the school districts shot video segments. After the symposium, newspaper articles highlighting students' impressions of agricultural research appeared in several local newspapers.

Symposium Program

The FACTS Student Symposium was an all day event offered free of charge to students and teachers. Five county school districts participated in FACTS: Anne Arundel, Howard, Montgomery, and Prince Georges Counties, MD; Arlington County, VA; and Washington, D.C. The day began with an opening plenary where the BARC Director welcomed everyone and reiterated the purpose of FACTS. Because BARC is a 7,000 acre research farm, a volunteer was assigned to each of the six groups. During the morning students and teachers rotated through the Beltsville Human Nutrition Research Center and the Plant Sciences Institute (Table 1). In the afternoon they rotated through the Livestock and Poultry Sciences Institute and the Natural Resources Institute (Table 2).

We used various methods to demonstrate research programs. Scientists at each BARC institute shared their personal academic and work experiences with the students and teachers. Students interacted with scientists through lab tours, computer and experimental demonstrations, posters and mini-lectures at each institute. For example, students went inside the calorimetry room and tested the exercise equipment; observed bees in an open standard bee hive; worked with analytical software used in body fat measurement; went into the fields to view various experimental weeds, and used an electronic bulletin board to access food composition data.

After the morning session all groups were brought together for lunch and students and teachers were told about the Research Apprenticeship Program (RAP). Students were encouraged to apply to the program; an annual process that takes place in the spring.

Lunch also included entertainment structured in the context of the FACTS experience. The students played "BARC Jeopardy," a game which involved questions BARC scientists had provided beforehand. These questions pertained to information the students should have learned that morning. Students enjoyed the game because it allowed them to test their knowledge in a fun way. "BARC Jeopardy" also allowed the scientists to observe how science could be delivered in a creative manner.

Participants' Evaluation of the Symposium

In general, the FACTS Student Symposium was viewed as being highly successful. A major goal was that students and teachers would realize that a career in science and technology could be just as feasible and exciting in agriculture as it is in medicine. The specific evaluation objective was to assess whether FACTS helped students and teachers to understand that agricultural research meant science and technology and encompassed more than their traditional views of agriculture. Evaluation questions were based on the information that would be needed to plan future FACTS Symposia. The planning committee selected questions that would address value, logistics, format, content and changes in attitude.

One hundred sixty-five students and twenty teachers attended FACTS. Sixty-three percent of the students and 65 percent of the teachers completed the evaluation forms (Table 3, 4). When asked what they liked best about FACTS, students and teachers chose the demonstrations and scientists. Most participants said the amount of time spent at each institute was just right, though several would have preferred more time at a specific institute or with a specific scientist. Students and teachers were most impressed with the variety of sciences involved in agricultural research. Students also felt they learned how much computers and other technologies are utilized in agricultural research. The major comment from teachers and students was that they would encourage others to register for FACTS in the future.

Conclusion and Recommendations

If we are to successfully meet the agricultural and food challenges of the 21st century, we must examine ways to improve agricultural education (National Council for Agricultural Education, 1995). "Real life" science can be presented to students in an interesting and creative manner to foster their interests in the agricultural sciences. Results from this first FACTS Symposium demonstrated how we might improve overall BARC student programs. FACTS will introduce students to the Research Apprenticeship Program (RAP). In turn, more substantive seminars on research design and analysis will be incorporated into RAP. More activities like FACTS should be sponsored by partnerships between government, public schools, universities, and the private sector.

Table 1. FACTS Student Symposium 1995 Morning Session

Beltsville Human Nutrition Research Center

Small groups of students rotated through the following research units:

FOOD SURVEYS RESEARCH GROUP
- SurveyNet (computerized food coding system)
- "1994-96 Continuing Survey of Food and Individual Intakes" instruments

NUTRIENT REQUIREMENTS AND FUNCTIONS LABORATORY
- Poster Session

FOOD COMPOSITION LABORATORY
- Poster Session

CAROTENOIDS RESEARCH UNIT
- Protein Electrophoresis Demonstration

NUTRIENT DATA LABORATORY
- Nutrient Data Electronic Bulletin Board

DIET AND HUMAN PERFORMANCE LABORATORY
- Body Composition Measurements

DIET AND HUMAN PERFORMANCE LABORATORY
- Calorimetry Room

HUMAN STUDIES FACILITY
- On-site facility where people participate in diet studies

Plant Sciences Institute

Students were divided into 6 groups during the morning. Each group met with scientists in 3 different laboratories:

1. FRUIT LABORATORY
   VEGETABLE LABORATORY
   FLORAL AND NURSERY PLANTS RESEARCH (**National Arboretum**)

2. BEE RESEARCH LABORATORY
   INSECT NEUROBIOLOGY AND HORMONE LABORATORY
   ELECTRON MICROSCOPE

3. INSECT BIOCONTROL LABORATORY
   MOLECULAR PLANT PATHOLOGY LABORATORY
   NEMATOLOGY LABORATORY

4. INSECT CHEMICAL ECOLOGY LABORATORY
   HORTICULTURAL CROPS QUALITY LABORATORY
   PLANT MOLECULAR BIOLOGY LABORATORY

5. SOYBEAN AND ALFALFA RESEARCH LABORATORY
   SYSTEMATIC BOTANY AND MYCOLOGY LABORATORY
   WEED SCIENCE LABORATORY

6. SYSTEMATIC ENTOMOLOGY LABORATORY
   BIOCONTROL OF PLANT DISEASE LABORATORY
   NATIONAL GERMPLASM RESOURCE LABORATORY

Table 2. FACTS student symposium 1995 afternoon session.

Livestock and Poultry Sciences Institute

Students rotated through the following sessions:

GERMPLASM AND GAMETE PHYSIOLOGY LABORATORY
- Access on the Internet: Introduction to LPSI Homepage and Information Resources Available

GROWTH BIOLOGY LABORATORY
- Live Animal Imaging and Body Composition

BIOSYSTEMATIC AND NATIONAL PARASITE COLLECTION UNIT
- National Parasite Collection

MEAT SCIENCES RESEARCH LABORATORY
- Meats Research and the National School Lunch Program

Natural Resources Institute

Students rotated through concurrent sessions with scientists in the afternoon:

ENVIRONMENTAL CHEMISTRY LABORATORY
- Saving the Chesapeake Bay
- Bioremediation: Cleaning Up the Environment with Special Plants

HYDROLOGY LABORATORY
- Agricultural Information Obtained with Satellites and Aircraft

REMOTE SENSING RESEARCH LABORATORY
- Computers and Satellites Make a New Kind of Farming Possible

SYSTEMS RESEARCH LABORATORY
- Computer Model Helps Soybean Growers

Table 3. Student evaluations of FACTS student symposium 1995. N=104.

Question/Item	Responses Per Item[z]
How much did you learn from FACTS?	
too much information	16
just the right amount of information	78
too little information	8
no response	2
What did you like best about FACTS?	
demonstrations	66
speakers	40
written materials	8
slide show	1
fungus/fungi	4
BARC Jeopardy game	1
What would you change about FACTS?	
nothing	48
would like more time	20
would like more hands-on	28
would like vegetarian lunches	4
would like to choose the BARC institute to visit	2
other responses	12
Was the amount of time at each Institute...?	
too much	10
just right	62
too little	32
Would you encourage your classmates to register for FACTS in the future?	
yes	88
no	12
no response	4
In what way did FACTS change your ideas about agricultural research?	
learned about the variety of sciences involved	68
learned how much computers and other technologies are involved	30
no change in ideas about agricultural research	18

[z] More than one item could be selected on some questions.

Table 4. Teacher evaluations of facts student symposium 1995. N=13.

Question/Item	Responses Per Item[z]
How much information did the students receive from FACTS?	
just the right amount of information	11
too much information	1
no response	1
What did you like best about FACTS?	
demonstrations	11
speakers	2
written materials	1
hands-on	1
What would you change about FACTS?	
nothing	3
increase hands-on	4
more time at each institute	3
change teaching methods so that lecture is less technical	2
end earlier	1
Was the amount of time at each Institute ...?	
just right	8
too little	4
too much	1
Would you encourage other students to register for FACTS in the future?	
yes	12
no response	1
In what way did FACTS change your ideas about agricultural research?	
learned about the variety of sciences involved	10
learned how much computers and other technologies are involved	4
no change in ideas about agricultural research	2
other - "learned how scientific it is"	1
What pre-activity did the students participate in to prepare them for FACTS?	
viewed the video, "21st Century Explorers"	2
class discussion	4
no pre-activity conducted	3
other - not specified	4

[z] More than one item could be selected on some questions.

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A Capstone Problem Solving Course Revisited

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Abstract

Several years ago in an article in the NACTA Journal (Zimmerman, 1991), I wrote about a cap-stone problem solving course which I developed for students at a technical college (Ohio State University, Agricultural Technical Institute) and had offered for the first time. This course, *Problem Solving Using Systems Approaches*, has been offered annually for a total of seven times. This article is a reexamination of the problem solving course and a) reviews the literature to see if the course topics and content remain current and important, b) describes the major changes which have been made in the course during the past six years, and c) discusses student performance in and evaluation of the course.

Introduction

The rationale for and initial content of the course, Problem Solving Using Systems Approaches, were based on many studies conducted during the 1980's which addressed the improvement of college teaching, curriculum reform, and results of industry/graduate surveys. This body of research clearly documented the importance of incorporating concepts and skill development in such areas as problem solving, communications, creative and critical thinking, interpersonal relations, group processes and teamwork, leadership, personality and learning styles, and decision making into course work and the curriculum using an interdisciplinary approach.

Does the current literature continue to support the importance of integrating these topics into courses and the curriculum? Even a review limited to articles published in the NACTA Journal since my article appeared in 1991 provides ample evidence that this question can be answered with a resounding "yes."

Authors of several articles discussed the results of industry surveys. Barkley (1991) surveyed employed graduates of the College of Agriculture at Kansas State University and reported that a large majority listed communication skills and people skills as the most important in their careers. Neal, et al. (1991) surveyed Ohio agricultural leaders and advisory committee members and found that communications and personnel management/leadership were two of five topics listed most often as important employment skills. Radhakrishma and Bruening (1994) surveyed agribusiness employees in Pennsylvania and reported that interpersonal and communication skills were included as very important for pursuing careers in agribusiness by the employee group. Bruening and Scanlon (1995) set up four agribusiness industry focus groups to help identify appropriate curricula modifications and revisions for courses offered by the Department of Agricultural and Extension Education at Penn State. Critical thinking, problem solving, decision making, team work, leadership, and communication skills were identified by this process as important topics to consider.

Several authors discussed important topics to

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