

Graduate Enrollments & Degrees Granted in Agricultural and/or Natural Resource Management at 4-year State Supported Non-Land Grant Colleges and Universities

College or University	Graduate Enrollment		Graduate Degrees		
	78-79	79-80	80-81	78-79	79-80
Northern Arizona University-Flagstaff	6	7	6	3	4
Arkansas State University-Jonesboro	11	4	31	2	3
Univ. of Arkansas-Montecello	0	0	0	0	0
Southern State, Magnolia, Arkansas	NO REPLY				
Arkansas Polytechnic College	0	0	0	0	0
California State University-Humboldt	126	132	150	26	20
California State University-Chico					
California State University-Fresno	1089	1119	1139	31	35
Calif. Poly. State University-Pomona	9	17	31	2	4
Calif. Poly. State Univ.-San Luis Obispo	93	97	100	50	44
Southern Illinois University	106	109	114	48	58
Western Illinois University	0	0	0	0	0
Illinois State University	0	0	0	0	0
Ball State University-Indiana	20	23	25	4	6
Fort Hays Kansas State	0	0	0	0	0
Western Kentucky University	22	24	24	7	7
Morehead State University-Kentucky	40	18	17	10	12
Murray State University-Kentucky	38	38	31	10	22
Eastern Kentucky University	NO REPLY				
Southeast Louisiana University	0	0	0	0	0
University of Southwestern Louisiana	20	22	18	0	6
McNeese State University-Louisiana	0	0	0	0	0
Northeast Louisiana University	0	0	0	0	0
Northwestern State University of LA.	NO REPLY				
Louisiana Tech. University	0	0	0	0	0
Nicholls State University-Louisiana	0	0	0	0	0
Western Michigan University	0	0	0	0	0
Southeast Missouri State University	0	0	0	0	0
Northeast Missouri State University	0	0	0	0	0
Northwest Missouri State University	25	28	28	6	7
Southwest Missouri State University	0	0	0	0	0
Central Missouri State University	NO REPLY				
Eastern New Mexico University	0	0	0	0	0
Panhandle State University-Oklahoma	0	0	0	0	0
Austin Peay State University-Tennessee	0	0	0	0	0
Tennessee Tech. University	0	0	0	0	0
Middle Tennessee State University	0	0	0	0	0
Angelo State-Texas	13	10	12	0	0
Sul Ross State University-Texas	23	22	10	6	8
East Texas State University	0	0	0	0	0
West Texas State University	49	54	44	13	13
Sam Houston State University-Texas	65	63	57	24	32
Texas A&I University	54	48	43	40	38
Texas Tech. University	177	203	203	45	48
Stephen F. Austin State University-TX	92	98	112	14	14
Southwest Texas State University-TX	22	5	6	10	2
Tarleton State University-Texas	54	49	52	27	24
University of Wisconsin-Platteville	22	24	26	11	13
University of Wisconsin-River Falls	13	10	11	12	12

Teaching Students To Solve Problems

D. L. Howell, F. L. Lukezic,

L. L. Wilson

Summary

This paper summarizes the development, conduct, and evaluation of an advanced course emphasizing applied problem solving on an interdisciplinary basis. The course was oriented toward tropical agriculture in developing and underdeveloped countries, although the physical resources of Puerto Rico were its primary subject. The course was generally informally taught, with a maximum of 16 students from different disciplines teamed so as to make recommendations which would enhance agricultural productivity and contribution to specific geographical areas of Puerto Rico. The areas were selected so as to vary in rainfall, topography, soils, agricultural enterprise orientation, and proximity to market. After in-depth classroom study of these specific sites in Puerto Rico, the students and faculty visited each study site to determine directly the applicability of their recommendations derived in the classroom. In addition to learning of new technology, integration of principles from other subject matter areas, and application of problem solving to real world situations, the students had an opportunity to observe tropical agriculture first-hand, and to travel briefly, study, and consult in a different culture. Student evaluation of the course was extremely high, with an average of 9.5 of 10 possible. Several student comments indicated that this kind of course, different from the typical lecture format, was a necessary "cap" course, particularly for internationally oriented students.

Introduction

Many college students think of each course in a given program in and of itself. They recall the material, pass the test, and frequently don't refer to the course content again. Their main interest is in getting or keeping a high GPA and not how they can apply what they are learning to real world problems. To circumvent this manner of thought and applying Fincher's¹ hypothesis that learning is facilitated by the active participation of students and their level of aspiration is raised, a new "applied problem solving" course was introduced to students in the College of Agriculture at Penn State University in 1980. The objective of this course was to allow students to apply what they had learned in their earlier courses and new knowledge gained in research to solving agricultural problems in diverse areas of the tropics. The class spent ten weeks in the classroom analyzing agricultural production in the tropics and specifically in four identified study locations

Assistant Professor of Agricultural Education, Professor of Plant Pathology, and Professor of Animal Science, College of Agriculture, The Pennsylvania State University, University Park, PA 16802.



Jose Vincent Chandler, center, Secretary of Agriculture in Puerto Rico, identifies methods of improving coffee production to Curt Blank and Dr. Felix Lukezic on the tour.

in Puerto Rico. This was followed by a two-week field trip to Puerto Rico to observe the agriculture in these same study locations and to determine if the recommendations could (or should) be implemented. It also provided an opportunity to observe, live, and work briefly in a Spanish culture.

Development of the Course

Because of the interest of many students in international agriculture and the lack of tropical agriculture courses at Penn State, it was decided that a new course was needed. To provide the expertise for teaching the new interdisciplinary problem solving course, a team approach was necessary. Instructors representing agricultural education, dairy and animal science, and plant pathology planned and coordinated the course. Resource persons from other disciplines were brought in as needed. Many of the pitfalls common in team teaching which were identified by Matthews³ were avoided by having the instructors serve as resource people and by guiding the discussion rather than lecturing. Specific references were also included as resource materials.

The course objectives included the following:

(a) To identify crop and animal management systems most appropriate in tropical agriculture when considering the soil and water available, disease and insect problems, inputs available to farmers, markets and cultural concerns.

(b) To identify instructional approaches which encourage acceptance of new agricultural practices and systems most readily in a developing country.

(c) To develop plans for using an interdisciplinary approach to solve specific problems relating to agricultural production in the tropics.

Class members were junior, senior, and graduate students in dairy and animal science, agricultural economics and rural sociology, horticulture, agronomy, entomology, and general agriculture. Each week the class was given a specific problem to investigate and was asked to make recommendations on how to improve the agriculture in a specific location in Puerto Rico. Extensive

library use was necessary to formulate these recommendations. To encourage an interdisciplinary approach, the class was divided into teams of two students from different majors. Each team approached the problem using the expertise of the team members. They investigated the role of changing social structure, laws, land tenure, animal and crop production, and energy availability on present and potential contribution of agriculture to the citizenry. They were also to consider the effect of their recommendations on the environment, energy requirements, protein conversion, livestock requirements, soil maintenance, and cropping systems. Each team summarized their findings and recommendations on a single type written page excluding references. These were due to the instructors 24 hours before the class meeting to allow instructors time to check the references and recommendations. The student recommendations were used to stimulate class discussion. In this way students were given the opportunity to apply their prior learning and their expertise and simultaneously experience interaction with and consideration of other disciplines.

The instructors led class discussions relating to animal considerations, feed analysis, diagnosis of plant and animal disease symptoms, synthetic foods, introduction of new techniques into developing countries, soils of the Amazon Basin, ecological considerations of land clearing, and the design and interpretation of field demonstration plots.

Field Trip to Puerto Rico

Following this in-depth classroom study of Puerto Rican agriculture, three faculty members and the students journeyed to Puerto Rico. Students' expenses averaged \$500 each, which they paid themselves. Dr. Jose Quinones, Coordinator of International Programs for the University of Puerto Rico at Mayaguez, assisted with the itinerary. Included in the program were research in breeding of yams; introduction and management of new and existing grasses and legumes; horticulture crop pro-



At one stop on the Puerto Rico field trip, Steve Hoffman and Dr. Felix Lukezic examine a fruit tree on the Fortuna substation of the University of Puerto Rico.

action and improvement; livestock production and feeding experiments; sugar cane and rice production; and commercial production of vegetables, dairy, coffee, sugar, and other commodities.

Two days were assigned for students, accompanying extension agents, to visit local farms. This proved to be a very important part of the visit in that the students observed a greater variety of farming operations of various sizes and speciality crops, and directly observed the role of the extension specialist at the farm level.

In addition to the direct study and application of new and established technology in a tropical environment, the students experienced traveling, studying, and consulting in a Spanish culture. This was particularly good training for the high proportion of the students whose lifetime goal is work in international agriculture.

Periodically during the tour of Puerto Rico, the students and faculty discussed the recommendations made earlier in class for specific sites and revised these recommendations based on on-site assessment of physical and human resources. Another discussion session was held after the tour of Puerto Rico to determine modifications in course conduct and tour itinerary for subsequent years.

Course Evaluation

The students were very enthusiastic about the course, giving it an overall rating of 9.5 of 10. All the students felt the course developed their ability to study independently and apply subject material, and to integrate their disciplines with other subject matter areas. One student stated that "exposure to a whole series of concepts and sources was among the most valuable assets of IntAg 498, and of my training at Penn State thus far."

The value of the trip to Puerto Rico was also rated high by all. As one student commented, "Vincente-Chandler was a great way to end the trip. I especially enjoyed the coffee day at Maricao, the day with the sugar cane extension specialist, and talking with the vegetable farmer whom we met at Rio Piedros. Learning more about the various fruits and vegetables is also good exposure to what tropical agriculture is all about."

Because of the enthusiasm of the students and faculty, the course will be repeated. The feelings of all are summarized by one student, who said, "This course was a long time coming. I consider myself fortunate to have been in an experimental class with so much give and take. We all worked very hard to get where we did and next year's class should be able to improve even more. The approach was unique and something very valuable for undergraduate and graduate students to get them out of the typical lecture mode and thinking on their own."

Since completion of the class, the students have been in close contact with the instructors. They have shared articles which they encountered relating to their Puerto Rican experience. Those still on campus served as recruiters for the following class, and several graduates sought further international experience.

Kuhns² suggested that courses should strive to disseminate knowledge, stimulate good thinking, and develop lasting interest. This course meets all three of the objectives. In an informal survey via telephone of five other land grant institutions offering a comparable course in international agriculture, it was learned that while most institutions are using the lecture-discussion format some novel alternatives are being attempted. Perhaps this article will prompt other instructors to share their experiences.

References

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2. L. J. Kuhns. June 1977. "Teaching for Permanent Learning," *NACTA Journal*, 21:14-16.
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INTERNATIONAL STUDENT: What Do They Perceive As Academic Need?

Wilmer M. Harper
Introduction

The international student has long been a significant part of the student body in Colleges of Agriculture in the United States, and there appears to be a continuing strong demand for training of these students, particularly at the graduate level. During the period 1970-71 to 1977-78, the average annual rate of increase in the number of international students studying in the United States has been 12.8 percent (*Yearbook of Higher Education*, 1979-80). Although this increase is for students in all disciplines, the demand in the agricultural disciplines is strong.¹ In a study of agricultural economics for the period 1974-75 to 1977-76, Stevenson found the percentage of international students funded by U.S. sources declined 16 percent, but the number of international students studying agricultural economics increased 260 percent. It seems reasonable to assume that this strong demand for the services of Colleges of Agriculture is likely to continue into the future, but it will not be without its problems.

The role of the land grant university in the United States is currently discussed in terms of a new dimension: international programs (Kussow). Whether this becomes explicit or remains an implicit dimension of the land grant university's role, Colleges of Agriculture are, and will continue to be, faced with two potentially divergent needs. They must maintain for domestic students programs which have the course content expected of the

Harper is an assistant professor in the Department of Agricultural Economics at New Mexico State University, Las Cruces NM 88003.