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Inservice Education Needs of Teachers of Pilot Agriscience Courses in Mississippi

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Teachers of agriculture continually want and need inservice education, particularly in technical subject matter (Barrick, Ladewig, and Hedges, 1983). Logically, this need is more pronounced when the teachers are asked to teach new subject matter or subject matter in which they have had little previous training.

In developing an inservice education program, assessing learner needs is an important early step in the process. Involving the learners in the process of planning an inservice education program increases the likelihood of implementing relevant programs (Waters and Haskell, 1989).

Tyler (1971) defined a need as a difference between a present condition and an acceptable norm. This definition serves as the basis for the discrepancy model of assessing learner needs. One discrepancy model, developed by Borich (1980), is commonly used in educational settings and is appropriate for assessing inservice education needs of teachers (Barrick et al., 1983). In this study, the researchers used the Borich model to assess the inservice education needs of teachers of pilot agriscience courses in Mississippi. Background information about the pilot courses and a discussion of the appropriateness of the Borich model for assessing inservice education needs are provided below.

In 1988, the National Research Council (NRC) reported that "much of the focus and content of many vocational agriculture programs is outdated" (p. 3). The NRC recommended that agricultural educators move quickly to upgrade the scientific and technical content of the curriculum.

Mississippi agricultural educators responded to this recommendation by developing two pilot courses in agriscience for the 1991-92 school year. One course, Introduction to Agriscience, was designed as a one-hour, 9th or 10th grade level course. The other, Agriscience I, was designed as a two-hour, 11th or 12th grade level course. A third course, Agriscience II, was designed as a two-hour, 11th or 12th grade level course. Agriscience II was implemented during the 1992-93 school year. In a report on the development of the courses, Johnson (1991) stated, "The courses were designed to teach the scientific principles which form the basis of the modern food and fiber industry and to provide students with active, hands-on learning experiences that emphasize the scientific method in the study of agriculture" (p. 1).

Agricultural education supervisory staff members of the Mississippi State Department of Education selected 42 teachers (employed in 41 secondary schools) to pilot-test the new agriscience courses for a three-year period. The schools and teachers were selected so as to be representative of schools and teachers offering secondary agricultural education programs in Mississippi (J. W. Jones, Assistant State Supervisor, Personal Communication, June 10, 1991). During June 1991, a two-week, intensive inservice workshop was held for all teachers selected to teach the new agriscience courses.

During the first year of the pilot test, the courses were well-received. Agriculture teachers, school administrators, guidance counselors, and science teachers all strongly support the courses and agree that science credit should be awarded for the course (Johnson & Newman, 1992; Newman & Johnson, 1992).

The Borich Model of Needs Assessment

Using the Borich model results in a framework for practical decision making, Barrick et al. (1983) concluded that the Borich model is a defensible method of assessment of teacher inservice education needs--better "than a survey of

desires or felt needs" (p. 19). The Borich model's use of weighted discrepancy scores to determine needs of learners usually yields results that are different from those that would be obtained by more traditional means of needs assessment or from those identified by using the importance ratings (Barrick et al., 1983; Barrick & Powell, 1986; Waters & Haskell, 1989).

In the Borich model, the teachers surveyed provide an evaluative judgment about the importance of competencies and their own performance in these areas (Borich, 1989). The attempt of the design is to determine the "congruence between what the teacher should be able to do and what the teacher can do" (Borich, 1980, p. 42).

Purpose and Objectives

The overall purpose of this research was to identify and assess the inservice education needs of teachers who teach the pilot agriscience courses in Mississippi and to determine their need for additional instructional materials. The results of the study were used to plan and implement an inservice education program to help meet these needs. The specific objectives of the study were to:

> Determine the teachers' perceptions of the importance of the various units taught in the courses and their personal level of competence in each unit.
>
> Determine the need for inservice education on the agriscience units based on the Borich model of assessing needs.
>
> Determine the units for which teachers perceive additional instructional materials are needed.

Procedures

The design of the study was a descriptive-survey. The population for the study was 39 teachers of pilot agriscience courses in Mississippi. Three of the original teachers in the pilot program were excluded because of resignations and retirements and replacements had not yet been put in place.

A mailed questionnaire was used to collect the data. Questionnaires were mailed to the 39 teachers in October, 1992. Questionnaires were mailed with a stamped, self-addressed, return envelope. One follow-up mailing was conducted 10 days after the original mailing. Thirty-one of the 39 teachers returned questionnaires for a response rate of 79.5 percent. Two responses were deemed to be usable because of response set and incomplete data, resulting in a usable response rate of 74 percent.

Chi-square tests used to compare early and late respondents on their ratings of the units on importance and competence to determine if a possible nonresponse bias existed were not significant. The researchers concluded that nonresponse bias was not a threat to the study (Miller & Smith, 1983).

Instrumentation

The instrument used for the study was designed by the researchers. As the competency areas to be rated, it contained the 40 units taught in the three pilot agriscience courses, with the mandatory objectives for each unit listed to further clarify the subject matter within each unit. The instrument was reviewed by a panel of experts consisting of agricultural education faculty and graduate students to establish content validity.

A pilot test was conducted with six preservice agricultural education teachers for the purpose of establishing test-retest reliability (coefficient of stability). The students were asked to complete the questionnaire and then asked to complete it again after 14 days. Based on the procedures outlined by Ferguson (1976), Pearson product-moment correlations for each competency were calculated and standardized by converting them to Fisher's Z scores. Then a mean Fisher's Z score was computed and converted to a Pearson product-moment correlation for the overall reliability score. The coefficient of stability for the instrument was .76.

Findings

Objective One

The teachers were asked to rate the importance of the units and their level of competence in the subject matter contained in each

Table 1. Teacher Perceptions of Importance of and Personal Competence in Units from Agriscience Courses

Course/Unit	Competence Mean	Competence SD	Importance Mean	Importance SD
Introduction to Agriscience (n=29				
Human Relations/Leadership	4.40	.72	4.04	1.14
Principles of Animal Science	4.33	.71	4.07	1.15
Principles of Plant Science	4.30	.70	4.18	1.06
Principles of Soil Science	4.17	.70	4.11	.99
Introduction to Agriscience	4.10	.80	4.03	1.04
Supervised Agricultural Experience	4.10	.76	3.82	1.25
Opportunities in Agriscience	4.00	.70	4.04	1.04
Principles of Food and Fiber Science	3.63	.81	3.89	1.03
Issues in Environmental Quality	3.63	.85	4.07	1.05
Principles of Entomology	3.57	.90	3.93	.94
Computers	3.50	1.08	4.17	1.10
Application of the Scientific Method	3.40	.86	3.89	1.10
Mechanical Technology	3.40	.89	4.04	1.08
Introduction to Biotechnology	3.03	.88	4.00	1.04
Agriscience I (n=14)				
Soil Science Technology	4.21	.70	4.39	.51
Animal Science Technology	4.14	1.10	4.31	.95
Human Relations/Leadership	4.14	.54	4.00	.91
Plant Science Technology	4.07	.92	4.39	.65
Introduction to Agriscience	3.93	.83	3.93	.49
Supervised Agricultural Experience	3.93	.92	3.77	1.09
Application of the Scientific Method	3.79	.80	4.23	.44
Principles of Fiber Science	3.71	.99	3.77	1.01
Natural Resource Technology	3.71	.99	4.15	.80
Computers	3.64	.84	4.31	.63
Principles of Entomology	3.57	1.02	4.23	.44
Opportunities in Agriscience	3.56	.73	4.25	.71
Mechanical Technology	3.36	1.08	4.15	.38
Biotechnology	3.07	1.00	4.39	.71
Agriscience II (n=7)				
Soil Science Technology	4.43	.54	4.83	.41
Communication Skills	4.29	.49	4.67	.52
Plant Science Technology	3.86	1.07	4.83	.41
Supervised Agricultural Experience	3.67	1.03	3.71	1.38
Mechanical Technology	3.50	1.22	4.20	.45
Entomology	3.29	.76	4.33	.52
Food and Fiber Industry	3.29	1.11	4.00	1.55
Environmental Technology	3.29	1.25	4.83	.41
Entrepreneurship	3.17	.75	4.00	.58
Aquaculture	3.00	.89	4.57	.54
Computer Usage	3.00	.63	4.00	1.41
Physical Technology	2.71	.95	4.33	.82

Note: Competence scale: 1=very low, 2=low, 3=average, 4=high, 5=very high.
Note: Importance scale: 1=very unimportant, 2=unimportant, 3=average importance, 4= important, 5=very important

unit in the courses which they were currently teaching. Twenty-nine teachers rated the competencies in the Introduction to Agriscience. For the Agriscience I course, 14 teachers rated the competencies. For the Agriscience II course, 7 teachers rated the competencies. (Several of the teachers were teaching two or all three courses.). Teachers rated the importance of the unit using the following scale: 1 = very unimportant, 2 = unimportant, 3 = average importance, 4 = important, 5 = very important. They rated their competency in each unit using the following scale: 1 = very low, 2 = low, 3 = average, 4 = high, 5 = very high. The competency ratings and importance ratings are summarized in Table 1.

Objective Two

Weighted discrepancy scores were calculated for each respondent for each of the units by subtracting the competency rating from the importance rating and multiplying the result by the importance rating (Borich, 1980). Mean weighted discrepancies were calculated for each unit by dividing the sum of the weighted discrepancy scores for the unit by the number of observations (Borich, 1980). These scores ranged from -2.87 to 9.00.

For Introduction to Agriscience and Agriscience I, the biotechnology, computer technology, and mechanical technology units, in order, had the highest mean weighted discrepancies. For Agriscience II, the three units with the highest mean weighted discrepancies were environmental technology, aquaculture, and physical technology. The mean weighted discrepancy scores and standard deviations are presented by agriscience course in Table 2.

Objective Three

Teachers were also asked if additional instructional materials were needed for each unit. In Introduction to Agriscience, more teachers perceived computer technology (100.0%) and mechanical technology (96.6%) to be in need of additional materials. In Agriscience I, biotechnology (100.0%) was highest, followed by computers (92.9%) and mechanical technology (92.9%). In Agriscience II, environmental technology, aquaculture, physical technology, and food and fiber science all had 100 percent of the teachers reporting a need for more materials. Table 3 contains the results for each unit in the three courses.

Conclusions and Recommendations

Teachers of pilot agriscience courses thought the units in the three courses were important and considered themselves competent in most of the units. Although the need for inservice education was not exceptionally high (possibly due to the teachers having participated in a workshop designed to prepare them to teach the courses in Summer 1991), the model consistently identified units where the level of competence was not on a par with the level of importance of the unit.

Teachers deemed themselves to be more competent in the traditional areas of animal science, plant science, soil science, supervised agricultural experience, and leadership development than in the not-so-traditional areas of computers, biotechnology, mechanical technology, entomology, environmental science, and aquaculture. The undergraduate curriculum probably should be restructured to provide more preparation in these areas.

The three most pressing needs for inservice education were in the areas of biotechnology, computers, and mechanical/physical technology. These units were rated highly in all three courses. Deficiencies were also identified in the areas of entomology, environmental sciences, and application of the scientific method. Teachers of the two advanced courses also need instruction in aquaculture and plant science. Based on the results of this study, inservice education programs have been designed to meet the needs of teachers in these areas.

The teachers perceived a dearth of instructional materials for the units included in the course, especially in computers, biotechnology, mechanical technology, environmental sciences, aquaculture, and entomology. Teachers perceived that more instructional materials were available for the more traditional units such as human relations/leadership, animal science, plant science, supervised agricultural experience, and soil science; but, for most units, teachers still felt they needed more instructional materials. Especially strong needs were indicated for computers,

Table 2. Mean Weighted Discrepancy Scores for Units of Agriscience Courses

Course/Unit	Mean	SD
Introduction to Agriscience (n=29)		
Introduction to Biotechnology	5.1	5.4
Mechanical Technology	3.6	4.8
Computers	3.5	.94
Issues in Environmental Quality	3.0	4.8
Application of the Scientific Method	2.8	4.1
Principles of Entomology	2.4	4.0
Principles of Food and Fiber Science	2.0	3.4
Opportunities in Agriscience	1.0	3.3
Principles of Soil Science	.82	3.5
Principles of Plant Science	.61	3.9
Introduction to Agriscience	.36	3.2
Supervised Agricultural Experience	.18	3.3
Principles of Animal Science	.04	3.1
Human Relations/Leadership	-.29	3.7
Agriscience I (n=14)		
Biotechnology	6.5	6.5
Mechanical Technology	3.8	5.8
Computers	3.7	4.9
Opportunities in Agriscience	3.5	3.8
Principles of Entomology	3.4	4.5
Application of the Scientific Method	2.2	4.8
Plant Science Technology	2.1	5.1
Natural Resource Technology	2.1	3.9
Principles of Fiber Science	1.0	4.2
Animal Science Technology	.9	3.7
Soil Science Technology	.9	3.7
Supervised Agricultural Experience	.8	5.1
Human Relations/Leadership	.1	3.8
Introduction to Agriscience	.1	3.2
Agriscience II (n=7)		
Environmental Technology	9.0	6.0
Aquaculture	8.2	6.2
Physical Technology	8.2	4.3
Computer Usage	6.0	5.8
Entomology	5.3	5.1
Plant Science Technology	5.0	6.3
Mechanical Technology	4.2	4.0
Food and Fiber Industry	4.0	3.7
Entrepreneurship	3.5	3.7
Communication Skills	2.5	2.7
Supervised Agricultural Experience	2.0	6.5
Soil Science Technology	1.7	2.6

Note: Competence scale: 1=very low, 2= low, 3=average, 4=high, 5=very high.
Note: Importance scale: 1=very unimportant, 2=unimportant, 3=average importance, 4=important, 5=very important.

Table 3. Teacher Perceptions of Need for Additional Instructional Materials for Agriscience Units

Course/Units	Additional Materials Needed? Frequency Yes	% Yes
Introduction to Agriscience (n=29)		
Computers	29	100.0
Mechanical Technology	28	96.6
Application of the Scientific Method	25	86.2
Issues in Environmental Quality	24	82.8
Principles of Entomology	24	82.8
Principles of Food and Fiber Science	24	82.8
Principles of Plant Science	22	75.9
Opportunities in Agriscience	20	69.0
Principles of Soil Science	17	58.6
Principles of Animal Science	17	58.6
Human Relations/Leadership	16	55.2
Introduction to Biotechnology	13	44.8
Introduction to Agriscience	13	44.8
Supervised Agricultural Experience	13	44.8
Agriscience I (n=14)		
Biotechnology	14	100.0
Mechanical Technology	13	92.9
Computers	13	92.9
Principles of Entomology	12	85.7
Application of the Scientific Method	11	78.6
Natural Resource Technology	11	78.6
Plant Science Technology	10	71.4
Principles of Fiber Science	10	71.4
Introduction to Agriscience	10	71.4
Animal Science Technology	10	71.4
Opportunities in Agriscience	9	64.3
Soil Science Technology	9	64.3
Supervised Agricultural Experience	8	57.1
Human Relations/Leadership	7	50.0
Agriscience II (n=7)		
Environmental Technology	7	100.0
Aquaculture	7	100.0
Physical Technology	7	100.0
Food and Fiber Industry	7	100.0
Entomology	6	85.7
Plant Science Technology	6	85.7
Entrepreneurship	6	85.7
Mechanical Technology	6	85.7
Soil Science Technology	6	85.7
Computer Usage	5	71.4
Supervised Agricultural Experience	4	57.1
Communication Skills	3	42.9

biotechnology, environmental technology, aquaculture, physical technology, and food and fiber industry. Based on the results of the study, proposals for the development of appropriate instructional materials have been submitted for funding.

Rankings of the units based on the mean weighted discrepancy scores appeared to be quite different from rankings of the units based solely on importance or competence. This supports the conclusions reached by Barrick et al. (1983) and Waters and Haskell (1989).

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