TEACHER CHARACTERISTICS RELATED TO THE ADOPTION OF AGRISCIENCE CURRICULUM IN VIRGINIA MIDDLE SCHOOL AGRICULTURAL EDUCATION PROGRAMS

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Abstract

Middle school programs in agricultural education are unique educational experiences that provide 6th, 7th, and 8th grade students in Virginia with a basic understanding of agriculture and its applied sciences. Curriculum innovations such as the one for Virginia middle schools provide guidance for teachers in the field and offer a base from which programs can operate. However, the benefits of educational innovations are never fully realized until the teacher in the classroom adopts and implements the changes. The purpose of this study was to determine the relationship between teacher characteristics and the adoption of agriscience curriculum in Virginia middle school agricultural education programs. The study was conducted in the fall of 1993. The population for this study consisted of the 57 middle school teachers of agricultural education in Virginia. All of the teachers were surveyed with an 81% response rate obtained.

The number of middle school programs in agricultural education has grown steadily over the last decade with 31 states currently offering agricultural education in the middle grades (Barrick & Hughes, 1992). Unfortunately, this boom in growth has not been followed by an increase in appropriate middle school curricula (Hansen & Miller, 1988).

Understanding Agriculture: New Directions for Education (1988), recommended additional science-based curricula be used in agricultural education programs to teach the biological, physical, and chemical science through agriculture. The Carl D. Perkins Vocational Education Act of 1990, further emphasized the importance of teaching the science of agriculture through integration of academic and vocational education.

In 1990, the Virginia Department of Education designed an agriscience curriculum entitled Agriscience Education for the Middle School that was reflective of recommendations

from the National Research Council and the Perkins Vocational Education Act of 1990. This agriscience curriculum is currently available for middle school agricultural education programs in Virginia.

This new curriculum for middle school agricultural education was developed by educators throughout the commonwealth and provided teachers with a comprehensive agriscience program. However, the question to be answered was: will the teachers adopt and use the new curriculum?

Triandis (1971) identified four indicators for predicting human behavior. They included attitude, social norms, habits, and perceived benefits of the behavior. For the purpose of this study, attitude represents "a state of mind or feeling" (Webster's 1988, p. 136) toward agriscience. Social norms are reflected in the current condition of agricultural education. The teachers' habits will be assessed through their knowledge and application of agriscience competencies as well as teacher

demographics. Expected benefits of agriscience education can be assessed through identifying the teachers' anticipated outcomes of agriscience curriculum (Mischel & Mischel, 1977).

If "educational change depends on what teachers do and think" (Fullam, 1982, p. 107), then predicting behavior should be closely tied to teacher knowledge. Curriculum taught in the classroom depends on the teacher's personal theories and beliefs (Ross, Cornett, & McCutcheon, 1992).

Teachers tend to teach what they know best (House, 1981). If teachers have a low degree of agriscience knowledge, they will be less likely to include agriscience topics in the curriculum. Hashew (1986) stated that prior teacher knowledge of subject matter contributed greatly to the transformation of the written curriculum into an active curriculum component in the classroom. Kirby (1990) reported that teachers in North Carolina believed that a lack of knowledge was a major barrier to teaching agriscience.

Expectations that the teachers hold toward an innovation will affect their adoption of the innovation. Teachers tend to be concerned about the affects of educational innovations on the student (Darr, 1985). Darr also noted that when teachers perceived changes in the curriculum to benefit the students, they were more likely to adopt those changes.

Placing subjects into categories that assist in the description of the population is a basic psychological process (Guilford, 1965). Guilford also noted the occurrence of classification variables in both scientific and social research to place individuals into categories for analysis.

Cheek and Beeman (1978) found that the age of the teacher effected the teacher's perception of the importance of professional affiliations and professional development. Blezek (1982), and Cheek and Beeman (1978), found a positive relationship between the years of teaching

experience and the perceived importance of the role of the teacher. Borko and Niles (1982) reported that older teachers could define their roles and philosophies better than younger teachers. Additional education was identified by Rush (1984) as a strong predictor of teacher effectiveness.

Given the growth of middle school programs in agricultural education in the United States and the unique needs of middle school youth, it is important for the agricultural education profession to analyze middle school curricular efforts, such as the one in Virginia. Measuring the influence of the teacher on curriculum adoption can offer insight for future curriculum development efforts as well as in-service and pre-service education.

Purpose and Objectives

The Commonwealth of Virginia has presented a new curriculum for middle school agricultural education programs. The extent to which the state approved curriculum has been adopted by middle school teachers needs to be determined. Furthermore, characteristics of the teachers within the middle school agricultural education programs that influence the adoption process also needs to be determined. Therefore, the purpose of this study was to determine the relationship between teacher characteristics and the adoption of the middle school agriscience curriculum in Virginia middle school agricultural education programs.

The specific objectives were to determine:

1. the amount of agriscience being taught in Virginia middle school agricultural education programs,

2. the extent to which teachers' attitude toward agriscience, teachers' knowledge toward agriscience, teachers' expectations of agriscience, and selected demographic traits of teachers were related to the adoption of agriscience curriculum in Virginia middle school agricultural education programs, and

3. a predictive model for the adoption of agriscience curriculum in Virginia middle school agricultural education programs.

Methods and Procedures

Population

The frame of this census study consisted of 57 teachers of middle school agricultural education (Virginia Agricultural Education Teachers Directory, 1993). Following the procedure outlined by Dillman (1978) for collecting survey data, an 81% response rate (46 teachers) was obtained from a series of mailings in the Fall of 1993. The mean responses for early respondents (responding to the first mailing) and late respondents (responding to the last two mailings) were compared to determine if there were significant differences between the groups. This technique described by Miller and Smith (1983) was used to control for non-response error. No significant differences were found so the results can be generalized to the target population of middle school agricultural education teachers in Virginia.

Instrumentation

A review of literature revealed that no satisfactory instruments had been previously developed to examine the objectives of this study. Therefore, the instrument was developed by the researchers to obtain the data needed to respond to the research objectives.

A panel of experts consisting of teacher educators and administrators at Virginia Polytechnic Institute and State University was used to establish content validity. The instrument was pilot tested with Virginia junior high school agricultural education teachers who were not included in the population of middle school teachers. To establish reliability, alpha coefficients of internal consistency (Cronbach's alpha) were calculated for the knowledge instrument (.91), the attitude instrument (.94), and the expectations instrument (.88).

The instrument to measure the amount of agriscience taught in Virginia middle school agricultural education programs was developed from the Virginia Department of Education's existing recommended curriculum for agricultural education in the middle grades entitled, Agriscience Education for the Middle School (1990). Teachers were asked to identify competencies taught in their programs by answering "yes," if they included the topic in their instruction, and "no," if they did not include the topic. The recommended curriculum for grades six, seven, and eight included 136 competencies.

On the recommendation of the panel of experts, the competencies were divided into two equal parts (68 competencies each) taking every other competency starting with the first to make list A, and using the opposite competencies to compile list B. The competencies were divided to decrease the size of the survey instrument and increase the response rate. The lists were randomly distributed to the teachers. One set of competencies was included in form A the other set was included in form B. The mean responses from list A and B were compared and showed no statistical difference.

The attitude instrument was a semantic differential designed to measure the evaluation, potency, and action domains of attitude. The instrument developed to measure teachers' knowledge of agriscience was a four point Likert-type scale. The scale was labeled Strongly Agree, Agree, Disagree, and Strongly Disagree. The subjects were asked to respond to the question: "I know enough about this competency to teach it to my students," for each of the 68 competencies. The competencies identified to measure the amount of agriscience taught were also used for this instrument.

The expectations instrument consisted of 10

statements that reflected benefits and expectations of agriscience programs. The statements were developed from Agriscience Education for the Middle School (1990). The teachers were asked to rate the statements on a four point Likert-type scale (Strongly Agree, Agree, Disagree, Strongly Disagree).

Demographic information was collected to amass the following information: teachers' age, teachers' gender, teachers' education level, teachers' experience, and teachers' professional affiliation.

Findings

Objective 1

Virginia middle school teachers of agricultural education taught an average of 67.39% (46 of the 68 competencies) of the approved agriscience curriculum with a standard deviation of 15.98. The range of competencies taught spanned from 31% to 99% (21 to 67 of the 68 competencies). The data had a bi-modal distribution with 22.2% of the respondents teaching between 51% and 60% of the

agriscience curriculum, and 28.9% of the resspondents teaching between 71% and 80% of the agriscience curriculum.

Objective 2

Scores on the attitude, knowledge, and expectations instrument were normalized to facilitate analysis. A low score of zero and a high score of 100 was possible for each of the three components.

The correlation coefficient between teachers' knowledge and the amount of agriscience curriculum taught was .61. The knowledge score distribution was positively skewed. The mean knowledge score for middle school agricultural education teachers was 82.23 with a standard deviation of 11.11. The range of knowledge scores spanned from a low score of 53.3 to a high score of 95.33. Over 61% of the teachers surveyed had a self reported knowledge score of 81 or above. Only 8.3% of the teachers evaluated their knowledge of agriscience below a score of 70.

Table 1. Amount of Agriscience Curriculum Taught (n=45)

% of Competencies	n of Competencies	# of Respondents	% of Respondents
30 - 40	20 - 27	1	2.2
41 - 50	28 - 34	5	11.1
51 - 60	35 - 40	10	22.2
61 - 70	41 - 47	7	15.6
71 - 80	48 - 54	13	28.9
81 - 90	55 - 61	5	11.1
91 -100	62 - 68	4	8.9
Total		45	100.0

The correlation coefficient between teachers' attitude and the amount of agriscience curriculum taught was .45. The mean attitude score of middle school agricultural education teachers in Virginia

was 87.78 with a standard deviation of 13.61. The range of scores spanned from a low score of 50 to a high score of 100. The distribution of attitude scores was positively skewed.

The correlation coefficient between teachers' expectations and the amount of agriscience curriculum taught was .34. The mean expectation score for middle school teachers of agricultural education in Virginia was 80.98 with a standard deviation of 10.38. The scores ranged from a low of 55 to a high score of 100. Over 88% of the teachers had an expectation score of 71 or higher.

Nine demographic variables were selected to differentiate among the teachers involved in the study. They included years of teaching experience, years of middle school teaching experience, years in the present teaching position, years of high school agricultural education teaching experience, membership in the Virginia Vocational Agriculture Teachers Association (VVATA), membership in the American Vocational Association (AVA), gender, age, and education level. See Table 2 for inter-correlations.

Objective 3

Multiple regression analysis was used to determine the best model for explaining the variance associated with the dependent variable, amount of agriscience curriculum being taught by a linear combination of the independent variables. Backward elimination was used to determine the multiple regression model that best explained the dependent variable, amount of agriscience taught. When all 13 variables were included in the regressing equation, the sequential R^2 was .70. The best fitting model consisted of the four independent

variables: knowledge of agriscience curriculum, attitude toward agriscience curriculum, years in the present teaching position, and expectations of agriscience curriculum.

The model had a total R^2 value of .64 accounting

Table 2. Inter-Correlation Matrix of Selected Variables

for 64% of the variance in the amount of agriscience curriculum taught. Although the addition of the variable, expectations of agriscience curriculum appears not to add a significant amount of unique variance in the model and did not have a significant t value (Table 3), it increased the model R^2 from .51 to .64. Inclusion of this independent suppressor variable adds an additional .13 to the model R^2 and carried an F value for change in R^2 of 12.67 that tested significant at the .05 alpha level. Suppressor variables purify equations by filtering error variance associated with independent variables that are highly correlated with the suppressor variable (Pedhauser, 1982).

Conclusions

1. There were two distinct groups of teachers in middle school agricultural education programs in Virginia, those who were teaching a large part of the curriculum and those who were teaching only a small portion of the curriculum.

2. Middle school teachers of agricultural education in Virginia had a high positive attitude toward agriscience. Attitude toward agriscience curriculum was a meaningful predictor of the amount of agriscience curriculum taught by middle school teachers of agricultural education in Virginia

3. Middle school teachers of agricultural education in Virginia were knowledgeable of agriscience curriculum. Knowledge of agriscience curriculum was a meaningful predictor of the amount of agriscience curriculum taught by middle school teachers of agricultural education in Virginia.

	Knowledge	Expectation	Attitude	Yrs Exp.	Yrs MS Exp.	Yrs Pres Pos	Yrs HS Exp.	VVATA	AVA	Age	Gender	Education	Amount
Amount	.61	.34	.45	.27	.21	.39	.23	.28	.08	-.26	.13	-.13	1
Education	-.01	-.22	-.26	.58	.48	.43	.26	.09	.01	.60	-.16	1	
Gender	.12	.15	.13	-.48	-.31	.42	-.22	.31	.19	-.51	1		
Age	-.16	.14	-.13	.98	.53	.68	.53	-.12	.10	1			
AVA	.17	.18	.02	.13	.18	.29	.14	.49	1				
VVATA	.37	.24	.18	-.12	.08	.14	-.03	1					
Yrs H S Exp.	-.20	.21	.06	.54	-.15	-.33	1						
Yrs.Pres Pos.	.05	-.07	-.20	.71	.71	1							
Yrs. MS Exp	.13	-.18	-.16	.57	1								
Yrs. Exp.	-.09	-.09	-.12	1									
Attitude	.18	.63	1										
Expectation	.44	1											
Knowledge	1												

Table 3.   Step-Wise Multiple Regression Analysis Model with the Dependent Variable Amount of Agriscience Taught (n=45)

Variable	Standard Estimate	t-val	t-prob	Seq R^2	R^2 Change
Knowledge of agriscience curriculum	.67	4.83	<.01	.39	.00
Attitude toward agriscience curriculum	.39	2.34	.03	.49	.10
Years in present teaching position	-.39	-3.33	<.01	.51	.02
Expectations of agriscience curriculum	-.25	-1.37	.18	.64	.13

4. Middle school teachers of agricultural education in Virginia held high expectations of agriscience curriculum. Expectations of agriscience curriculum was a meaningful predictor of the amount of agriscience taught by middle school teachers of agricultural education in Virginia.

5. As the teacher's tenure at a school increased, the likelihood of adopting the agriscience curriculum decreased. Years in the current teaching position was a meaningful predictor of the amount of agriscience curriculum taught by middle school teachers of agricultural education in Virginia.

Recommendations

1. Given the existence of two distinct groups of agricultural education teachers in Virginia middle schools, more attention needs to be given to the characteristics of knowledge, attitude, expectations, and time spent in the current position to understand differences in these groups.

2. Given the existence of the contribution of the teachers' positive attitude toward the amount of agriscience curriculum taught by middle school teachers of agricultural education in Virginia, greater efforts by teacher educators, the Virginia Department of Education, and agricultural interests in Virginia should be devoted to building on positive attitudes toward agriscience.

3. Given the existence of the significant contribution of the teachers' knowledge toward the amount of agriscience curriculum taught by middle school teachers of agricultural education in Virginia, more effort is needed by teacher education to prepare prospective teachers in agriscience content and methods as part of their teacher preparation. The Virginia Department of Education and agricultural interests in Virginia should also commit to teacher education through pre-service and development activities involving agriscience education. Additional study is warranted in the area of teacher experience and curriculum adoption.

5. Although this study provides baseline data as to the amount of the agriscience curriculum being taught, the depth of instruction is not addressed. The researchers would suggest replication of this study using qualitative measures such as classroom observation to determine the accuracy of these findings.

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