Relationship of Supervised Occupational Experience Program Scope to Student Achievement in Ornamental Horticulture

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Supervised occupational experience (SOE) programs have traditionally been a vital component of vocational agriculture. Most educators agree that SOE helps teachers be more effective in causing learning to occur, assists students understand the relevance of classroom instruction, and promotes close cooperation with the community. Agricultural educators continue to recognize SOE as an integral part of vocational agriculture. A recent national study found that over 98% of the profession agreed that SOE should be required of all students of vocational agriculture in grades 9-12 (Sutphin & Newcomb, 1983).

Research has been conducted to investigate the relationship between student achievement and participation in SOE (Cheek & McGhee, 1985; Christensen, 1964; Cushman, Hill, & Miller, 1968; McGhee & Cheek, 1983; Neavill, 1973). However, only two studies investigated the relationship between the scope of students' SOEs and their level of achievement in vocational agriculture. Morton (1978) and Potter (1984) examined the quality or scope of a student's SOE and student achievement in vocational agriculture. Morton found a positive relationship between achievement test scores and the scope of SOE, opportunity to engage in SOE, cumulative grade point average, number of years in vocational agriculture, and the number of SOE visits received by students from their instructor on an annual basis. Potter, who focused on handicapped students, found no significant relationship between SOE quality and student achievement. Variables which he found to be positively related to student achievement included FFA involvement and parental encouragement.

Further research needs to be conducted to determine the extent to which SOE influences student achievement. Additional research should consider the unique situations within other states and other extraneous variables related to student achievement not measured by Morton or Potter. A comprehensive review of the literature suggested that, in addition to SOE involvement, student performance on an achievement test can be related to: student interest in the subject area (Christensen, 1964; Neavill, 1973; Sjoberg, 1984); FFA involvement (Cheek & McGhee, 1985; Long & Israelsen, 1983; McGhee & Cheek, 1983; Potter, 1984; Smith, 1983); years of previous enrollment in vocational agriculture (Morton, 1978); parental involvement and expectations (Caroselli, 1980; Christensen, 1964; Gigliotti & Brookover, 1975; Seginer, 1983); cumulative grade point average (Christensen, 1964; Morton, 1978); and teacher effectiveness (Dunkin & Biddle, 1974; Rosenshine & Furst, 1971).

Purpose and Objectives

The primary purpose of this study was to determine the relationship between the scope of SOE, as measured by total Productive Man Work Units (PMWUs), and the level of achievement in technical knowledge for students who were enrolled in ornamental horticulture in Florida. The

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primary research hypothesis was: There is a positive relationship between the scope of an SOE as measured by PMWUs and the level of achievement on a multiple choice test designed to measure technical knowledge in ornamental horticulture. In addition to the primary hypothesis, the following alternate rival hypotheses were considered: There is a positive relationship between student achievement on a multiple-choice test designed to measure technical knowledge in ornamental horticulture and the following independent variables: cumulative grade-point-average, parental expectations and encouragement, number of years spent in vocational agriculture, student involvement in FFA, student interest in agriculture, number of teachers in the department, and teacher effectiveness as indicated by clarity, variability, enthusiasm, business-like behavior, student opportunity to learn the material, and indirectness.

Design and Methodology

This research was completed as part of Project FLA-AEE-02496 of the Florida Agricultural Experiment Station, Institute of Food and Agricultural Sciences, University of Florida, Gainesville. The design of this study was ex-post facto in nature. The primary independent variable (SOE scope) had already occurred and the research began with the measurement of the dependent variable. To control the weaknesses in this design, Kerlinger (1964) recommends that rival hypotheses be stated before the data are collected. These hypotheses are tested along with the major hypothesis. Those alternative hypotheses that are disproved serve to strengthen the major hypothesis. For this study, alternate independent variables were identified in the literature as having a positive relationship with student achievement; they formed the basis for the alternate rival hypotheses.

The population consisted of 23 public high schools offering ornamental horticulture in Northeast and Central Florida. These schools were identified to facilitate on-site data collection and to minimize costs. Northeast schools tended to be rural in nature while Central Florida schools tended to be urban. From this population, a purposive sample of 8 schools was taken in the 1985-86 school year. Data were collected from 84 students in the sample of 8 schools. All data were collected by the researchers through on-site administration of the instruments during the spring of 1986. Students absent on the day data were collected were administered the instruments at a later time by their vocational agriculture teacher, and the completed instruments were mailed to the researchers.

Four instruments were used: a 40-item, multiple choice test designed to measure technical knowledge in ornamental horticulture; a questionnaire on which students were requested to provide information regarding the type and scope of their SOE; a questionnaire designed to collect information related to FFA involvement, length of enrollment in vocational agriculture, interest in agriculture, teacher effectiveness, and parental expectations and encouragement; and a grade-point-average form completed by the guidance counselor at each school.

Items on the student achievement test were selected from two test item banks (Maday, 1985; McCall & Farrington, 1982). The item banks had an average item difficulty of .71, an average item discrimination of .50, and a Kuder-Richardson 20 correlation coefficient of .94. The Florida Department of Vocational Education Student Performance Standards for Ornamental Horticulture were used as a basis for question selection. Forty competencies were randomly chosen from the competency list. A single question was chosen for each of these competencies to compose the 40-item test. Items were selected which most closely fit the following criteria: measured the specified competency, had an item

discrimination index greater than .30, and had an item difficulty between .50 and .80.

Data related to each student's SOE program were collected by means of a written questionnaire which was administered with the achievement test. Students were asked to provide information relating to the type and scope of their SOE. The scope scores for supervised occupational experience programs were computed using these data. Income was defined as the net income of a student's ownership projects and net receipts from a student's placement work experience. A PMWU was defined as the work accomplished by one person in a 10-hour work day with typical levels of production practices and equipment. SOE score was calculated according to the formula:

$$S = \frac{I}{100} + \frac{PMWU}{5}$$

Where: S = scope score for the SOE program

I = total income for the 1984-85 school year

PMWU = Estimated Productive Man Work Units for the 1985-86 school year.

This formula was used to measure SOE scope because several researchers have used productive man work units to measure SOE scope. McMillion and Auville (1976) examined factors associated with the success of supervised farming programs of Virginia high schools using a similar formula called productive man work days to measure SOE scope. Morton (1978) used the PMWU formula to determine SOE scope scores in order to study the relationship between quality of SOE program and student achievement. Later, Arrington (1981), using the PMWU formula, determined SOE scope scores to examine the relationship of length of teacher contract to SOE scope and FFA chapter activity level.

A questionnaire was developed in order to collect information from the students related to the following variables: parental involvement and expectations, years of previous enrollment in vocational agriculture, teacher effectiveness, FFA involvement, and student interest in vocational agriculture. This questionnaire was field tested at a high school near the university and with university faculty to determine content validity. The cumulative grade point average for each student was calculated from the time the student entered secondary school. This information was obtained by submitting an information sheet listing student names and test numbers to the guidance counselor at each school. The counselor calculated each student's GPA and listed it on an information sheet according to name and test number. The names were then removed before returning the information sheets to the researchers.

Achievement tests were scored, SOE information was translated into PMWUs, and students were assigned raw scores for each of the independent variables. Descriptive statistics were calculated for each variable studied. Pearson product moment correlation coefficients were calculated, and step-wise multiple regression analysis was performed. The .05 level of significance was set as the critical standard.

Results

Characteristics of Students

The scores on the ornamental horticulture achievement test ranged from 5 (12.5%) to 36 (90%) with a mean score of 21.7 (54%). The mode

and median were 22 and the standard deviation was 5.91. Almost 50% of the students scored higher than 23 (57.5%).

Table 1 summarizes information relative to SOE scope. The minimum SOE scope was 0 and the maximum value was 83.2. The largest number of students, 40 (48.2%), had an SOE score between 0 and .12. The mean scope was 5.95, the median was .15, the mode was 0, and the standard deviation was 13.25.

Table 1

Frequency and Summary Statistics for Supervised Occupational Experience Scope

SOE Scope	Frequencies N	%	Cumulative
0.00- 0.12	40	48.2	48.2
0.13- 5.13	23	27.7	75.9
5.14-83.24	20	24.1	100.0
Total	83	100	

Min = 0 — M = 5.95
Max = 83.24 — Md = 0.15
SD = 13.25 — Mo = 0

The students answered questions regarding their involvement in FFA activities and contests. Each activity was assigned a point value, and responses were totaled to yield an FFA involvement score. Eighty-eight percent of the students were FFA members. The FFA involvement scores ranged from 0, or non-membership, to a maximum value of 41. The mean value was 8.27, the median value was 5.0, the mode was 0, and the standard deviation was 10.2.

Student interest in agriculture was measured by a series of questions using a five-point scale (5 = high interest, 1 = low interest). The mean interest score was 3.74 with a standard deviation of 1.09. Both the mode and median were 3.66. Seventy-four percent of the students had an interest score of 3.10 or higher.

Students were asked to react to six statements about the teaching effectiveness of their vocational agriculture teacher. Each question was answered using a five-point scale (5 = high teacher effectiveness, 1 = low teacher effectiveness), and responses were averaged to give a composite teacher effectiveness score. The lowest score assigned was 1.33 and the highest value was 5.00. The mean teaching effectiveness score was 3.88, the median was 4.00, the mode was 4.16, and the standard deviation was .797. Greater than 75% of the students rated their teacher 3.34 or higher, and 47.6% rated their teacher 4.16 or higher.

Parental involvement and encouragement was assessed by asking students to indicate their level of agreement on a five-point scale (5 = strongly agree, 1 = strongly disagree) relative to statements regarding parents' encouragement and expectations of them. The mean score was 3.70 with a standard deviation of .654, which indicates that students were receiving some encouragement from their parents. Both the median and mode were 3.75. The scores ranged from 1.75 to 5.0.

Over 70% of the students had completed two or more years of vocational agriculture prior to enrolling in ornamental horticulture. The mean number of years was 2.34 with a standard deviation of 2.03. The average cumulative grade point average was 2.43 on a 4.0 scale and a standard deviation of .68 was calculated.

Relationships Between the Major Variables

Table 2 presents Pearson product moment correlation coefficients for all possible pairs of variables. The Pearson correlation analysis indicated statistically significant, positive relationships between the dependent variable, student achievement in ornamental horticulture, and the following independent variables: SOE scope ($\underline{R}$ = .350), FFA involvement ($\underline{R}$ = .195), years previously enrolled in agriculture ($\underline{R}$ = .230), student interest in agriculture ($\underline{R}$ = .394), and the number of teachers in the vocational agriculture department ($\underline{R}$ = .311). The additional variables measured in the study showed no significant relationship with the dependent variable.

Step-Wise Multiple Regression of Achievement Test Scores on Selected Independent Variables

Table 3 summarizes the step-wise multiple regression analysis. This statistical technique computes a sequence of multiple linear regression equations in a stepwise manner. At each step, one variable is added to the regression equation. The variable that is added is the one which makes the greatest reduction in the error sum of squares and the variable which, when added, has the highest $\underline{F}$-value. Variables are automatically removed when their $\underline{F}$-values are insignificant (Dixon, 1973). Three variables were found to be statistically significant in explaining variance in student achievement: student interest in agriculture, number of teachers in the department, and SOE scope. Combined, they explained almost 28% of the variation in achievement test scores.

Conclusions

The primary research hypothesis that revised occupational experience scope, as measured by PMWUs, was positively related to student achievement in ornamental horticulture when achievement was measured by a multiple choice test of technical knowledge in ornamental horticulture was accepted.

The hypothesis that cumulative grade point average was positively related to student achievement in ornamental horticulture was rejected. The hypothesis that the amount of parental involvement and expectations a student received was positively related to student achievement in ornamental horticulture was rejected. The hypothesis that the number of years a student was previously enrolled in vocational agriculture was positively related to student achievement in ornamental horticulture was accepted. The hypothesis that FFA involvement was positively related to student achievement in ornamental horticulture was accepted. Students who were more involved in FFA tended to have a higher level of achievement in ornamental horticulture.

Table 2

Pearson Product Moment Correlation Coefficients for the Major Variables

Variables	Achievement	SOE	FFAI	YPE	INT	PIE	TE	GPA
SOE Scope	.350*							
FFA Involvement	.195*	.383*						
Years Previously Enrolled	.230*	.289*	.407*					
Interest in Agriculture	.394*	.214*	.435*	.229*				
Parental Involvement and Expectations	-.041	-.036	.158	.078	-.001			
Teacher Effectiveness	.023	.035	.129	.002	.131	.118		
Grade Point Average	.050	.114	.178	.073	.088	.233*	-.029	
Number of Teachers	.311*	.231*	.041	.038	.119	-.010	.121	.065

*Significant at the $p<.05$ level.

Table 3

Step-Wise Multiple Regression of Achievement Test Score on Selected Independent Variables

Variable	Partial R^2	R^2	F	Probability of F
Student Interest	0.1405	0.1405	11.9337	0.0009
Number of teachers	0.0849	0.2254	7.8874	0.0064
SOE program scope	0.0511	0.2765	5.0147	0.0283

The hypothesis that students who expressed greater interest in agriculture was positively related to higher levels of achievement in ornamental horticulture was positively related to higher levels of achievement in ornamental horticulture was accepted. The hypothesis that the number of teachers in the department was positively related to student achievement in ornamental horticulture was accepted. The hypothesis that teacher effectiveness, as indicated by clarity, variability, enthusiasm, business-like behavior, student opportunity to learn material and directness, was positively related to student achievement in ornamental horticulture was rejected.

Based on the step-wise multiple regression analysis, three variables were found to be statistically significant. Those variables were student interest in vocational agriculture, number of teachers in the department, and supervised occupational experience scope. These variables, combined, accounted for 28% of the variance in student achievement.

Recommendations

Further research needs to be conducted to reconcile the conflicting results of this study with previous research, concerning the independent variables not found to be related to student achievement in this study. Administrators, teacher educators, state staff members, community employers, and agriculture instructors should continue to support and emphasize the importance of Supervised Occupational Experiences, which has been shown to be related to student achievement. Because of the association between Supervised Occupational Experience scope and student achievement, vocational agriculture instructors should encourage students to increase the scope of their SOE activities as they progress through the program.

Participation in the FFA should be encouraged and instructors should provide students with the opportunity to become involved in various FFA activities. Teachers should develop and employ methods of creative classroom instruction that stimulate and maintain student interest. Low SOE scope scores indicate that efforts must continue to identify strategies to encourage the implementation and development of SOE at the local level. While SOE scope is an acceptable method of determining the quality of an SOE, other measures need to be developed and further attention provided for all areas of agricultural education.

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