

Agricultural Instruction in the Middle School

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Agricultural literacy has become a major concern for agricultural educators, educational administrators, agribusiness, and agricultural production personnel as well as federal and state agencies. As reported by the National Research Council (1988), this issue should be of importance to everyone in the United States.

Too many Americans know very little about the social and economic relevance of agriculture in the United States, and agriculture is too important a subject to be taught only to a relatively small proportion of students enrolled in vocational agriculture. (p. 1)

The W. K. Kellogg Foundation (1984) reported that there were few issues of greater importance to the world than adequate food supplies, proper food use, and the knowledge of the components of the agricultural industry. Yet according to a study conducted by the Kansas State Center for Extended Services and Studies, less than 30% of 2000 elementary, junior, and senior high students surveyed gave correct answers to relatively basic agricultural questions (Horn and Vining, 1986). As stated by Law (1990):

As special interest groups revolving around issues such as animal rights, pesticide usage, soil and water conservation, and other environmental concerns gain more media and public attention, it becomes even more important that the general public have some background and understanding of not only what agriculture is all about, but on how it affects each person's life on a daily basis. (p. 5)

A regional committee of agricultural educators confirmed the need that agricultural literacy programs should be targeted at all youth, particularly school age youth at all grade levels, and adults (AATEA Central Region Committee on Agricultural Literacy, 1989). One objective stated for these programs was to identify what the average student or citizen should know about agriculture. Another objective was to define the concepts in agriculture that need to be universally taught in school systems. These concepts should include the importance of agriculture as a business and industry, the importance of agriculture and the environment, and the historical significance of agriculture (Kansas Foundation for Agriculture in the Classroom, 1984).

Perritt and Morton (1990) reported that most youngsters in urban and suburban areas receive little exposure to agriculture. They also concluded that one of the growing responsibilities that agricultural educators face in the 1990's is to develop a positive association with agriculture in the public sector.

There has been a national move to implement programs to improve the agricultural knowledge and attitude of individuals from kindergarten through the adult level. These

programs have been primarily delivered through the public school system and can range from merely incorporating agricultural information into the current curriculum to complete courses in education about agriculture.

Christensen suggested (1988) that in the evaluation of a new curriculum, an attitude scale and an achievement test might be given at the beginning of the school year. The new curriculum is then introduced to the students. At the end of the school year, the attitude test and achievement test are again administered. The pre- and post-test scores on the attitude scale and achievement scale are examined for change. A significant change between these two scores may be attributed to the new curriculum. Because learning is one of the major goals of education, measures of amount learned (i.e., achievement) are often used in educational research. Although achievement tests have been criticized on social grounds, they are probably the most valid, reliable, and useful measures available to the educational researcher (Borg and Gall, 1989). Cronbach and Furby (1970) reported that differences in scores are thought to be worth estimating if the aims are to provide a dependent variable in an experiment on instruction or some other attempt to change behavior or beliefs, or to provide a measure of growth rate or learning rate that is to be predicted.

An assessment of the middle school students' knowledge about agriculture and attitude towards the subject, through the administering of an agricultural knowledge instrument (achievement test) and an agricultural attitude survey, provides a challenge. Such an evaluation could give direction for curriculum improvement and help identify subgroups which may profit from instruction about agriculture.

Little information was found related to outcomes about agricultural literacy programs for younger students. The focal point of this study was to provide information about the agricultural literacy of selected middle school students.

Purpose of Study

The purpose of this study was to assess if middle school students' agricultural knowledge and attitude scores differed after being exposed to an agricultural curriculum.

The general research question was: Did the middle school students' agricultural knowledge and attitude pre-test scores differ from the students' agricultural knowledge and attitude post-test scores after being exposed to varying lengths of agricultural education?

More specific questions addressed by this study were:

To what extent did the middle school students' agricultural knowledge pre-test scores differ from post-test scores?

To what extent did the middle school students' agricultural attitude pre-test scores differ from post-test scores?

To what extent did the middle school students' agricultural knowledge pre-test scores differ from the post-test scores in relation to the various lengths of agricultural instruction?

To what extent did the middle school students' agricultural attitude pre-test scores differ from the post-test scores in relation to the various lengths of agricultural instruction?

Related null hypotheses were formulated for purposes of this study.

Methods

This study was conducted as a single group pre-test, post-test quasi-experimental design. As reported by Borg and Gall (1989), where random assignments of subjects is not possible, particularly in field studies, the use of a quasi-experimental design is required. There were two independent variables and two dependent variables involved in this study. The independent variables included: length of instruction, either 6, 9, or 18 weeks, and the test type of either a pre- or post-test. The dependent variables included the achievement scores from the Agricultural Knowledge Assessment Instrument and the attitude scores derived from the Agricultural Attitude Survey.

The population for this study consisted of all 7th and 8th grade students in the 20 Missouri middle schools which taught the *Exploring Agriculture in America* (Humphrey, Birkenholz, and Harris, (1991) curriculum. The sample for this study consisted of the middle school students who were actually enrolled in classes which offered agricultural instruction during the fall semester of the 1990-91 school year. These classes were comprised of 7th and 8th graders and included 264 students in 20 schools. Students received either 6, 9 or 18 weeks of instruction in agriculture prior to or after rotating to other subject areas such as computers, home economics or industrial arts. Each school received, in addition to the curriculum materials, copies of the Agricultural Knowledge Assessment Instrument, the Agricultural Attitude Survey, machine scoreable answer sheets, and instructions for the administration of the tests. These instruments were administered before the first day of instruction using the new curriculum and then again following the completion of the 6, 9, or 18 weeks of agricultural instruction. The instructors were the current teachers from the secondary programs.

The Agricultural Knowledge Assessment Instrument was a revised version of the instrument used in the Kansas State agricultural literacy survey (Horn and Vining, 1986) and was composed of 40 multiple choice questions. Revisions included replacement of the word "Kansas" with "Missouri" and the addition of questions more closely related to the agricultural concepts in the instructor's guide and student reference. It was reviewed for construct and content validity by a panel of experts consisting of Agricultural Education, Agronomy, Agricultural Engineering, and Extension Education faculty members. The instrument was then analyzed using the Kuder-Richardson Formula 20 which yielded a reliability estimate of .83.

The Agricultural Attitude Survey was a modified form of the "Attitude Toward Any School Subject" survey by Remmers (1986) using a seven point Likert-type scale and the term "agriculture" instead of "subject matter." The internal consistency reliability for the 20 item modified Agricultural Attitude Survey instrument used in a similar study was estimated at .95 using Cronbach's alpha (McCaskey, 1987).

A multivariate analysis of variance procedure was employed using the dependent variables of achievement scores and attitude scores to test for significance between the length of instruction, test type, and interaction. The MANOVA, followed when appropriate by an analysis of variance for repeated measures procedure, was used to test the hypotheses. The repeated measure was the scores on the pre-test and post-test. As reported by Brogan and Kutner (1980), a common analysis for a pre-test/post-test design was to calculate a difference score for each subject as a relative difference measure. Another method was to view the pre-test and post-test as a repeated measures/split plot design. They also indicated that since the difference-score analysis was embedded in the repeated measures analysis, the repeated measures analysis provided more information about the data.

Results

Of the 264 students, 50.8 percent were male and 49.2 percent were female. The largest percentage of the students (39.8%) lived in small towns of less than 2500, while 27.2 percent lived on farms of more than 10 acres. A total of 57.5 percent of the students had lived on a farm. The means for achievement and attitude toward agriculture are presented in Table 1.

Table 1. Means for Achievement and Attitude

		Number of observations	Achievement	Attitude
Length				
	18 weeks	200*	27.67	107.34
	9 weeks	194*	27.64	105.25
	6 weeks	134*	27.50	104.67
Test Type				
	Pre	264	26.37	103.59
	Post	264	28.89	108.29
Length	Test type			
18 weeks	Pre	100	26.34	104.08
18 weeks	Post	100	29.02	110.64
9 weeks	Pre	97	26.12	103.05
9 weeks	Post	97	29.20	107.52
6 weeks	Pre	67	26.77	103.63
6 weeks	Post	67	28.23	105.74

*Indicates two observations per student.

A multivariate analysis of variance procedure using the Pillai's Trace value at the .05 alpha level was employed with the dependent variables of agricultural knowledge and agricultural attitude and the independent variables of length of instruction and test type. The analysis yielded a partial correlation of .1264 for the dependent variables. Although this correlation was low, it was judged to be appropriate to run the MANOVA. The MANOVA yielded a Pillai's Trace value of .2356 and a significant F of 38.4 (df=2249; p=.001) for the independent variable of test type (Table 2). The first null hypothesis of no significant difference in pre-test and post-test knowledge scores was rejected indicating that there was a significant difference (F=66.2; p=.0001) in the agricultural knowledge mean scores of the students (Table 3). The mean knowledge scores improved from 26.3 to 28.6.

Table 2. Multivariate Analysis of Variance for Knowledge, Attitude, and Interaction

Source	Pillai Trace	F	df	Prob>E
Instruction length	.0178	1.13	4500	.342
Pre-test and post-test	.2356	38.38	2249	.001
Length by test type	.0243	1.54	4500	.189

Table 3. Analysis of Variance for Knowledge

Source	Sum of squares	df	F	Prob>F
Instruction length	2.5748	2	.02	.987
Error	15550.6497	265		
Pre-test and post-test	831.3051	1	66.17	.000
Length by test type	52.1322	2	2.07	
Error	3140.5626	250		

The second null hypothesis of no significant difference in pre-test and post-test attitude toward agriculture scores was rejected indicating that there was a significant difference ($F=18.5$; $p=.0001$) in the agricultural attitude mean scores of the students (Table 3). The mean attitude scores improved from 103.5 to 108.3.

Table 4. Analysis of Variance for Attitude

Source	Sum of squares	df	F	Prob>F
Instruction length	692.7078	2	.76	.4703
Error	121330.7428	265		
Pre-test and post-test	2873.8586	1	18.50	.0001
Length by test type	385.4486	2	1.24	.2908
Error	38825.4860	250		

A MANOVA procedure was used to test for significance among the three groups based on length of instruction. The MANOVA yielded a Pillai's trace value of .0178 and an estimated F value of 1.13 ($df=4500$; $p=.3412$) as indicated in Table 1.

The third null hypothesis of no significant difference in knowledge scores by length of instruction was not rejected as there was not a significant difference among the mean scores of students regardless of the length of instruction received.

The fourth null hypothesis of no significant difference in attitude scores by length of instruction was not rejected as there was not a significant difference in the attitude mean scores of students whether they received 6 weeks, 9 weeks or 18 weeks of instruction. Subject to the conditions of this study, the following conclusions were drawn concerning the effectiveness of instruction about agriculture in selected Missouri middle schools.

There is a change in the agricultural knowledge and agricultural attitude of the students after they receive instruction about agriculture.

The length of time middle school students receive agricultural instruction between 6 and 18 weeks does not affect the change in agricultural knowledge or attitude.

Implications

The finding that there was not a strong ($r=.1264$) significant relationship between the agricultural knowledge and the agricultural attitude of the middle school students indicated that although the students may have good knowledge of agriculture, they may not necessarily have a positive attitude toward the subject. Conversely, they may have a favorable attitude toward agriculture but may not possess good understanding or knowledge of the subject. This finding strengthens the need for agricultural literacy programs for all students. Improving the agricultural knowledge of individuals may not change their attitude but it should allow them to make competent judgments about the subject. As reported by the USDA (1984), it is imperative that students have the information to fully appreciate the impact agriculture has on our society.

The significant differences found in the knowledge and attitude mean scores of the middle school students indicated that study about agriculture did indeed have a positive affect on the students. Although this study found a weak relationship between achievement and attitude scores, this finding suggests that both of these variables can be significantly altered through the use of an agricultural literacy curriculum.

The fact that in this study no significant difference was found in the achievement mean scores due to length of instruction, indicated that exposure to an agricultural education curriculum for a period as short as 6 weeks can have an impact on middle school students' agricultural knowledge. This finding supported Birkenholz' (1990) recommendation that a curriculum could be designed to accommodate a module within an existing course or to encompass only a quarter or semester long program.

The results of this study indicated that there can be an improvement in the agricultural attitude of middle school students in selected Missouri schools through instruction about agriculture. This age group of students represents an important educational stage for developing an increased understanding and appreciation about agriculture. To the extent that these findings can be extrapolated to similar groups, persons interested in increasing the agricultural literacy of the general population should continue promoting the teaching about agriculture.

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