Cognitive Achievement Using New Curriculum Materials in High School and Community College Agricultural Programs

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Technological advances in the agricultural industry have increased the need for dissemination of new agricultural information to students of agriculture. Because of these advances, teachers must constantly update curricula. Educational media, particularly audio-visual materials, can be tailored to meet these changing curriculum needs.

New technical information in agriculture must be provided to programs of agriculture. The Illinois Institute of Natural Resources provided funds to the Department of Agricultural Education and Mechanization at Southern Illinois University to develop and field test pesticide use and water quality curriculum materials for Illinois high school and community college agricultural programs. These curriculum materials were developed to provide knowledge of regulations on pesticide use in Illinois and the relationship of pesticides to the environment. Industry personnel, high school and community college agriculture teachers, and state regulatory staff were used to develop and validate the new curriculum materials. The Pesticide Use and Water Quality booklet and a slide/tape set (80 slides, approximately 19 minutes) were prepared, critiqued, and validated for content accuracy using state regulatory and industry personnel.

Purpose

The purposes of this study were:

1. to determine the cognitive achievement of students as rated by the instructor.
2. to determine the effectiveness of the slide/tape set when compared with printed materials/lecture.
3. to determine whether selected independent variables (pesticide use and class level) related to cognitive achievement.

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Methodology

Sample

Two high schools and two community colleges which offer agriculture were randomly selected from each of five Illinois Association of Vocational Agriculture Teacher districts. Ten high school vocational agriculture programs with 131 students and ten community college agriculture programs with 197 students were selected. Three hundred twenty-eight students participated in the pretest, the instructional phase, and the posttest.

The printed material group consisted of five randomly assigned secondary vocational agriculture classes with 60 student and five randomly assigned community college agriculture classes with 102 students. The slide/tape group consisted of five secondary vocational agriculture classes with 71 students and five community college agriculture classes with 95 students.

The researcher taught all 20 classes. All aspects of the class presentations were identical, with the exception of the 20 minutes allotted to either the slide/tape method or the use of printed material/ lecture method as presented by the researcher.

Instrumentation

Identical pretest and posttest instruments were used to collect the data. The 20 content questions were validated by five consultants representing the pesticide industry, agriculturalists, and high school and community college teachers. The content was evaluated for readability, accuracy, and clarity of information. The reliability of the test was established through a pilot test of high school vocational agriculture students and assessed by the Kuder Richardson-20 technique, with a resulting reliability coefficient of .79.

Procedure

Participants in the study were rated by the teacher as to their past performance on cognitive type tests. Students were rated as high, medium, or low. High achievers were students with past cognitive test performance of A or B grades; medium achievers, C grades; and low achievers, below C grades. The teacher ratings were collected at the time the posttest was administered to the students. The researcher administered the pretest and posttest to the sample of 131 high school and 197 community college students enrolled in agriculture during the 1980-81 school year.

The amount of time devoted to each method of instruction was determined by the length of the slide/tape presentation. The groups received the following sequence of instruction:

Introduction to Pesticide Use & Water Quality
Pretest
Printed Material/Lecture (20 min.)
or Slide/Tape Media (20 min.)
Summary
Posttest

Analysis

The Statistical Package for the Social Sciences (SPSS) (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975) was used to analyze the data. The t-test and analysis of variance (ANOVA) were used to determine which independent variables were significantly different from the dependent variables' pretest and posttest scores. An alpha level of .05 was used.

The following null hypotheses were tested:

H_o1 - There is no significant difference in the teachers' ratings of cognitive achievement of students and the students' performance on the pretest and posttest when using new curriculum materials.

H_o2 - There is no significant difference in the cognitive achievement of students using slide/tape media and those students taught using printed material/lecture.

H_o3 - There is no significant difference in the cognitive achievement of students on the pretest and posttest and the selected independent variables of pesticide use and class level.

Results/Conclusions

Results of the study supported the following conclusions:

1. The teacher rating of students, as to cognitive test performance, and the students' pretest and posttest scores indicated that students cognitive performance resulting from the presentation of curriculum was similar to the students' past performance on cognitive tests. Those students the teacher rated high, medium, or low scored (as a group) in that range on the pretest and posttest (Table 1). The null hypothesis (H_o1) was not rejected.

Table 1

Means of Students' Scores and Teachers' Ratings of Students' Cognitive Learning

	High	Medium	Low
Pretest	11.22	9.63	8.79
Posttest	15.14	12.87	11.52

2. There was no significant difference in the cognitive achievement between scores of the slide/tape group and scores of the printed material/lecture group (Table 2). The null hypotheses (H_o2) was not rejected.

Table 2

T-Test Comparison of Slide/Tape Media and Printed Media Involving High School and Community College Students

	Media	n	$\bar{x}$	SD	t
Pretest	Slide/Tape	166	10.186	3.418	
	Printed/Lecture	162	10.185	3.041	0.00
Posttest	Slide/Tape	166	13.222	3.958	
	Printed/Lecture	162	13.759	3.491	1.30
Gain Score	Slide/Tape	166	3.036	2.954	
	Printed/Lecture	162	3.574	3.015	1.63

t = 1.960, the critical value at alpha of .05.

3. The results of the analysis of variance comparisons were significant for the variables class level, and pesticide use. The null hypothesis (H_o3) was rejected for the independent variables class level, and pesticide use. The results shown in Tables 3 and 4 indicate there was a significant difference at the .05 level between the scores of the students enrolled in the various class levels.

Table 3

Analysis of Variance of Students' Pretest Scores Among Various Class Levels of Agricultural Students[1]

Source	Degrees of freedom	Sum of squares	Mean squares	F-Ratio*
Between groups	5	909.280	151.547	19.360
Within groups	321	2505.946	7.828	
Total	326	3414.225		

[1]Class level Groups: HS Freshman, HS Sophomore, HS Junior, HS Senior, CC Freshman, CC Sophomore

*F of 2.05 is the critical value at alpha of .05

Table 4

Analysis of Variance of Students' Posttest Scores Among Various Class Levels of Agricultural Students[1]

Source	Degrees of freedom	Sum of squares	Mean squares	F-Ratio*
Between groups	5	1327.003	221.167	21.906
Within groups	321	3230.724	10.096	
Total	326	4557.727		

[1]Class level Groups: HS Freshman, HS Sophomore, HS Junior, HS Senior, CC Freshman, CC Sophomore

*F of 2.05 is the critical value at alpha of .05

The Scheffe procedure was used to determine where the differences existed by class level (Table 5). This result supported the finding that class level was associated with pretest and posttest scores. The higher the class level, the higher the students' scores.

Table 5

Pretest and Posttest Group Means by Agricultural Students' Class Level

	n	Pretest group mean	Posttest group mean
HS Freshman	11	7.091*	9.909*
HS Sophomore	9	7.222*	9.556*
HS Junior	62	8.597*	10.742*
HS Senior	44	9.046*	12,614*
CC Freshman	101	10,099*	14.129**
CC Sophomore	89	12,191**	15.596***

SCHEFFE PROCEDURE--Results:
Pretest Group Mean: Subset 1*, Subset 2**
Posttest Group Mean: Subset 1*, Subset 2**, Subset 3***.

Using a one-way analysis of variance at the .05 probability level, there was a significant difference between the scores of those students who had used pesticides and those students who had not used pesticides. Students who had used pesticides scored significantly higher pretest and posttest scores (Tables 6 & 7). Students benefited from practical experiences in using pesticides.

Table 6

Analysis of Variance of Agriculture Students' Pretest Scores by Use of Pesticides[1]

Source	Degrees of freedom	Sum of squares	Mean squares	F-Ratio*
Between Groups	1	182.610	182.610	18.404
Within Groups	324	3214.791	9.922	
Total	325	3397.401		

[1]Pesticide Use Groups: Have used pesticides, have not used pesticides.
* F of 3.86 of the critical value at alpha of .05.

Table 7

Analysis of Variance of Agriculture Students' Posttest Scores by Use of Pesticides[1]

Source	Degrees of freedom	Sum of squares	Mean squares	F-Ratio*
Between Groups	1	192.116	192.116	14.325
Within Groups	324	4345.325	13.412	
Total	325	4537.438		

[1]Pesticide Use Groups: Have used pesticides, have not used pesticides.

* F of 3.86 of the critical value at alpha of .05.

Summary of Conclusions

The conclusions were:

1. Teachers accurately predicted how well the students would perform on cognitive tests (as to high, medium, and low) from new materials presented by a visiting instructor.

2. Students' cognitive achievement level did not differ significantly when using the printed material/lecture versus the slide/tape media.

3. The higher the class level of the students, the greater the cognitive test score.

4. Students who had prior experience in using pesticides scored higher cognitive scores.

Recommendations

1. New curriculum materials should be evaluated using various methods to determine their effectiveness.

2. Printed material/lecture method should be viewed as viable as the use of slide/tape method for disseminating agriculture information to high school and community college students.

3. Students should be provided practical experiences with the technical area of agriculture.

Further study is needed to:

1. Determine if adequate level of knowledge is reached as identified by industry.

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