
An Iowa Example: Testing an Alternative Strategy for Teaching in Agricultural Distance Education

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Abstract

Distance education is being utilized more often by colleges of agriculture to meet the educational needs of a more diverse clientele. The College of Agriculture at Iowa State University utilizes a variety of communications media to deliver distance education programming, but relies most heavily on videotapes. In this article, the authors synthesize research related to effective teaching through one-way instructional television, and test two hypotheses derived from this research. The instructional manipulation is described, and its influence on achievement across four cognitive levels in addition to learner satisfaction are tested.

Introduction

Moore (1987) reported a decline in the use of television broadcasting in favor of videotape distributions at the Open University. The advantages of videotape, according to Moore, lie mainly in the students' ability to have increased control over their learning. Students can watch when they want, as often as they want, and pause and replay a tape as necessary. For similar reason, videotape has become the primary delivery system for the Iowa State University College of Agriculture distance education programs. According to Smith (1987) distance education by videotape can be an effective means of teaching a growing mass of scholars.

Research into agricultural distance education at Iowa State University has identified characteristics of students, their attitudes toward videotape as a tool for delivering agricultural courses, and student perceptions of effective teaching and learning strategies (Miller & Honeyman, 1993a, 1993b). However, the influence of teaching strategies on student learning and satisfaction have yet to be researched in this context.

Wolcott (1991) discovered that teachers approached instruction for distance settings in much the same manner as they approached more conventional settings. The one major difference involved the development of a more detailed course syllabus for the distance settings. Wolcott concluded that students were given much less consideration than the course

content. Furthermore, distance educators are often guilty of presenting large quantities of abstract ideas (Lehtola & Boyd, 1992; Miller & Honeyman, 1993a), but television is not well suited to such uses (Bates, 1988). Distance educators often are not aware of the characteristics and educational needs of their students.

Hilgard and Bower (1975) recognized that students could learn from film and that their learning could be increased by participation (inserted questions and feedback). Miller and Honeyman (1993b) recommended that videotaped instructors alter their teaching strategies to accommodate the preferences and learning strategies of their students. One such alteration was providing logical points in the lesson to pause the tape and allow students to complete activities requiring real-world application of content. Similarly, Bates (1988) recommended that instructors exploit the nature of videocassettes by using segments, providing clear stopping points, and using activities.

Naidu and Bernard (1992) reported that inserted questions have been found to positively enhance student learning, however, the observed effects tended to diminish as the cognitive level of questions was increased. Naidu et al. also report findings which suggest that distance learners were more likely to actually answer inserted questions that were relevant to their interests as learners. These assertions were made in the context of text-based distance education programs. Are the assertions applicable to video-based distance education delivery? Can videotaped instruction that utilizes segments and activities which require higher level cognitive processes positively effect achievement and learner satisfaction?

Purpose and Objectives

The purpose of this study was to determine whether or not videotaped instruction that utilized segments and activities would result in higher achievement and learner satisfaction scores when compared to conventional videotaped instruction. The study was guided by the following research objectives and hypotheses.

Research Objectives

1. Compare control and experimental groups on selected characteristics.
2. Describe relationships between selected variables and achievement.

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Research Hypotheses

1. Students receiving instruction that utilizes segments and activities will attain higher scores on an achievement test than those receiving conventional instruction ($H_1: u_1 > u_2$).
2. Students receiving instruction that utilizes segments and activities will provide higher scores on a learner satisfaction measure than those receiving conventional instruction ($H_1: u_1 > u_2$).

Procedures

The posttest-only control group design (Campbell & Stanley, 1963) was used to test the research hypotheses. The independent variable was teaching strategy which consisted of two levels (segments and activities, and no segments and activities) Students were randomly assigned to levels of the independent variable. Lecture and supporting films were used during the session (agricultural chemicals and gases) in which the experiment was conducted.

Both groups received identical videotapes with two exceptions. The experimental group received a special mailing of three activity sheets and a videotape that was presented in three segments (anhydrous ammonia, silo gases, and manure storage and handling). After each segment, the instructor directed students in the experimental group to the proper activity sheet and asked students to stop the tape to complete the activities. After completion of the activities, the instructor summarized appropriate responses. Research has shown that the technique of providing correct answers after students' attempts to answer a question is more effective than questioning without providing correct answers (Teather & Marchant, 1974). Activities were designed to reach each of the levels of cognition identified by Newcomb and Trefz (1987). Personnel in the Iowa State University Media Production Unit inserted the experimental activities into the original two-hour videotape that was assigned to the control group.

The sample consisted of students enrolled in an Agricultural Safety and Health course offered by videotape through the off-campus program of the college of agriculture. Forty eight students were enrolled in the course. A total of 42 (19 in the experimental group and 23 in the control group) students provided

data for the study. Sixteen students in the control group and 23 students in the experimental group provided complete data on the achievement test while 16 students in the control group and 19 in the experimental group provided complete data on the Learner Satisfaction Index.

The achievement test was developed by the instructor. In regards to levels of cognition, 32% of the total test score consisted of remembering items, 3% consisted of processing items, 16% consisted of creating items, and 49% consisted of evaluation items. Prior to grading the achievement tests, the instructor randomly selected eight tests to be utilized in establishing reliability. Two weeks after grading all achievement tests, the instructor regraded the eight randomly selected tests. Intra-rater reliability was assessed by correlating initial scores with scores assigned two weeks later. The reliability coefficient was .87.

The learner satisfaction index consisted of 15 Likert-type items, with five response categories ranging from strongly disagree to strongly agree. Content and face validity were established by faculty in the Department of Agricultural Education and Studies. Cronbach's alpha was used to assess the reliability of the learner satisfaction index. The resulting coefficient was .89.

Lesson satisfaction indexes were mailed to all students along with their respective videotape. Students were asked to complete the lesson satisfaction index after viewing the videotape and return it with their weekly assignment.

Table 1. Comparisons of control and experimental groups on background characteristics

Background Variable	Control		Experiment		All Cases	
	f	%	f	%	f	%
Gender						
Male	17	94.4	20	90.9	37	92.5
Female	1	5.6	2	9.1	3	7.5
Total	18	100.0	22	100.0	40	100.0
Phi = .07						
Education attainment						
High school	2	11.	1	5.0	3	8.1
Associate's	5	29.	7	35.0	12	32.4
Bachelors	6	35.	11	55.0	17	45.9
Masters	5	23.	1	5.0	5	13.5
Total	17	100.0	20	100.0	37	100.0
Cramer's V = .32						
Occupation						
Farming	9	56.3	5	26.3	14	40.0
Agribusiness	0	0.0	7	36.8	7	20.0
Ag. Extension	3	18.8	3	15.8	6	17.1
Soil Conservation	1	6.3	1	5.3	2	5.7
Other	3	18.8	3	15.8	6	17.1
Total	16	100.0	19	100.0	35	100.0
Cramer's V = .48						

Achievement tests were administered to students at an on-campus session held approximately two weeks after the videotapes were mailed. The instructor was not informed of which students were in the control or experimental groups.

Analysis of Data

All data were analyzed with the SPSS/PC+ personal computer program. The alpha level was set a priori at .05, and Davis' (1971) conventions were used to describe all relationships. In order to control the family-wise type I error rate, multivariate analysis of variance was used to test for significant differences between the control and experimental groups on interval scaled variables. An independent samples t-test was used to test for a significant difference between groups on the total achievement test score since the total score was linearly dependant on remembering, processing, creating, and evaluating scores.

Results

Since there was differential mortality between the control and experimental groups, the groups were compared on a number of characteristics. Table 1 shows the relationships between treatment group and gender, level of educational attainment, and occupation. The relationships were negligible for gender, and moderate for educational attainment and occupation. None of the relationships were statistically significant.

Differences on age, number of videotaped courses taken, and viewing time are shown in Table 3. When compared to the control group, students in the experimental group were approximately seven years younger, had completed an average of 1.22 fewer videotaped courses, but spent approximately six more minutes viewing the videotape. The control and experimental groups did not differ significantly on these characteristics.

Table 3 Summary of Control and Experimental Group Differences

Variable	Group				t calc.
	Control		Experimental		
	Mean	S.D.	Mean	S.D.	
Age	40.25	11.24	33.65	9.72	—
No. Courses	4.81	5.36	3.58	4.86	—
Viewing time ^a	148.13	44.61	154.17	42.33	—
Achievement					
Remembering	27.00	3.43	27.26	3.68	—
Processing	2.50	.73	2.65	.49	—
Creating	12.88	4.10	13.30	3.69	—
Evaluating	41.94	5.09	38.86	9.72	—
Total	84.31	8.85	82.09	13.36	-.58
Lesson Satisfaction ^a	4.07	.47	3.75	.56	—

Wilks' lambda = .79; F (1,28) = .85; p > .05

^aNote. Based on scale: 1 = strongly disagree; 2 = disagree; 3 = undecided; 4 = agree; 5 = strongly agree.

^bTime in minutes.

Relationships between selected variables and achievement ranged in magnitude from negligible to substantial (Table 2). The relationship between student age and scores on creating and evaluating items and the total test score were statistically significant. Older students tended to achieve higher scores on creating and evaluating items and on the total test. Although the relationships were not significant, Table 2 shows that students who had taken more videotaped courses tended to achieve higher achievement scores, as did students who spent more time viewing the videotape.

Hypothesis 1

Table 3 shows that students in the experimental group achieved slightly higher scores on test items written at the remembering, processing, and creating levels. However, students in the control group achieved higher scores on the evaluating items and on the total test. None of the differences were statistically significant. Therefore, the research hypothesis that students receiving videotaped instruction that utilizes segments and activities would attain higher achievement test scores than students receiving conventional instruction was rejected.

Hypothesis 2

Table 3 shows that students in the experimental group were slightly less satisfied with the lesson. The research hypothesis that students receiving instruction that utilizes segments and activities would provide learner satisfaction scores higher than students receiving conventional instruction was rejected.

Table 2 Associations between selected variables and achievement

Variable	Achievement				
	Remembering	Processing	Creating	Evaluating	Total
Age	.08	-.27	.49*	.63*	.58*
Gender	.13	.03	.02	-.06	.01
No. courses taken	.28	.19	.12	.15	.22
Viewing time	.22	.29	.15	.07	.17
Lesson Satisfaction	-.05	-.05	-.24	-.13	-.18

*p < .05

Conclusions

The reader is cautioned that differential mortality was an issue with this study. Fewer students from the control group provided complete data, but it is unlikely that the treatment had any influence on mortality. Five students changed their status to audit during the course and one student was unable to attend the on-campus session due to personal reasons.

The results of this study indicate a significant relationship between students' age and their scores on test items written at higher cognitive levels. Also, non-significant positive relationships were observed between achievement and the number of courses taken by videotape and viewing time. The magnitude of the latter two associations tended to be higher at the lower cognitive levels. Further research is needed to explain relationships between demographic variables, in addition to instructional variables, and students' achievement at different cognitive levels.

Presenting instruction in segments and utilizing activities resulted in no advantage for students on the achievement test. Perhaps, the no-difference conclusion can be partially explained with three points. First, one-shot experiments often do not provide sufficiently complete or reliable evidence (Lin & Creswell, 1989). Second, students in the experimental group may have resisted doing the activities. Bates (1988) described research which suggests that students are less likely to stop a videocassette to answer questions when working alone. Third, the instructor involved in this study normally utilizes a variety of teaching methods. She does not fit the description of a "talking head". Her teaching philosophy is embodied in the adage: "Tell me, I forget. Show me, I may Remember, Involve me, I understand!" Therefore, utilization of segments and activities may have been received by students as a "normal" teaching strategy.

Students in the experimental group were slightly less satisfied with the lesson than were students in the control group. A possible explanation for this conclusion could be that students in the experimental group were frustrated by the additional time needed to complete the experimental activities.

Results of this study do not provide conclusive evidence that segmented instruction and activities are superior to, equal to, or inferior to conventional teaching strategies used in distance settings. It is recommended that this study be replicated with other off-campus instructors. These instructors should represent a variety of teaching styles. Perhaps, the effect of this instructional manipulation may differ among situations in which differing instructional styles are used. Also, replications should be longer in duration. A longer period of treatment may allow students to become accustomed to viewing videotapes in segments and completing activities related to the lesson. Results of such studies would allow more reliable conclusions regarding the efficacy of this teaching strategy.

Implications

Although this study shows that no instructional advantage was gained by presenting videotaped instruction in segments with accompanying activities, college teachers of agriculture should continually identify, implement, and test alternative teaching strategies for both conventional and distance settings. Using a variety of instructional strategies can help college teachers accommodate the variety of learning styles and learning strategies possessed by students enrolled in their courses. College teachers of agriculture should document their efforts and share their successes and setbacks with others. Perhaps this article may serve as an example of how to test experimentally the effectiveness of alternative teaching strategies in college level agricultural courses.

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