

## CASE STUDY

# The Impact of An Audio - Video, Self-Learning Program On Beginning Students in Agricultural Economics

Kelso Wessel, Donald Larson, Alan Evans, and Edward Powers

### Abstract

*Audio-video cassettes provide students with additional modes of learning. Audio-video cassettes, prepared at The Ohio State University, Department of Agricultural Economics, provide discussion to problem sets in a workbook. Analysis found students favoring audio-video, self-learning material. However, no significant difference between the achievement of users and non-users was found.*

The research embodied in this paper deals with a survey course in economics at The Ohio State University. More specifically, **Food Fiber and Natural Resource Economics (AEC 100)** is taught primarily to freshman and sophomore students whose interests are in agriculture or natural resources. For many students, AEC 100 is their first and only course in economics; therefore, it is imperative that students complete this course with a good understanding of economics.

### Problem

Approximately 1,200 students take AEC 100 each year. Due to the varied backgrounds of students and the large enrollment, optional instructional media have been developed to supplement the lectures and text. Approximately five faculty members teach four or five sections of the course, on a rotating basis, during each of three quarters every year. Section size varies from 50 to over 180 students. Each professor frequently teaches an additional advanced course, thus the amount of personal attention students receive is limited. The instructional media provide additional material for students not able to understand fully the material as presented in the lectures and/or text. The media also standardize the course content among professors.

Over the past four or five years, a series of homework problems related to concept application in economics has been assembled in a workbook available to students. Traditionally, these problems were graded by the professor. However, increasing student enrollment made it impossible to grade each set of problems. Because of the learning value placed on the problem sets by stu-

The authors are indebted to Howard Phillips, Robert Warmbrod, and two anonymous Journal reviewers for helpful comments on an earlier draft of this paper. Any errors are the sole responsibility of the authors.

Associate Professors Wessel and Larson and Graduate Student Powers are in the Department of Agricultural Economics and Rural Sociology. Evans is Consultant for Instructional Media Development in the Teaching Aids Laboratory, The Ohio State University.

dents, solutions to the problems were placed on video-cassette tapes (also referred to as AVIS-audio video instructional supplements) so students could review them at their own pace and convenience. Also several parts of the course were adapted for use with computer assisted instruction (CAI). Thus, parts of the course were supplemented by both CAI and AVIS programs whereas some parts were not supplemented by either.

### Objectives

The general objective of the research was to evaluate the impact of AVIS on student understanding of the course material presented in AEC 100. More specifically, the objectives were:

- (1) To describe student's use of instructional media available to them.
- (2) To determine the impact of the video-cassettes on the amount of study time and the degree of substitution between the video-cassettes and the other available instructional media.
- (3) To test the impact of the video-cassettes on student grades.
- (4) To evaluate the effect that location of the video-cassettes had upon their use.

### Historical Perspective

Application to modern technology should permit educational institutions to better teach more students at less cost. The main purpose of this technology is to free the teacher from repetitive tasks for more interaction with students (Mohlner). The textbook and lecture are frequently inadequate, and students need additional modes to enhance their learning and retention. CAI has been the educational technology most widely adopted during the past decade.

Like CAI, most audio-visual programs have attempted to replace part or all of the material normally presented in lecture or text (Riner and Waits, and Ackers and Dosthock). Results have been very favorable, with the only complaints due to equipment failure and waiting for programs (Bertrand). Students generally have rated audio-visual programs good to excellent, have felt they learned more than in a traditional classroom, and have wanted more programs on the material covered in the course (Utz). With the above in mind, the authors developed a set of audio-visual instructional supplements (AVIS) to complement rather than replace a set of classroom lectures.

A grant of approximately \$2,000 was received from the OSU Task Force on Learning (a faculty development program supported by the Office of Academic Affairs) by Professors K. Wessel, D. Larson, W. Wayt, and G. Himes in the Department of Agricultural Economics and Rural Sociology.

## Development of AVIS

Until the introduction of AVIS, the resources available in AEC 100 consisted of the workbook and CAI programs. The workbook had 11 major units, each essentially corresponding with a different topic taught in the course. CAI programs covered four of the 11 units. Six units were then produced on video-cassettes with some cassettes duplicating CAI programs and some units not covered by either medium (Table 1).

Several agricultural economics faculty members worked with the staff of the Telecommunications Center at Ohio State University to produce the six 30 to 45 minute video-cassettes.<sup>1</sup> Broadcast quality studios equipped with two-inch, quad recorders were used in the production; and four student copies of each lesson were duplicated on video-cassette.

A variety of techniques such as the chalk board, the write-a-mile, graphs, tables and slides were used in producing the cassettes. The character generator was used to flash the answers to questions on the viewing screen at an appropriate time in the presentation. Also a film strip, slides, and theme music were used as an introduction and closing for each of the cassettes.

Each recording began with a brief statement about the set of problems to be discussed. Then two faculty members discussed in dialog format the concepts illustrated in the problem set. High student interest was maintained by cutting from one faculty member to the other, and switching to the production techniques mentioned above. To conclude the recording one professor provided a brief review of key points to assist the student in comprehending the major concepts.

The AEC 100 course was taught at the Agricultural Campus and West Campus. The video-cassette facilities

Table 1. Course Content and Availability of Instructional Media for AEC 100.

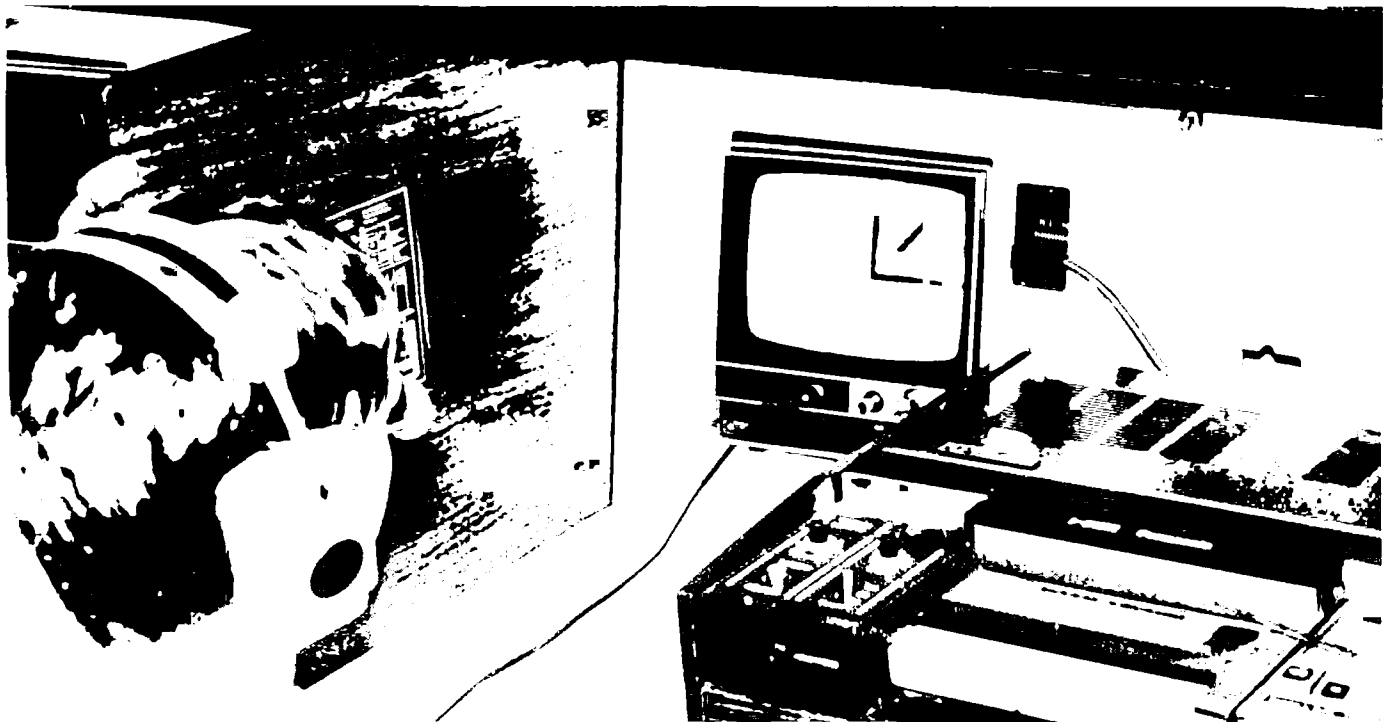
| Unit Number and Title                       | Media Available |     |
|---|-----------------|-----|
|   | Video-Cassette  | CAI |
| I Index Numbers                             | Yes             | No  |
| II Circular Flow of Economic Activity       | Yes             | No  |
| III Monetary and Fiscal Policy              | Yes             | No  |
| IV Loans and Interest                       | No <sup>1</sup> | No  |
| V Stocks and Bonds                          | No <sup>1</sup> | No  |
| VI Specialization and Comparative Advantage | No              | No  |
| VII Physical Production Relationships       | Yes             | Yes |
| VIII Costs, Revenue, and Profit             | No              | Yes |
| IX Changing Equilibrium                     | Yes             | Yes |
| X Model For Imperfect Competition           | No              | No  |
| XI Trading in Futures                       | Yes             | Yes |

Covered by audio-cassettes and 35mm slides but not included as part of the AVIS analysis of this paper.

were located in the Learning Resources Center on West Campus, which is an approximately five-minute bus ride from the Agricultural Campus. CAI could be accessed through remote terminals on all campuses. The students went to the circulation desk in the Learning Resources Center to sign out video-cassettes for use in the nearby study carrels. Each carrel is equipped with headphones and a small screen television attached to a video-cassette player. These self-threading video-cassette players operate with push buttons providing the student the option of stopping, reversing the cassette tape, and reviewing as frequently as desired. Upon completion the tape is re-wound and returned to the circulation desk.

The major problems encountered were video-cassette damage in the form of edge damage, wrinkled tape, or tape snagged in the player; however, these occurred in less than one percent of the uses.

Agricultural economics student using the AVIS system in the Learning Resources Center at The Ohio State University.



## Procedure

To compile the data for this research, two sections of AEC 100 were used during Winter Quarter, 1976. One section of 160 students was told that they were to be involved in an evaluation of the instructional media available to them and that the class would be divided into two groups, each having access to the AVIS during alternating weeks. Due to its smaller size the other section of 80 students was not split; instead, everyone was encouraged to use AVIS. Students were expected to have read and worked a set of problems in the workbook before viewing the appropriate video-cassette.

Lectures and tests were conducted in the same manner as previously. A weekly quiz was given covering the material made available in the lectures, text, and one study unit. After each quiz, the students completed a questionnaire which indicated what instructional media had been used and their evaluation of them. Also two separate evaluation forms were used at the end of the quarter. One was a summary analysis of the instructional media and the other a comprehensive course-instructor analysis.

Various statistical techniques, such as chi-square tests, analysis of variance, and frequency counts, were used to evaluate the effect of the instructional media on student grades.

## Workbook Analysis

By the end of the second week of the quarter, 206 students (88 percent) had purchased the workbook. However, student use of the workbook was probably greater since several copies were on reserve in the Agricultural and West Campus libraries.

The number of students who reported working the problems before using the cassettes was very high initially, but tapered off quickly as the quarter progressed (Table 2). More than one-half of the students worked the problem set before going to the answers for the first four units. A large drop in usage of the last two units can possibly be explained by the fact that these units were introduced after the second midterm and just before finals; thus, some students may have had other course work pressing at that time.

The amount of time students spent working the problems tended to decrease over time. For the most part, students who worked less than an hour decreased in numbers as the quarter progressed. The first and second units had 28 percent and 32 percent, respectively, work-

Table 2. Percentage of Students Who Reported Working the Problem Sets Before Viewing the Video-Cassettes.

| Unit Number and Title                 | Percent |
|---------------------------------------|---------|
| I Index Numbers                       | 69      |
| II Circular Flow of Economic Activity | 64      |
| III Monetary and Fiscal Policy        | 60      |
| VII Physical Production Relationships | 55      |
| IX Changing Equilibrium               | 39      |
| XI Trading in Futures                 | 39      |

ing less than an hour; however, this figure declined to a low of 19 percent for units V and VI. Most students spent one to three hours study time per unit; this increased during the quarter from 59 percent for unit I to 68 for units V and VI. Interestingly, the number of students who worked the problems before looking at the answers decreased, but the total time that was spent on the problems increased as the quarter progressed. More than 40 percent of the students worked the problems as intended.

The problems were intended to be of a level of difficulty so most students could work them. For unit I, 92 percent of the students were able to complete more than one-half of the problems (Table 3). This indicates that the problem set for this unit may have been too easy.

Table 3. Distribution of Students Completing Various Proportions of the Problems for Each Study Unit.

| Unit Number and Title                 | Percent Distribution of Problems Completed |       |       |        | Total |
|---------------------------------------|--|-------|-------|--------|-------|
|                                       | 0-24                                       | 25-49 | 50-74 | 75-100 |       |
|                                       | (Percent of Students Responding)           |       |       |        |       |
| I Index Numbers                       | 4  | 4     | 21    | 71     | 100   |
| II Circular Flow of Economic Activity | 23   | 14    | 28    | 35     | 100   |
| III Monetary and Fiscal Policy        | 8  | 9     | 29    | 54     | 100   |
| VII Physical Production Relationships | 14   | 9     | 34    | 43     | 100   |
| IX Changing Equilibrium               | 15   | 9     | 35    | 41     | 100   |
| X Trading in Futures                  | 13   | 13    | 33    | 41     | 100   |

Unit II dealt with the circular flow of economic activity. This appears to be a difficult unit since only 63 percent of the students were able to solve over half of the problems before seeking assistance. Furthermore, 23 percent were not able to complete one-fourth of the problems in this unit. Unit VII, production economics, was above average in difficulty; based on past experience this was probably the most difficult concept in the course for a majority of the students.

## Video-Cassette Analysis

AVIS had an important role in the intended study program for the course. The study schedule suggested to students was that they first attend lectures and take notes; second, work as many homework problems as possible, even working with another student if helpful; and finally, view the video-cassettes for answers and additional explanation. The primary purpose of the video-cassettes was to provide an individualized learning environment to supplement the traditional classroom.

At the end of the quarter, students were asked how, in their opinion, the video-cassettes could be improved. As one would expect, not all students were completely satisfied; however, more reacted favorably. Some of the responses were:

"The additional lecture time was nice."

"Helped to get ideas and definitions straight without rushing."

"The video-cassette explained how the answers could be derived for each question, which was helpful."

"It explained the answers better. I could concentrate better with the video-cassettes and I enjoyed them."

"In just using the workbook answer key, you find the answers to the problems but not the reasoning behind them. By using the video-cassette, someone is explaining the reason behind the correct answer."

Some of the negative responses can be explained by the fact that AVIS was designed to be used after attending the lecture and working the problems. It was obvious that some students went directly to the video-cassettes without any advance preparation. It is significant that negative replies to the open-ended question of how the video-cassettes could be improved were only 10 percent of the total replies. A few specific examples of negative reactions to the video-cassettes were:

"Make the presentations more interesting."

"Expand the discussion beyond the workbook and add more examples."

"More information and examples would be better."

"Too repetitious."

At the end of the quarter, students were asked to rank each video-cassette unit on a scale of one through five, with one being the highest mark. Almost half (49 percent) of the students felt that AVIS was beneficial and ranked the units as 1 or 2. The range of "rank 1" replies for each unit varied from 37 percent for unit V to 56 percent for unit III.

Students found that the 30-minute cassettes maintained their interest better than the longer ones. A few students indicated a need for improvement in delivery on some tapes. The authors concluded that considerable advance preparation and rehearsal time is necessary to produce high quality programs.

Total usage of the video-cassettes was higher at the beginning of the quarter and showed a significant decrease for units IX and XI. The overall mean usage was 30 percent. This was about 50 percent of those eligible to use the video-cassettes. Two factors may account for usage to have dropped late in the quarter: First, as with the workbook, unit IX followed immediately after the second midterm and unit XI was only two weeks prior to finals. Secondly, the CAI program covered the same material as that contained in units VII, IX, and XI.

The preceding has dealt with those students who actually viewed the video-cassettes. Those who did not use the program overwhelmingly gave location (32 percent) or lack of time (56 percent) as their reasons. Had the video-cassettes been at a more convenient location, their total usage would perhaps have been higher.

### Study Habits

Recall that over 50 percent spent one to three hours study time per problem unit. By comparing this figure with the time that students allocated to the text and lecture notes, it seems that many students substituted the new instructional media for traditional study based on textbook and notes. For example, a large percentage of the students spent less than three hours per week on the textbook and lecture notes for each of the following six

units: (I) index numbers - 45 percent; (II) circular flow of economic activity - 60 percent; (III) monetary and fiscal policy - 46 percent; (IV) stocks and bonds - 38 percent; and (VI) specialization and comparative advantage - 38 percent. Clearly a high percentage of the students spent less time studying outside of class than the "rule of thumb" of 10 hours weekly for a five credit-hour course.

For units IX and XI, an increase in the time for the traditional methods of study was found; but each of these units had a marked decrease in workbook and video-cassette usage. The use of CAI tended to follow the same general pattern. The use decreased from about 40 percent on unit VII to 29 percent on unit XI. It appears that students used these instructional media when time permitted, but as the end of the quarter approached and time pressures increased, their use declined.

On the whole, total study time for AEC 100 was less than the total time spent on other introductory courses. For example, 60 percent of the students spent four hours or less studying for AEC 100, whereas 67 percent spent more than four hours on their other most time-consuming course.

### Course and Instructor Evaluation

Realizing that AEC 100 was an introductory course required of all students who planned to major in agriculture, one might expect student interest in the course to be relatively low. However, for the group under analysis, just the opposite was true. Over 80 percent of the students found the course "moderately" to "very" interesting. Of these students, 42 percent stated that they would have taken AEC 100 even if it were not required of them. Only 38 percent of the students felt it was not as good as other introductory courses they had taken.

A teacher's knowledge of the discipline should be broad and his presentations should guide the students. Students should feel comfortable with the teacher and feel that he enjoys his profession and maintains a good relationship with them. The professors involved in this research met these requirements. Eighty-six percent of the students rated the professor's attitude good or excellent, while 72 percent were satisfied with the faculty-student relationships.

### Video-Cassette Usage

To compare the results obtained by those who used the video-cassettes with those who did not, an analysis of variance of the quiz grades from each unit was used. The null hypothesis was that the means obtained on the quiz grades were equal between users and non-users. No significant differences among the means between groups was found so the null hypothesis could not be rejected. The conclusion from this is that students who used the video-cassette program did not receive better grades on their quizzes.

In an attempt to relate the effectiveness rating of the cassettes to the final examination grades, the students were divided into three separate groups according to their final exam scores (1) those students who received a score of 60 or less, (2) those who received between 61 and

80; and (3) those between 81 and 100. Students with good final exam scores (81-100) found the video-cassette programs least effective. Eighty-seven percent of the average students (61-80) rated the programs either very good or good, and about 80 percent of the below average students rated the AVIS programs good or very good. In all, more than 90 percent of the students responding indicated that the video-cassettes were effective as an instructional media. However, a Chi-Square analysis indicated that the results were not significant.

### Conclusions

The students in AEC 100 have access to a wide range of instructional media in addition to the traditional textbook and lecture notes. These media include video-cassettes, workbook, and CAI.

Student use of the workbook was very high (88 percent ownership) and a majority spent from one to three hours per unit on the problems. Student use declined as the quarter progressed due to time pressures of exams. Some of the study unit problems appear to be quite difficult for students, such as circular flow of economic activity, while others such as index numbers may be too easy. Some changes in these units may be warranted to increase student learning.

AVIS is an important supplement for students who encounter difficulty understanding the concepts from traditional lectures. Student reaction to the video-cassettes was very favorable from those who used them. For any one unit about half of those eligible used them. Almost one-half the students rated the usefulness of the video-cassettes as good or excellent. The lowest ratings were from those students who were high achievers and perhaps did not need the supplemental teaching program.

Usage of the video-cassettes and CAI was higher at the beginning of the quarter than at the end. One factor that may account for the decreased use late in the quarter is the time pressure of final exams. Little substitution seems to exist between the video-cassettes and CAI. Rather it appears that students substituted AVIS or CAI for the traditional study of the text and lecture notes.

Little evidence could be found to show that total study time was increased by introducing the instructional media. A high percentage of students spend very little time studying outside of class. Total study time for 60 percent of AEC 100 students was no more than four hours per week outside the classroom. This was less than that for some other introductory courses which these same students had taken.

Students who used the video-cassette program did not obtain better grades on quizzes than the non-users. Some factors which may explain part of this failure to perform better are the experimental design and the location of the tapes. The experimental design only permitted analysis of the impact of the program on quiz grades. Analysis of student performance on midterm and final exams would have been desirable but could not be conducted because students were users for one unit and non-users for the next. Thus, all students had the opportunity

to use some of the video-cassettes during the quarter. The location of the tapes was also a problem which caused relatively low and declining use throughout the quarter. Most students at OSU do not have classes on the West Campus; therefore, they had to make a special trip to the Learning Resources Center if they wanted to use AVIS. More convenient access on other parts of the campus would have increased the number of users. Because of these difficulties, further research on this program seems warranted.

### References

- Ackers, G. W. and J. K. Oosthoek. "The Evaluation of an Audio-Tape Mediated Course - 1." *British Journal of Educational Technology*, (May, 1972), Vol. 3, No. 2.
- Bertrand, John. "Shasta College: Growing Into An Individualized Learning Program," *AV Guide, The Learning Media Magazine*, (June, 1972), Vol. 51, No. 6
- Mohlner, Andrew. "Ten Years of Educational Broadcasting," *Educational Broadcasting Review*, (June, 1969), Vol. 3.
- Riner, John and Bert Waits. "Television and Video-Cassettes for Math at Ohio State," *Videoplay Magazine*, (October, 1973), page 37.
- Utz, Peter. "Is This Any Way to Teach Mathematics," *AV Guide, The Learning Media Magazine*, (June, 1972), Vol. 51, No. 6.

## Avoid Common Pitfalls In Team Teaching

### Abstract

*Pitfalls common to team teaching can be avoided by careful team planning, proper coordination, and effective course review.*

**Stephen F. Matthews**

Team teaching is meant to describe a course taught by more than one instructor, usually two or three instructors. The benefits of team teaching include increased student exposure to related subject matter, integration of previously taken courses, and efficient utilization of teaching resources. On the other hand, team teaching can become a disastrous experience for both instructors and students. This article points out some common pitfalls encountered when team teaching and recommends some preventive procedures to minimize these potential pitfalls.

### Disjointed Course Objectives

A common problem of team teaching is the assumption that each instructor is to exercise sole decision-making power over his part of the course. Before any team-taught course can realistically be offered, the potential instructors must individually develop instructional objectives which clearly express what the student is to learn and how achievement will be measured. After this initial formulation of each instructor's objectives, there should be a careful review by all instructors of each other's instructional objectives.

Team teaching can better benefit instructors when each shares his experience and offers constructive criti-

*Dr. Matthews is an associate professor in the Department of Agricultural Economics, University of Missouri, Columbia MO 65201.*