A QUASI-EXPERIMENTAL STUDY OF THE DIFFERENTIAL IMPACT OF A SET OF INFORMATIONAL DELIVERY SYSTEMS ON STUDENT UNDERSTANDING OF ELEMENTARY ECONOMIC CONCEPTS

DISSERTATION

Presented to the Graduate Council of the North Texas State University in Partial Fulfillment of the Requirements

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By

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The problem with which this investigation is concerned is that of determining the differential impact of informational delivery systems $T_1$ (games and simulations), $T_2$ (closed-circuit television), $T_3$ (programmed learning), and $T_4$ (standard lecture and discussion) on student understanding of elementary economic concepts as measured by the *Test of Understanding in College Economics*. In addition, the study seeks to determine whether a significant relationship exists between students' revealed preferences for specific informational delivery systems and increased economic understanding, and whether a significant relationship exists between students' evaluation of specific informational delivery systems as most effective in preparation for class examinations and increased economic understanding.

The principal sources of data are students' test scores on the *Test of Understanding in College Economics*, students' revealed preferences for specific informational systems, and students' evaluations of specific informational delivery systems as most effective in preparation for class examinations.
The organization of the study includes a statement of the problems; a review of literature related to games and simulations, closed-circuit television, programmed learning, and standard lecture and discussion; the methodology used in the statistical analysis of the data; an analysis of the data; the findings, conclusions, implications, and recommendations for additional research.

Chapter One introduces the background and significance of the problems. Hypotheses to be tested are stated, terms in the study are defined, and limitations are delineated.

Chapter Two is a topically-arranged review of the related literature including both experimental and descriptive studies. Literature is included on games and simulations, closed-circuit television, programmed learning, and standard lecture and discussion.

Chapter Three includes information on the population of the study, the Test of Understanding in College Economics, variables used to test each hypothesis, how data were collected, and multiple linear regression, the basic statistical design employed in the study.

Data are analyzed in Chapter Four, and reported in tables of regression coefficients on a measure of a change in economic understanding. Tables showing the results of analysis of variance and t-scores are included on informational delivery systems judged most interesting by students.
Chapter Five concludes that informational delivery systems used in the study produce no significantly different mean gains in student understanding of elementary economic concepts as measured by the Test of Understanding in College Economics, and that students' revealed preferences for and evaluations of informational delivery systems considered most effective in preparing for class examinations show no significant relationships between positive attitudes and increased economic understanding. Although informational delivery systems showed no significant impact on cognition, there was a relationship between how well students scored on posttests after using programmed learning and the degree to which they found programmed learning interesting and helpful. Analysis of variance shows that the evaluations of informational delivery systems did not occur by chance. These conclusions contain the pedagogical implication that attitudes toward informational delivery systems are critical. When students see pedagogy as interesting or helpful, there is an opportunity for an increase in cognition.
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CHAPTER I

INTRODUCTION

This study, which was conducted at North Texas State University during the academic year 1972-1973, is designed to measure the differential impact of four informational delivery systems on the understanding of certain defined elementary economic concepts by students in a beginning economics course of microeconomic theory at the university level. A modification of Campbell and Stanley's, quasi-experimental, counterbalanced research design number eleven, i.e. Latin square, was employed (1, pp. 50-52).

National surveys have shown that, while research in the pedagogy of economics has been widespread, almost all of it has been descriptive rather than experimental. For example, Vanderbilt University, in a national survey conducted in 1962, confirmed that, while research has been varied and often highly original, almost all of the studies conducted have been descriptive, with no control groups being used or statistical evaluations being undertaken (5, pp. 68-73). As late as 1969, only 10 per cent of doctoral dissertations in social studies education could be classified as experimental (8).

Subsequently, research in economic education has improved, particularly in the use of more sophisticated
statistical methodology. Research Papers in Economic Education (17) is a collection of fourteen research papers which, to use Campbell and Stanley's term, study "dimensional relationships and interactions along many degrees of the experimental variables" (1, p. 3). Campbell and Stanley see experimentation as the only way to settle disputes concerning pedagogy, as the only way to verify change as a positive force, and as the only way to attain cumulative progress (1, p. 2).

While it is obviously true that the teaching of economics needs to be improved, attempts to bring about positive change in teaching economic concepts must be accompanied by rigorous and scientifically controlled measurement and evaluation instead of curriculum changes, course revisions, and the new methods and materials being based on nothing but guesswork, as has been the case in the past (3, p. 119). This research picks up the genuinely experimental thrust so desperately needed to bring about positive change based on scientifically controlled measurement and evaluation.

Background and Significance

A booklet by Walter E. McPhie, published in 1964, contains an annotated list of some 550 dissertations in the field of social studies education which were written before 1962-1963. Of these 550, about 20 per cent can be categorized as being experimental in nature (14). Richard E. Gross and Leonardo de la Cruz conducted a survey of doctoral dissertations in social studies education for the period 1962-1963.
to 1969 and found that only 10 per cent could be classified as experimental at that time (8). This decline in experimental studies can be explained if one realizes that such studies are the most difficult to mount and that variables are difficult to control in the classroom. However, hard data are needed to ascertain the efficiency cost of various methods and programs in the field of social studies (7).

The experimental study of informational delivery systems, as they pertain to the discipline of economics, is in its infancy. It was not until 1960 that the success of pedagogy in economics had been evaluated by the use of objective questions (16). The pioneering effort began during the summer of 1969 when Directors of Centers for Economic Education from all sections of the United States met with the staff of the Joint Council on Economic Education to work out a series of research projects to be conducted during the 1969-1970 academic year (17, p. iii). This was the first organized attempt by any discipline to link itself with pedagogy on the basis of rigorous research. Most of the research in the teaching of economics prior to this time had been descriptive or of the one-group, pretest-posttest variety. Also, 74 per cent of the 221 studies dealing with college-or adult-level economic education either were completed in the 1960's or are still in progress. Thirty-six studies were completed in the 1950's, while ten were dated in the 1940's, nine in the 1930's, and two in the 1920's (2, p. 80).
The discipline has just begun trying to identify the variables relating to cognition. Even fewer experimental studies have been conducted to ascertain the relationship between economic cognition and elements of the affective domain (11, pp. 13-22).

G. L. Bach of Stanford University has written that the time is ripe for concentrated efforts in economic education. This is particularly the case in view of the fact that the time of nearly 1,000,000 students, plus the time of their teachers, and the cost of all the supporting software and hardware involved, are involved each year in elementary economic education. Since economics is traditionally concerned with efficiency in the allocation and use of resources, it is only logical that experimental studies in the teaching of economics be instituted (12, p. 25).

This study finds its significance in research which is quasi-experimental and which concerns the efficiency cost of alternative informational delivery systems.

Statement of the Problems
1. Does the use of informational delivery systems $T_1$, games and simulations; $T_2$, closed-circuit television; $T_3$, programmed learning; and $T_4$, standard lecture and discussion, produce differential impacts on student understanding of elementary economic concepts as measured by the Test of Understanding in College Economics (TUCE) (4)?
2. Does a significant relationship exist between increased economic understanding and students' revealed preferences for specific informational systems?

3. Does a significant relationship exist between increased economic understanding and students' evaluation of specific informational delivery systems as being most effective in preparation for class examinations?

Hypotheses

1. *Ceteris paribus*, informational delivery systems $T_1$, $T_2$, $T_3$, and $T_4$ will produce significantly different mean gains in student understanding of elementary economic concepts as measured by the TUCE.

2. *Ceteris paribus*, students' revealed preferences for a specific informational delivery system will show a significant relationship between positive attitudes and increased economic understanding.

3. *Ceteris paribus*, students' evaluations of the informational delivery system considered most effective in preparing for class examinations will show a significant relationship between positive attitudes and increased economic understanding.

Definition of Terms

The following definitions hold for this study.

*Microeconomics* is concerned with specific economic units and a detailed consideration of the behavior of these
individual units. Microeconomics studies competitive markets, supply and demand, elasticity, theory of the firm, markets and antimonopoly policy, factor markets and income distribution, and government and the allocation of resources (13, p. 14).

Games are models for student interaction which involve a winner in a competitive setting for the learning of subject-matter content. Games contain a chance component with more than one possible outcome (10, p. 2).

Simulations are models of a portion of reality in an artificial situation. Students assume roles in a social, economic, or political system and try to understand how the system operates by participating in it as members, rather than as an observer. Because the outcome is defined, there are no chance components (10, p. 2).

Programmed learning has certain defined characteristics. It focuses the student's attention on a limited amount of material at one time in a frame or step; it requires a response to each segment of material; and it permits each student to respond at his own pace (15, p. 1017).

Closed-circuit television is here used as a learning situation wherein designated groups of students are video taped for a specified period of time as each group presents material related to specific economic concepts to fellow class members and a tutor. After the tape is played for the groups, class members, and tutor, verbal interaction concerning the
concept, its presentation, and reception by classmates follows.

**Standard lecture and discussion** is a method of teaching in which the instructor gives an oral presentation of facts or principles, followed by verbal participation by the class, characterized by adherence to a topic, question, or problem about which the participants wish to arrive at a decision or conclusion (6, pp. 178, 315).

**Informational delivery systems** are methods based on the kinds of procedures used in teaching (6, p. 345).

**Limitations**

The weakness of the Latin square is that it assumes no interaction. However, some significant interaction effect could be identified as due to treatment occurring at different times for different groups, specific sequence of treatments, tutors presenting certain concepts well or poorly, or some material being better suited to certain treatments (9).

Repeated replication with specific Latin squares is necessary to change a study employing Latin squares from quasi-experimental to experimental (1, p. 52). This study dealt partially with the weaknesses of the design by replication during the Spring semester using a second randomly selected Latin square, and by randomization of students into groups to take care of the interactive effects of selection, history, maturation, and practice effects.
Two other reservations must be made concerning this study. One, the results reported may be idiosyncratic to North Texas State University; and, two, the research is quasi-experimental. A genuinely experimental study might not produce the same results.

Summary

The American Economic Association has shown some interest in the problems associated with the teaching of economics since 1890, but not until the 1960's was serious attention given to conducting a survey of innovations and experiments in the teaching of economics, to the implementing of a variety of projects designed to stimulate further research, and to testing the results (12, p. 25). The problem of this study is to test quasi-experimentally the effects of designated informational delivery systems and students' preferences for specific informational delivery systems on student understanding of certain elementary economic concepts.

Four informational delivery systems were tested in this study. Games and simulations, a specified variation of closed-circuit television, programmed learning, and standard lecture and discussion were assessed as a means of measuring student understanding of elementary economic concepts.

Students' revealed preferences for specific informational delivery systems and students' evaluations of the informational delivery system considered most effective in
preparation for class examinations were assessed by observing the relationship between positive attitudes and increased economic understanding.
CHAPTER BIBLIOGRAPHY


9. Hartley, H. O., Director of Statistics Institute, Texas A & M University, College Station, Texas, interview, April 6, 1973.


CHAPTER II

REVIEW OF RELATED LITERATURE

A topically arranged review of the related literature follows. Experimental and descriptive studies are included.

Games and Simulations

In one study by Glenn F. Marston, Kenneth Lyon, and Richard Knight, two experiments were designed to test hypotheses concerning the relationship between the playing of the National Income Simulation Game (NISG) and the students' understanding of and interest in economics. One experiment was conducted using a large introductory college class, while the other used two high school economics classes taught by the same instructor. Control groups were used in both instances. The experimental groups played the National Income Simulation Game, while the control groups did not. All participants were pretested and posttested, and they all filled out a questionnaire at the beginning and the end of the course. The college students were given the TUCE, both A and B forms of Part I. High school students were given A and B versions of the Test of Economic Understanding published by Science Research Associates, Inc.
The college experiment was conducted at Utah State University in 1970 with 150 subjects who met three days a week with the professor. The class was divided into six quiz sections which met twice a week. Three quiz instructors conducted two sections each, one control group and one experimental group. Subjects were randomly assigned to quiz sections.

The high school experiment occurred during the spring term of 1970 and consisted of two intact classes taught by the same teacher using the same text for both classes. The number in the experimental class was sixteen and the number in the control class was fifteen. Regression analyses were applied to the data for the college class and also, with some modifications caused by data limitations, to the high school classes. In both experiments the differences in achievement between the control and experimental groups were not significant.

Interest data were collected by a comparison of economics with other subjects taken the previous two years. A semantic differential questionnaire was used. The Chi-square test of independence was used to test whether the difference in responses was dependent upon the group. The evidence was reported in contingency tables. There was no evidence that the National Income Simulation Game (NISG) generated interest in the discipline of economics (24).

Another study by Terry K. Reigel examines whether students would score higher in cognition after completion of a simulation game series in economics compared with
those taught with only lecture and discussion; it also compares the critical-thinking ability of students using simulation and those taught by lecture and discussion. The experimental classes were taught with Economic Discussion Games, developed by Irwin Rausch and Science Research Associates, Inc.

Eight twelfth-grade New Jersey high school classes during the 1968-1969 school year were involved in the experiment. Four instructors taught one control and one experimental class each. Control classes were taught with only lecture and discussion, while the experimental classes used the games. The Watson-Glaser Critical Thinking Appraisal, Form YM, and Stages of Economic Growth tests were administered during three phases of the experiment.

Analysis of covariance was run for the pretest and post-test scores and for delayed posttest scores. Further, t-tests were used to determine significant differences between tests and groups and games scores of groups. Both groups showed a significant gain in cognition. For retention, as measured by the delayed posttest, significant differences over time for both groups were shown. There were no other significant differences; however, the author thought the experimental group enjoyed the games and profited from playing them (28).

Charles R. Anderson used simulation to determine the relative effectiveness of simulation and conventional
classroom techniques in helping twelfth-grade students acquire factual information about consumer credit, the comparison of sources of credit, and the selection of a credit contract. The experimental group used the simulation Consumer, by Gerald Zaltman, to study consumer credit. The control group received the same information through the use of a unit plan developed around the content of the game. Through analysis of variance, no significant differences at the .05 level were found owing to the method of instruction for the factors of IQ, age, knowledge test score, comparison frequency score, and contract rating score. Significant differences were found when data were analyzed by students' sex and the method of instruction and the students' major and method of instruction. Anderson concluded that the simulation and the conventional classroom techniques were equally effective in teaching factual knowledge about credit. For males and for students majoring in business education or general education, the simulation was more effective in teaching credit (2).

Fred A. Thompson attempted to determine whether there are significant differences in achievement between junior college students taught in a conventional way and students taught by means of computer simulation technique developed for an elementary economics course. Experimental and control groups were selected for the evaluation, and the two groups
were compared by school and college ability test scores and the pretest scores on the **Test of Economic Understanding**. Another comparison was made using a midterm examination. No significant differences between the experimental and control groups were found.

Multiple-regression analysis was employed, using total points earned during the course as the Y variable. The following variables were significant in descending order of predictability: school and college ability test scores, previous grade-point average, and previous knowledge of economics. Gaming was not a significant factor in determining student performance over the course. Pre- and post-attitudinal questionnaires were administered. When posttest rankings were examined, both groups revealed a substantial shift in attitudes with the higher shift for the experimental group. However, no rank correlation coefficients were used to analyze the data. Thirty-four per cent of the students made favorable references to the game on an instructor-rating scale administered to both groups at the end of the course (31).

Three computer-based games were developed for the sixth grade: the Sumerian Game, the Sierra Leone Game, and the Free Enterprise Game. The Sumerian Game and the Sierra Game were tested in 1965-1966 on twenty-six sixth-grade students against a control class of equal-ability students studying the same economic topics and content under the direction of
a teacher using conventional methods. Various methods such
as interviews, comparisons of pretest and posttest scores,
and in-depth interviews were used to determine the effective-
ness of the experiment. Conclusions reached after employing
statistical tests for significance were as follows: sixth-
grade students were able to handle the technicalities of
playing such games; the computer-based economics games were
as effective as the traditional methods of teaching; the
control group showed more understanding of economic
principles several months later than did the experimental
group. The game appeared superior in teaching graphs and
diagrams but not as effective in teaching facts. The more
intelligent students and the students who read well gained
more from playing the game, but all students enjoyed the
games (35).

Phillip Saunders of Carnegie-Mellon University has com-
pared a simulation market game with a programmed workbook in
a study concerning the teaching of supply and demand. Students
in both groups were given a twenty-question test on supply and
demand at the conclusion of the experiment. Students who
played the market game achieved a mean of 12.4; those who had
used the workbook achieved a mean of 12.8. The same test was
given at the end of the course. The mean for those participat-
ing in the game was 13.9 whereas for the users of the workbook
it was 13.4. The mean differences were not significant. The
game was successful in arousing student interest, since 79 per cent rated it as very successful or successful in increasing their interest, against 36 per cent who rated the programmed workbook very successful or successful. The game was recommended for future use by 92 per cent of the students, while 60 per cent recommended the programmed workbook (12).

The Consumer Game was used with a class of seventh-grade students in a target-area school where the students were poorly motivated and consistently displayed poor attitudes toward school. Experimental and control groups were set up to teach similar material, with attitude questionnaires and tests of cognition used at the end of the game. Results indicated that students learned consumer-buying concepts through the use of the game; they also showed an improvement in behavior and school attendance during the time the game was used (10).

A game of mock bargaining was substituted for traditional lecture and discussion in a seven-week portion of a labor problems course. The testing instrument was a set of twenty statements of causes of industrial unrest, divided equally between management and labor. Students evaluated the statements before and after the game in an effort to see if attitudes were affected by such role-playing experiences. Chi-square analysis suggested, but not confirmed, that attitudes were affected (19).
Myron L. Joseph, Professor of Economics and Chairman of the Department of Administration and Management Science at Carnegie-Mellon University, lists games and simulations as one approach to increasing the understanding of the fundamental tools of economics for students. By such methods, the student is involved directly in the economic process; and, therefore, students are able to move from abstraction to reality. Joseph, along with other writers, warns against overcomplication in games and computer simulations, pointing out that, while the computer is a valuable tool, educational objectives should not be obscured by its tempting potential. Joseph deplores the paucity of hard data on the relative value of such approaches as games and simulations and states that the interest evidenced by students in these approaches make research on their contribution to substantive learning a necessity (17).

Fifteen game and simulation models have been designed at Furman University since 1970. The programs, written in Fortran IV, are in three categories: microeconomics, general equilibrium, and macroeconomics. Four of the microteaching programs and three microgame programs have been used to accompany a standard intermediate microeconomic theory text, Microeconomic Theory, by C. E. Ferguson. The macroeconomic-game program and two of the macroteaching programs have been used in intermediate macroeconomic-theory courses to accompany
Macroeconomics by T. F. Dernberg and D. M. McDougall. Other games have been used in international trade courses. The results of the program are as follows: The results show no significant quantitative gains, but there are positive qualitative gains. The author cites the types and degree of sophistication of questions which students ask as evidence of these qualitative gains. He says that the games have prevented to a certain extent the frustration seen previously in students as they studied complex micro- and macroanalysis. The author concludes that sequential game models can provide instructors with a highly productive set of teaching devices, provided that instructors do not become enamored with the use of games themselves and do not fall prey to the danger of the misconception that the complex real world can be decomposed into uniquely identifiable elements, as in simulation models (30).

The Apple Game does not attempt to measure effectiveness in increasing economic knowledge *per se*, but instead it attempts to evaluate the reaction of students in terms of its effectiveness as a pedagogical device. One hundred and fifty students participated in the evaluation of the Apple Game as a medium of instruction compared to a regular classroom presentation. Eighty-six evaluated it as much better, and fifty-five as better. Students were asked how effective they felt the Apple Game had been in enabling them to internalize
the concept of demand. Sixty-five felt it was very effective, and seventy-five felt it was effective. In the experiment, the instructor used apples and purchase-agreement forms to illustrate the generation of a market-demand function and the determination of equilibrium price. The author said the benefits derived from the experiment were that the game encouraged learning at the behavioral levels of application, analysis, and synthesis; that the data generated could be used as the basis for teaching additional economic concepts; that the game had wide applicability; and that it was easy to administer, and it was fun (34).

Ralph N. Calkins twice used a computerized model of exchange in the teaching of price theory with college-level classes in 1970. Thirty-five students in introductory economics were involved in the first instance, and twenty-two used it as an adjunct to the formal content of a course. A control group was made up of thirty-five elementary accounting students. The experimental group scored significantly higher; however, although the experimental and control groups were comparable in aptitude as measured by CEEB, the experimental group was older, had more economics, and was more committed to the business major (7).

In another study B. J. Dooley compared the performances of fourth-grade students taught with the Market Game with those taught by the conventional lecture method. Although
no significant differences in cognition were found, the students enjoyed the game and were interested in participating in it (13).

Keith G. Lumsden reiterates the interest of students in games and simulations when he says that there is no doubt of the high level of involvement, and that Adam Smith would be extremely impressed with the higgling in the marketplace. He does not deny the motivational aspects of such teaching devices, but he urges that experimentation take place. He sees the need for a scientific approach to teaching economics with the necessary evaluation (22).

The Joint Council on Economic Education designated the Center for Economic Education at the University of Minnesota as the national repository for games and simulations in economic education in September, 1970. The Center has been actively engaged in evaluating games and simulations in economic education since that time. Following is a summary of the limited research on games and simulations compiled by the Center for Economic Education at the University of Minnesota.

1. Games and simulations generally result in increased student involvement, motivation, and interest.

2. Generally, no significant differences have been found between cognition of students using games and simulations and students taught by more conventional methods.
3. Less able students are usually able to perform as well in games and simulations as brighter students.

4. Males usually perform better than females.

5. Brighter students are better able to articulate reasons for their winning behavior.

6. Although females perform less well, tests show they apparently learn just as much.

7. If both audio and visual media are used, performance of participants improves compared to that when only one type is used.

8. In simulations, players may develop more empathy for the particular role they are assuming and the environment in which they are operating.

9. Repeated use of games and simulations seems to improve the performance of the participants.

10. Students appear to gain a better understanding of the complexity of the variables in a social system.

11. Games and simulations seem to have the same impact on different student populations (18, pp. 4-5).

Closed-Circuit Television

Specific literature concerning the interaction of students and materials, when students are video taped, is limited. The most analogous discussion is by Dwight Allen and Kevin Ryan in their definitive work on microteaching (1).
This study was not concerned with microteaching, however, but with what might be called a variation of it. Allen and Ryan emphasize video taping as a motivational device for teachers throughout their writings. Obviously, teachers become deeply involved with subject matter when they are to present the material on video tape. As in the inquiry approach, where the teacher leads the student to respond correctly orally or in writing to a well-thought-out series of developmental questions, closed-circuit television was used in this study as a process method of instruction, wherein students are involved in the process with an interaction of students with materials taught.

Ned A. Flanders of the University of Michigan wrote in the introduction to Microteaching that the most exciting inquiry comes when one's own behavior is one of the subjects being investigated (1, p. xv). Allen and Ryan say that the most promising thing about microteaching is the extent to which it lends itself to as-yet-unconceived experimental studies and new uses (1, p. 122). It was assumed in this study that students would be motivated to interact with instructional material and its presentation before a peer group, just as teachers are in microteaching situations. Closed-circuit television was used as such a motivational device and as a way of involving students in the learning process of presentation, reinforcement, and feedback.
Programmed Learning

Most college students can learn basic economic concepts as effectively from programmed texts as they can from texts plus lectures with a more efficient use of time. The majority of students questioned by Keith G. Lumsden preferred programmed learning to other conventional methods (20).

Programmed learning has been one of the fastest growing educational methods in this country. Its advantages were presented by Hilgard of Stanford University in the Autumn, 1963, issue of *Stanford Today*.

1. Programmed learning recognizes individual differences.

2. Programmed learning requires that the learner take an active part in the learning process.

3. Programmed learning gives an immediate knowledge of results.

4. Programmed learning is based on an organized nature of knowledge.

5. Programmed learning provides for review.

6. Programmed learning does not threaten the learner.

Results from research indicate that programmed texts can be a valuable tool in the teaching of economics (8).

were 4,121 students at forty-eight universities. The study was designed to evaluate the efficiency of programmed materials in teaching both the basic micro- and macroeconomic sections of typical college-level elementary economics courses. Each school established three test groups, with one group using programmed texts exclusively and not attending classes. The average period involved was three weeks, with an average of twelve hours spent reading the programmed text. In groups two and three, students were given conventional reading assignments and attended lecture and discussion class sections. Those in group two were also required to read the programmed text. Students in group three were asked not to use the programmed text.

Preliminary forms of the TUCE were used, with a different test form being given to groups two and three to avoid contamination from the earlier testing of group one. Regression analysis found the following student characteristics to be statistically significant: educational level, sex, and SAT. Average freshman entrance examinations, school size, and prestige of schools and state colleges also showed statistical significance.

Major results of the study were (1) that by spending twelve hours studying a programmed-learning text, students learn almost as much micro- or macroeconomics as do students in seven weeks of a conventionally taught elementary course,
(2) that students using only programmed-learning materials performed better on applications of theory than on simple concept recognition, and (3) that students generally have a more positive attitude toward programmed learning (4).

Two experiments, similar in design, were undertaken in 1965 and 1966 by Keith Lumsden to measure the effectiveness of programmed learning in microeconomics at the college level. One involved 100 students at Stanford during the summer of 1965, and the other involved students at the University of California at San Diego in January, 1966. Students were split into three matched groups. Those in group A were instructed to study only from a programmed text; students in group B were taught conventionally by the lecture method; and students in group C studied material contained in the nonprogrammed basic text. All students attended question sessions and could consult the professor and teaching assistants during office hours. An identical examination of true-false and essay questions was taken by all students at the end of one month. In both experiments, students in the programmed learning section scored higher than other students on the complete examination. There were no statistical differences on the objective part of the examination. The author carried out a parallel experiment in 1966-1967. Sections were selected randomly from elementary economics classes and told to study the programmed text only.
The other class members were taught the same material in conventional fashion. On testing, simple regression analysis showed no statistically significant differences between the groups except for one group which scored significantly less than the nonprogrammed section (23).

One of the problems in using programmed instruction has been the lack of motivation to use the materials by the students. A short-term incentive system was implemented at the University of Missouri-Columbia in which a programmed-instruction program was used in conjunction with a large lecture course of about 1,000 students in economics. A series of nine quizzes over the material in the programmed instruction text was developed. If students failed the quiz on the first attempt, one of four other forms of the same quiz could be taken. Each quiz pass counted as one bonus point, for a total of nine possible bonus points. Relative weights for the points were specified, depending on performance on other class examinations and laboratory work. The primary objective was to furnish a series of short-term goals for students to encourage them to keep up with the weekly programmed-instruction assignments. Student opinion evaluated the programmed-instruction quiz package as helpful in learning economics.

A second part of the evaluation process compared pre-test and posttest scores on TUCE. Results from regression
analysis indicated that each quiz passed was associated with a half-point improvement on TUCE and that about 12 per cent of the posttest score was explained by the quiz points variable. Overall student performance was also evaluated. Results suggested that the programmed-instruction quiz package had a significant impact on varied measures of student performance, exclusive of quizzes passed (29).

Televised instruction and programmed instruction were combined in two pilot studies conducted in 1965-1966 at the University of Illinois. Two hundred and forty-two students registered for the principles course during the fall semester of 1965-1966 were randomly assigned to control and experimental groups. The experimental group used televised instruction and programmed instruction techniques, and the control group used only televised instruction. Pretests and posttests were given as well as a course-evaluation questionnaire consisting of statements eliciting opinions about various aspects of the instructional program.

Analysis of covariance indicated that the experimental groups scored significantly higher on the immediate and the delayed posttest. The experimental group responded more favorably in terms of course evaluation than did the control group. There were significant differences in the mean scores between the control and the experimental groups for both immediate posttest and delayed posttest scores (32).
An attempt was made to measure the effectiveness of programmed instruction with graduate-student teaching assistants. Three hundred and six students enrolled in a general economics course met twice a week in two large groups with a regular faculty member and once a week in fourteen groups with graduate-student teaching assistants. The fourteen groups were divided into two groups of seven sections each. In the first group, the teaching assistants discussed the material covered; in the second, the teaching assistants handed out programmed materials, and the students worked on their own. Both groups met an equivalent time. Regression analysis indicated that programmed materials were not as effective as sections taught by teaching assistants. When a breakdown of performance based on abilities was made, programmed materials seemed to be more effective for those with low abilities (34).

Two experiments were conducted at Vanderbilt University in 1961-1962 to measure the usefulness of programmed instruction in teaching theoretical economic concepts. Forty-two students who had been exposed to supply and demand analysis were divided into homogeneous groups on the basis of test scores and grade averages. One group received programmed instruction, and the other group received classroom instruction covering the same material. Instruction time was the same for both groups. At the end of the experimental period,
both groups were tested, and t-tests showed that the group receiving only classroom instruction gained significantly more than the group using the programmed instruction. In the second experiment, which was similar, there was no significant difference in the two groups (14).

An experiment with programmed materials dealing with supply and demand was carried out during the 1964-1965 school year at the University of Michigan. Rather than attending three one-hour discussion sessions during the first week of the second semester of the introductory economics course, two sections of the class studied programmed material on their own. One of the two experimental sections was told to study the textbook also. All students were pre- and posttested. Students in the experimental sections kept a log of time spent in studying the programmed materials. Two control sections were taught by the same instructor, given pre- and posttests, and told they were part of an experiment. Two other control sections were selected and given the same posttest. All students were told that the posttest would be counted as part of their grade. Four questions were asked in the study: Are students able to learn as well using programmed materials? If a textbook is used in conjunction with programmed instruction, is there a difference? Does awareness of the experiment and expectation of testing improve learning? Is there a time saving owing to
independent study with programmed materials on the part of students and/or teachers? Results showed no differences between experimental and control groups. Programmed instruction and teaching by instructors were equivalent according to posttests. Awareness of the experiments and tests expectation did make a significant difference in learning. The group using the programmed material showed a saving of time (15).

An experiment at the University of Illinois compared economic understanding between students receiving instruction through the means of television tapes and classroom instruction and those using only a programmed text. Mean scores of the programmed-learning group were higher than either the live or the television sections. Multiple-linear regression analysis indicated that the significant coefficients were class, initial test score, major, ability index, and number of absences. Differences were not statistically significant, however; so the conclusion was that the three methods were approximately equally effective in teaching content, although students seemed to prefer live instruction to either of the other two methods of instruction. Since the method of instruction seemed to make very little difference in students' scores, programmed learning would seem to be much more efficient because of less demand on teacher time (27).
G. L. Bach conducted an experiment in 1969 at Stanford specifically to consider programmed learning in comparison with conventional classroom teaching by an experienced, highly skilled teacher. Two hundred students chose one of three alternatives for economic instruction: using a programmed text, reading a textbook and not coming to class, reading a textbook and coming to class for regular lectures. Identical examinations were given on the material one week later with an identical amount of time being given each group. The group in the conventionally taught course learned slightly more microeconomics in one week. The textbook-only section did about as well as when they had to rely on the programmed-learning material. Exceptionally able students learned enough economics to do well on the TUCE no matter how they were taught. Since differences were slight in all cases, programmed learning appears to be an efficient means of learning the core of economic analysis. This seems to be true especially in the case of average or below-average teachers, since the professor in this experiment was generally considered one of the best teachers in the economics department at Stanford (5).

Alex Maurizi, in a study involving the programmed-learning approach, tested the educational theory that retention will be greater the less the effort required to attain it in the first place. Sixty-five students first were
tested, then worked through a programmed text for two weeks, and finally returned to the regularly scheduled classroom for conventional instruction for the remainder of the semester. They were tested on returning to the classroom and at the end of the semester. The t-tests showed that ability and retention were positively related and that poorer students not only had more difficulty in retaining knowledge but that they also had to spend proportionately more time mastering it. The poorer students retained less even of the least difficult material than the brighter students did of the most difficult material (25).

In an experiment at Virginia Polytechnic Institute in 1968, no regular classes were held. Students used a programmed text and took a test over each two chapters of macroeconomic material for four weeks. Students then wrote short position papers on different economic-policy issues. The three categories of results were time of students and instructor, understanding of economics, and student attitude. Students and instructor devoted less time to the experimental class. In the understanding of economics, the experimental section did as well as the control sections, and student attitude was favorable. The investigator did not suggest that programmed learning should replace all other approaches to teaching economics but confirmed that it might be one of several viable methods of teaching principles of economics.
He urged that it be one of several options available to students since learning was comparable to other approaches, student attitude was positive, the role of economics in the real world was emphasized, and faculty teaching resources were utilized efficiently (11).

Programmed materials were used to test the effectiveness of the teaching of economics at the high-school level, with fifty-eight seniors from the Palo Alto High Schools. The programmed material was used for a period of ten weeks, and the Test of Economic Understanding was used as pretest and posttest. The test results were compared with national test results for the Test of Economic Understanding scores of college students who had completed a two-semester course in economics, and scores of school teachers who had taken the television course "The American Economy." The mean differences between, before, and after scores for the experimental group were significantly greater than the difference between, with, and without instruction scores from the national sample; the Palo Alto students did nearly as well as the college student and teacher groups. The majority of the students liked the programmed-learning materials (3).

In an experiment at Duke University during the Fall of 1969, the effectiveness of programmed instruction was compared to the conventional lecture method of instruction in the teaching at the college level of money and banking.
In a one-week period, thirty-six sophomores were asked either to complete eleven chapters of programmed instruction in money and banking or to attend three class lectures and one individual tutorial conference session. All students were taught by the same instructor; fifteen students used the programmed materials, twenty-one attended the conventional class lectures. Both groups were pretested and posttested. The mean posttest score for the programmed instruction group was significantly higher (16).

Standard Lecture and Discussion

Throughout this survey, references have been made to the traditional method of teaching--lecture--with or without concomitant discussion and periods for questioning and answering. This is the pedagogical method against which other informational delivery systems are compared; it is ubiquitous throughout all levels of the educational systems of the world.

Historically, lecture and discussion has been accepted as the most viable teaching method, the ideal way to achieve personal interaction between teacher and students. A meaningful relationship between teacher and student has been viewed as education at its best. A caveat is imperative at this point: Such terms as "personel interaction" and "meaningful relationship" have not been operationally defined, and, until they are, such terms are meaningless.
With the current influx of technological innovations in the field of education, most studies have been made using lecture and discussion as the norm, with other informational delivery systems compared to lecture and discussion. It is hoped that in the future, all educational outcomes will be clearly defined so that lecture and discussion, as well as other forms of pedagogy, can be experimentally observed and tested.

Some studies try to determine whether it is possible for students to grasp principles of economics without any lectures at all, and some attempt to find the optimum mix of lectures and other technology. In one study, it was discovered that those students studying principles of economics with lectures and those taking the course with no lectures performed equally well on objective examinations and that there were no significant differences in the attitudes of the two groups toward economics. The lecture-less group, according to informal feedback, met in small groups in which each student could accept responsibility for one chapter. In effect, the students lectured other students (26).

The implication made in this and other studies is that programmed materials and other informational delivery systems can be substituted for classroom lectures. Many argue that
this does not mean that there is no value in lectures. Allan M. Cartter has said,

... however effective these technological improvements (programs, teaching machines, etc.) are for purely informational and routinized aspects of learning, they may be called diabolically illiberal ... . Given the will and the desire, one can obtain knowledge from the book, the television screen, the magnetic tape, but wisdom, understanding, and tolerance—the essential aims of liberal learning—are attainable only through personal confrontation of teacher and student. Interest, individualism, and integrity cannot be mass produced; they react from the personal interaction of man with man (9, pp. 159-160).

Campbell R. McConnell and Charles Lamphear conclude that perhaps systems could be used in highly resource-absorbing elementary courses in the social sciences and that the released labor could be reallocated to provide sufficiently small junior- and senior-level courses to achieve meaningful relationship and dialogue between students and professor in the more advanced courses (26).

In a study by Stephen G. Buckles and Marshall E. McMahon, regression analysis was used to determine the marginal effect of lectures on a set of test scores. Results indicated that lectures did not improve student performance. Additionally, students were tested immediately after the experimental period ended and at the end of the semester in an effort to determine whether lectures had a more lasting effect than other methods. Results supported the conclusion that
lectures did not add significantly to students' learning (6).

Summary

The picture that emerges from the survey of literature in economic education is multifaceted. Although there was a spurt of interest in the teaching of economics in the 1920's and in the 1940's, the major thrust of experimentation has come since the 1960's. The American Economic Association, Inc. was responsible for sessions on the teaching of economics at annual meetings in each of the years 1961 through 1964; professional support to the National Task Force on Economic Education was offered; a survey of innovations and experiments in the teaching of economics in the United States was conducted; and a variety of projects to stimulate further experimentation and testing have been encouraged. A pattern of findings is beginning to emerge (20).

Although games and simulations seem to interest students, they do not seem to have had much impact on economic cognition. No studies have been done on the interaction of students and materials as students are video taped. The use of closed-circuit television as a process approach is open for experimentation. Programmed learning has had a powerful impact on the teaching of economics. It has been the fastest growing educational method and has a proven effectiveness
and efficiency. Although much has been claimed for standard lecture and discussion by the traditionalists in education, there is no empirical evidence that these assertions are true.


10. Cohen, Karen C., Effects of the Consumer Game on Learning and Attitudes of Selected Seventh Grade Students in a Target-Area School, Johns Hopkins University, The Center for the Study of Social Organization of Schools, Baltimore, Maryland (May, 1970).


CHAPTER III

METHODOLOGY

Population Frame

The population in this study consisted of all students enrolled in a weekly lecture section of Economics 110 (microeconomic theory) during the fall session of 1972 and the spring session of 1973 at North Texas State University. There was no reason to believe that the subjects' responses would differ in any systematic manner from other similar samples.

This weekly lecture section ($N_1 = 78$, fall, 1972; $N_2 = 35$, spring, 1973; $N = 113$ for study) was conducted once a week by a regular full-time member of the Economics Department. The text used was Economics by Lewis C. Solmon (7). Laboratory sessions were conducted at scheduled intervals by tutors (graduate students in the Economics Department). All students in this weekly lecture section were included in the sample and were assigned to given groups by random processes.

Instruments

The TUCE was developed between 1965 and 1968 by economists and psychometricians (1) to evaluate introductory courses in economics and (2) to serve as a research instrument for controlled experiments (4). The test questions
comprise a measurement of economic understanding for the discipline.

Members of the Test Committee were G. L. Bach, William G. Bowen, R. A. Gordon (1965-1967), Bernard F. Haley (1967-1968), Paul A. Samuelson, and George J. Stigler as members, with Paul L. Dressel as executive director, John M. Stalnaker as consultant, and Rendigs Fels as chairman. The Committee was appointed by the Joint Council on Economic Education.

To ascertain content validity of the TUCE, the Test Committee specified what they felt should be measured. Validity was determined by comparing the questions comprising the test with the content judged to be important.

As an operational measurement of the content validity of the TUCE, instruction in economics should affect test scores. The collection of the data on the TUCE has provided information concerning the extent of this effect after item analyses were made on all questions employed to eliminate negatively discriminating items.

Table I presents the TUCE scores for students tested before and after economics instruction.

Students taking the posttest attained higher scores than the pretest groups. The range of these effects varies from 1.91 to 8.14, with an average for the total group of 5.61. There are no significant differences between the breakdown scores and the aggregate scores (4, pp. 15-16).
TABLE I
PRETEST AND POSTTEST MEANS AND STANDARD DEVIATIONS FOR NORMING SCHOOLS

<table>
<thead>
<tr>
<th>Number of Students</th>
<th>Pretest</th>
<th></th>
<th>Posttest</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D.</td>
<td>Mean</td>
<td>S.D.</td>
</tr>
<tr>
<td>101</td>
<td>13.65</td>
<td>3.73</td>
<td>18.75</td>
<td>4.30</td>
</tr>
<tr>
<td>100</td>
<td>12.62</td>
<td>3.97</td>
<td>19.24</td>
<td>4.43</td>
</tr>
<tr>
<td>88</td>
<td>13.96</td>
<td>4.02</td>
<td>19.67</td>
<td>4.39</td>
</tr>
<tr>
<td>80</td>
<td>13.01</td>
<td>3.39</td>
<td>18.04</td>
<td>4.44</td>
</tr>
<tr>
<td>94</td>
<td>13.98</td>
<td>3.96</td>
<td>21.91</td>
<td>4.04</td>
</tr>
<tr>
<td>109</td>
<td>13.44</td>
<td>3.61</td>
<td>17.17</td>
<td>5.25</td>
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<tr>
<td>76</td>
<td>13.57</td>
<td>3.92</td>
<td>16.59</td>
<td>4.15</td>
</tr>
<tr>
<td>85</td>
<td>13.87</td>
<td>3.61</td>
<td>16.96</td>
<td>4.34</td>
</tr>
<tr>
<td>83</td>
<td>14.69</td>
<td>4.14</td>
<td>22.83</td>
<td>4.00</td>
</tr>
<tr>
<td>36</td>
<td>18.00</td>
<td>4.12</td>
<td>22.80</td>
<td>3.81</td>
</tr>
<tr>
<td>39</td>
<td>13.79</td>
<td>4.12</td>
<td>20.66</td>
<td>5.31</td>
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<tr>
<td>90</td>
<td>13.85</td>
<td>4.30</td>
<td>19.54</td>
<td>4.94</td>
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<td>81</td>
<td>12.18</td>
<td>3.40</td>
<td>19.50</td>
<td>4.74</td>
</tr>
<tr>
<td>73</td>
<td>12.83</td>
<td>3.72</td>
<td>15.78</td>
<td>4.74</td>
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<tr>
<td>109</td>
<td>10.76</td>
<td>2.57</td>
<td>12.67</td>
<td>4.02</td>
</tr>
<tr>
<td>83</td>
<td>10.77</td>
<td>4.02</td>
<td>18.27</td>
<td>5.23</td>
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<tr>
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<td>20.88</td>
<td>4.94</td>
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<tr>
<td>112</td>
<td>14.68</td>
<td>3.78</td>
<td>22.81</td>
<td>3.98</td>
</tr>
<tr>
<td>58</td>
<td>14.58</td>
<td>3.62</td>
<td>20.84</td>
<td>4.30</td>
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<tr>
<td>86</td>
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<td>3.69</td>
<td>20.52</td>
<td>4.52</td>
</tr>
<tr>
<td>100</td>
<td>13.46</td>
<td>3.36</td>
<td>18.52</td>
<td>4.60</td>
</tr>
<tr>
<td>113</td>
<td>13.51</td>
<td>3.80</td>
<td>20.54</td>
<td>5.02</td>
</tr>
<tr>
<td>35</td>
<td>14.88</td>
<td>4.34</td>
<td>19.11</td>
<td>5.61</td>
</tr>
</tbody>
</table>

To ascertain the reliability of TUCE, the Kuder-Richardson Formula 20 and the standard error of measurement ($SE_M$) were used. Kuder-Richardson Formula 20 was used to obtain an estimate of the correlation that would exist between scores obtained on one test at one time and those obtained on a similar test at a different time. Therefore,
Parts I and II of TUCE were used. $\text{SEM}$ estimates the amount of variation which may be expected in a test score. For TUCE, the $\text{SEM}$ is about 2.60. For approximately two-thirds of the scores, the error of measurement will be equal to or less than 2.60. This means that for about 95 per cent of the obtained scores, the error of measurement will be equal to or less than two standard errors ($5.20$).

Table II presents reliability coefficients and standard errors of measurement of TUCE.

TABLE II

RELIABILITY COEFFICIENTS AND STANDARD ERRORS OF MEASUREMENT

<table>
<thead>
<tr>
<th>Group</th>
<th>Form</th>
<th>N</th>
<th>KR20</th>
<th>$\text{SEM}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part I--Pretest</td>
<td>A</td>
<td>1341</td>
<td>.57</td>
<td>2.59</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>1328</td>
<td>.55</td>
<td>2.62</td>
</tr>
<tr>
<td>Part I--Posttest</td>
<td>A</td>
<td>876</td>
<td>.76</td>
<td>2.63</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>829</td>
<td>.76</td>
<td>2.59</td>
</tr>
<tr>
<td>Part II--Posttest</td>
<td>A</td>
<td>1014</td>
<td>.72</td>
<td>2.53</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>980</td>
<td>.67</td>
<td>2.64</td>
</tr>
</tbody>
</table>

The reliability of the pretest scores is low, since students are responding to questions whose content is new to them. The reliability of the TUCE as a posttest is higher, and, when both forms of the test are used, reliability is still higher. The reliability estimate for combined forms
administered as a posttest is .86 for Part I and .82 for Part II. There are no significant differences in norming and reliability data between the breakdown scores and the aggregate scores (4, pp. 16-17).

Part II, with Forms A and B, deals with microeconomic concepts of (1) competitive markets (including supply and demand, elasticity, and agriculture); (2) theory of the firm, markets, and antimonopoly policy; (3) factor markets and income distribution; (4) government and the allocation of resources; (5) international economics; and (6) comparative economic systems. Eighty-five per cent of the questions on the TUCE relate to microeconomic concepts $C_1$, $C_2$, $C_3$, and $C_4$ of this study. Questions relating to concepts $C_1$, $C_2$, $C_3$, and $C_4$ were extracted from the TUCE for use as the pretest and posttest of each concept. Questions from Form A and Form B of Part II, the microeconomic tests, were used in this study. (See Appendix A.)

After all of the students were exposed to all informational delivery systems, each subject completed a form ranking the four systems in order of preference (what was enjoyed most) and in order of effectiveness in preparing for examinations. (See Appendix A.)

Variables

The variables used in the research for Hypothesis One, Two, and Three appear in Tables III, IV, and V which follow.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Continuous or Dummy</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y--Knowledge of economics</td>
<td>A measure of the change in understanding of macro- and micro-principles at the elementary level. Measured by taking first order differences in pre- and posttests for each concept.</td>
<td>C</td>
<td>TUCE Manual (4)</td>
</tr>
<tr>
<td>X₁--Groups</td>
<td>A series of variables used to codify each subgroup and account for individual group differences.</td>
<td>D</td>
<td>---</td>
</tr>
<tr>
<td>X₂--Concepts</td>
<td>A series of variables used to codify each concept and account for differences attributable to concepts.</td>
<td>D</td>
<td>---</td>
</tr>
<tr>
<td>X₃--Info. del. sys.</td>
<td>A series of variables used to codify each system and account for differences attributable to systems.</td>
<td>D</td>
<td>---</td>
</tr>
<tr>
<td>X₄--SAT (Total)</td>
<td>The subjects' scores on the Scholastic Aptitude Test described as a measure of innate ability or previous learning to be regressed against the variable under consideration for control purposes.</td>
<td>C</td>
<td>NTSU Records</td>
</tr>
</tbody>
</table>
TABLE III--Continued

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Continuous or Dummy</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>X₅--SAT Missing data points</td>
<td>A dichotomized variable where 0 = data available and 1 = data not available.</td>
<td>D</td>
<td>---</td>
</tr>
<tr>
<td>X₆--Knowledge of economics</td>
<td>A measure of pre-experimental knowledge of economic concepts.</td>
<td>C</td>
<td>TUCE Manual (4)</td>
</tr>
<tr>
<td>(pretest)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X₇--Knowledge of economics</td>
<td>A dichotomized variable where 0 = data available and 1 = data not available.</td>
<td>D</td>
<td>---</td>
</tr>
<tr>
<td>(pretest) - Missing points data</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>X₈--Replication</td>
<td>A dichotomized variable where 0 = Spring semester and 1 = Fall semester.</td>
<td>D</td>
<td>---</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
<td>Continuous or Dummy</td>
<td>Reference</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td><strong>Y</strong>--Knowledge of economics</td>
<td>A measure of the change in understanding of macro- and microprinciples at the elementary level. Measured by taking aggregate first order differences.</td>
<td>C</td>
<td>TUCE Manual (4)</td>
</tr>
<tr>
<td><strong>X&lt;sub&gt;1&lt;/sub&gt;--Groups</strong></td>
<td>A series of variables used to codify each subgroup and account for individual group differences.</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td><strong>X&lt;sub&gt;2&lt;/sub&gt;--SAT (Total)</strong></td>
<td>The subjects' scores on the Scholastic Aptitude Test described as a measure of innate ability or previous learning to be regressed against the variable under consideration for control purposes.</td>
<td>C</td>
<td>NTSU Records</td>
</tr>
<tr>
<td>**X&lt;sub&gt;3&lt;/sub&gt;--SAT-Missing data points</td>
<td>A dichotomized variable where 0 = data available and 1 = data not available.</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td><strong>X&lt;sub&gt;4&lt;/sub&gt;--Knowledge of economics (pretest)</strong></td>
<td>A measure of pre-experimental knowledge of economic concepts.</td>
<td>C</td>
<td>TUCE Manual (4)</td>
</tr>
<tr>
<td><strong>X&lt;sub&gt;5&lt;/sub&gt;--Knowledge of economics (pretest)-Missing data points</strong></td>
<td>A dichotomized variable where 0 = data available and 1 = data not available.</td>
<td>D</td>
<td></td>
</tr>
</tbody>
</table>
TABLE IV--Continued

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Continuous or Dummy</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>$X_6$--Info. del. sys. judged most interesting</td>
<td>A nonparametric variable where +3 = most interesting ranging through +1, -1, and -3 = least interesting.</td>
<td>C</td>
<td>Researcher Developed Instrument</td>
</tr>
<tr>
<td>$X_7$--Replication</td>
<td>A dichotomized variable where 0 = Spring semester and 1 = Fall semester</td>
<td>D</td>
<td>---</td>
</tr>
</tbody>
</table>
### TABLE V

**VARIABLES USED TO TEST HYPOTHESIS THREE**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Continuous or Dummy</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y -- Knowledge of economics</td>
<td>A measure of the change in understanding of macro- and microprinciples at the elementary level. Measured by taking aggregate first order differences.</td>
<td>C</td>
<td>TUCE Manual (4)</td>
</tr>
<tr>
<td>X&lt;sub&gt;1&lt;/sub&gt; -- Groups</td>
<td>A series of variables used to codify each subgroup and account for individual group differences.</td>
<td>D</td>
<td>---</td>
</tr>
<tr>
<td>X&lt;sub&gt;2&lt;/sub&gt; -- SAT (Total)</td>
<td>The subjects' scores on the Scholastic Aptitude Test described as a measure of innate ability or previous learning to be regressed under consideration for control purposes.</td>
<td>C</td>
<td>NTSU Records</td>
</tr>
<tr>
<td>X&lt;sub&gt;3&lt;/sub&gt; -- SAT-Missing data points</td>
<td>A dichotomized variable where 0 = data available and 1 = data not available.</td>
<td>D</td>
<td>---</td>
</tr>
<tr>
<td>X&lt;sub&gt;4&lt;/sub&gt; -- Knowledge of economics (pretest)</td>
<td>A measure of pre-experimental knowledge of economic concepts.</td>
<td>C</td>
<td>TUCE Manual (4)</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
<td>Continuous or Dummy</td>
<td>Reference</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>$X_5$--Knowledge of economics (pretest) -</td>
<td>A dichotomized variable where 0 = data available and 1 = data not available.</td>
<td>D</td>
<td>---</td>
</tr>
<tr>
<td>Missing data points</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_6$--Info. del. sys. judged most helpful</td>
<td>A series of variables used to codify each system for comparison with</td>
<td>D</td>
<td>Researcher</td>
</tr>
<tr>
<td></td>
<td>posttest scores.</td>
<td></td>
<td>Developed Instrument</td>
</tr>
<tr>
<td>$X_7$--Replication</td>
<td>A dichotomized variable where 0 = Spring semester and 1 = Fall semester.</td>
<td>D</td>
<td>---</td>
</tr>
</tbody>
</table>
Collection of Data

Four tutors, all of whom were graduate students in the Economic Education Program of the Department of Economics at North Texas State University, were assigned to specific groups of subjects by random processes.

Each tutor used each informational delivery system once only. Tutors attended orientation sessions with the director of the research before each laboratory session. Precise directions were given on the specific informational delivery system to be employed at that particular time. Written lesson plans were distributed and discussed before each laboratory session. (See Appendix B.) Tutors were given a list of the chapters to be covered in conjunction with each concept. (See Appendix C.) Sections of the programmed text (1) to be used in conjunction with each concept were assigned. (See Appendix D.) Information and directions concerning the specific game to be used with each concept were given. (See Appendix E.) Assignments for the closed-circuit television groups and specific points to be covered in the lecture and discussion section were delineated. (See Appendices F and G.)

Immediately before the full-time instructor introduced concept $C_1$, competitive markets (including supply and demand, elasticity, and agriculture) in microeconomics, tutors pre-tested the groups assigned to their particular laboratory sessions using the questions from Form A and Form B of TUCE which were relevant to concept $C_1$. (See Appendix H.)
The full-time instructor introduced concept C₁ to all students in the large lecture section, using the standard lecture and discussion method. The tutors employed informational delivery systems T₁, T₂, T₃, and T₄ during the three-hour laboratory session immediately following the conclusion of the presentation of the specific concept by the regular instructor. Students were posttested immediately after being subjected to T₁, T₂, T₃, and T₄. (This procedure is shown in the schemata in Figures One and Two.)

When the full-time instructor was ready to introduce concept C₂, theory of the firm, markets, and anti-monopoly policy; concept C₃, factor markets and income distribution; and concept C₄, government and the allocation of resources, the procedure was repeated, using the schedule of informational delivery systems as shown in Figures One and Two, and using the questions for pre- and posttesting that corresponded to the concept taught. (See Appendix H.)

After the four concepts were presented and posttests administered, students evaluated the teaching activities of the laboratory sessions in two ways. First, they ranked the four different informational delivery systems in order of what system they judged most interesting. Second, they indicated which of the four they considered most effective in preparation for examinations.
The replication during the spring semester of 1973 used different subjects and a different Latin square which was randomly selected.

Analytical Methodology

Research Design

The basic research model, a modification of Campbell and Stanley's quasi-experimental, counterbalanced design No. 11 (2, pp. 50-52), is schematically outlined as follows for the fall semester of 1972.

\[
\begin{array}{cccc}
C_1 & C_2 & C_3 & C_4 \\
W & X & Y & Z \\
G_1 & 0 & T_1 & 0 & 0 & T_2 & 0 & 0 & T_3 & 0 & 0 & T_4 & 0 \\
G_2 & 0 & T_3 & 0 & 0 & T_1 & 0 & 0 & T_4 & 0 & 0 & T_2 & 0 \\
G_3 & 0 & T_2 & 0 & 0 & T_4 & 0 & 0 & T_1 & 0 & 0 & T_3 & 0 \\
G_4 & 0 & T_4 & 0 & 0 & T_3 & 0 & 0 & T_2 & 0 & 0 & T_1 & 0 \\
\end{array}
\]

Fig. 1--Research design for the fall semester of 1972

The Latin square shown below was used during the spring semester of 1973.
These symbols may be explained as follows:

0 = Pre- and posttest scores on the TUCE

T_1 = Games and simulations

T_2 = Closed-circuit television

T_3 = Programmed learning

T_4 = Standard lecture and discussion

C_1 = Competitive markets (including supply and demand, elasticity, and agriculture)

C_2 = Theory of the firm, markets, and antimonopoly policy

C_3 = Factor markets and income distribution

C_4 = Government and the allocation of resources.

G_1, G_2, G_3, and G_4 on the vertical axis of the schematic diagrams represent the four laboratory session groups and tutors. The horizontal elements W, X, Y, and Z represent...
the occasions on the laboratory sessions. The specific Latin squares used were randomly selected (6).

The design contains three main effects of groups, concepts, and experimental treatments. According to H. O. Hartley (5), the group effects are represented almost certainly by the rows; the concept effects are represented by the columns, and the experimental treatment effects are represented by the informational delivery systems.

Each classification is orthogonal to the other three. Each variant of each classification occurs equally often within each of the other classifications.

**Statistical Procedures**

Data were subjected to multiple linear-regression analyses with the regression statistics revealing how each variable affected the TUCE score, other things remaining unchanged. The basic statistical design of the multiple linear regression was of the form $Y = a + b_1x_1 + b_2x_2 \ldots + b_nx_n + E$. The dependent variable $Y$ was assumed to be additively and linearly related to the predictor variables. The $Y$, or dependent variable, in the multiple linear-regression analyses was the posttest scores on TUCE. These analyses permitted the inclusion of continuous quantitative variables and also the inclusion of qualitative variables in the dummy form (3, p. 428). Missing data points were
controlled by substituting the mean score for the category for the missing data and including a dummy companion variable where 0 = real data and 1 = mean substitution.

To test Hypothesis One, the regression of the dependent variable (individual TUCE scores for each subject) on one particular independent variable (informational delivery systems) was measured, while the values of other independent variables were held constant. The critical statistic was the beta coefficients of the $X_3$ variable. Other variables were utilized for control purposes. (See Table VI.)

To test Hypothesis Two, the regression of the dependent variable (aggregate TUCE scores for each subject) on one particular independent variable (informational delivery system judged most interesting) was measured while the values of other independent variables were held constant. The critical statistic was the beta coefficient of the $X_6$ variable. Other variables were utilized for control purposes. (See Table VII.)

To test Hypothesis Three, the regression of the dependent variable (aggregate TUCE scores for each subject) on one particular independent variable (informational delivery system judged most helpful in preparation for tests) was measured, while the values of other independent variables were held constant. The critical statistic was the beta
coefficient of the $X_6$ variable. Other variables were utilized for control purposes. (See Table VIII.)

Four additional multiple linear-regression analyses were run to measure the regression of the dependent variable (individual TUCE scores of each subject after using a specific informational delivery system) on one particular independent variable (the informational delivery system judged most interesting by each subject) while the values of other independent variables were held constant. The critical statistic was the beta coefficient of the "most interesting" variable. Other variables were utilized for control purposes. (See Tables IX, X, XI, and XII.)

Also, four analyses were run to measure the regression of the dependent variable (individual TUCE scores of each subject after using a specific informational delivery system) on one particular independent variable (the informational delivery system judged most helpful by each subject) while the values of other independent variables were held constant. The critical statistic was the beta coefficient of the "most helpful" variable. Other variables were utilized for control purposes. (See Tables XIII, XIV, XV, and XVI.)

A one-way analysis of variance was run on students' evaluations of informational delivery systems as being most interesting. A second one-way analysis of variance was run on students' evaluations of informational delivery systems
as being most helpful in preparation for tests. The mean evaluations of each informational delivery system were tested for significant differences.

All collected data were transferred to IBM worksheets in order to be keypunched for electronic data processing. The research hypotheses are stated in the null form for testing.

1. Ceteris paribus, informational delivery systems $T_1$, $T_2$, $T_3$, and $T_4$ will produce no significantly different mean gains in student understanding of elementary economic concepts as measured by the Test of Understanding in College Economics.

2. Ceteris paribus, students' revealed preferences for specific informational delivery systems will show no significant relationship between positive attitudes and increased economic understanding.

3. Ceteris paribus, students' evaluations of the informational delivery system considered most effective in preparing for class examinations will show no significant relationship between positive attitudes and increased economic understanding.

Levels of significance are reported.


5. Hartley, H. O., Director of Statistics Institute, Texas A & M University, College Station, Texas, Interview, April 6, 1973.


CHAPTER IV

ANALYSIS OF THE DATA

Table VI is a breakdown of the absolute beta coefficients generated by the multiple linear-regression analysis of the Hypothesis One variables.

The hypothesized relationships between informational delivery systems and gain scores were not significant. The probability of chance relationships for informational delivery systems 1, 2, and 3 was .5979, .7211, and .4565, respectively. The significant, critical relationships derived from Table VI are as follows: (a) the relationship between the mean gains in student understanding of elementary economic concepts and the SAT and the SAT-MDP (companion variable controlling for missing data points) scores and (b) the relationship between the mean gains in student understanding of elementary economic concepts and the Pretest and the Pretest MDP (companion variable controlling for missing data points) scores. The probability that the relationship between the mean gains in student understanding of elementary economic concepts and Concept 3 being a chance relationship is 0.0673, which approaches significance at the .05 level.
### TABLE VI

**Regression Coefficients on a Measure of a Change in Economic Understanding**  
(Hypothesis One)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Standard Weight</th>
<th>Beta</th>
<th>$R^2$ Square</th>
<th>Standard Error</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>0.01562986</td>
<td>0.70913253</td>
<td>0.0002</td>
<td>2.4420</td>
<td>0.0843</td>
<td>0.7717</td>
</tr>
<tr>
<td>Group 2</td>
<td>0.01352822</td>
<td>0.58329174</td>
<td>0.0001</td>
<td>2.3516</td>
<td>0.0615</td>
<td>0.8043</td>
</tr>
<tr>
<td>Group 3</td>
<td>-0.00678403</td>
<td>-0.27630568</td>
<td>0.0000</td>
<td>2.3134</td>
<td>0.0143</td>
<td>0.9050</td>
</tr>
<tr>
<td>Concept 1</td>
<td>0.04903620</td>
<td>2.13265904</td>
<td>0.0020</td>
<td>2.2592</td>
<td>0.8911</td>
<td>0.3460</td>
</tr>
<tr>
<td>Concept 2</td>
<td>0.02156898</td>
<td>0.93806788</td>
<td>0.0004</td>
<td>2.2544</td>
<td>0.1731</td>
<td>0.6776</td>
</tr>
<tr>
<td>Concept 3</td>
<td>0.09506520</td>
<td>4.13452981</td>
<td>0.0076</td>
<td>2.2544</td>
<td>3.3635</td>
<td>0.0673</td>
</tr>
<tr>
<td>Info. del. sys. 1</td>
<td>0.02742422</td>
<td>1.19272119</td>
<td>0.0006</td>
<td>2.2592</td>
<td>0.2787</td>
<td>0.5979</td>
</tr>
<tr>
<td>Info. del. sys. 2</td>
<td>0.01851979</td>
<td>0.80545377</td>
<td>0.0003</td>
<td>2.2544</td>
<td>0.1276</td>
<td>0.7211</td>
</tr>
<tr>
<td>Info. del. sys. 3</td>
<td>0.03865282</td>
<td>1.68106966</td>
<td>0.0013</td>
<td>2.2544</td>
<td>0.5560</td>
<td>0.4565</td>
</tr>
<tr>
<td>SAT</td>
<td>0.78782842</td>
<td>0.03062636</td>
<td>0.0443</td>
<td>0.0068</td>
<td>20.2593</td>
<td>0.0000</td>
</tr>
<tr>
<td>SAT-MDP</td>
<td>0.80836407</td>
<td>30.71868611</td>
<td>0.0468</td>
<td>6.6285</td>
<td>21.4769</td>
<td>0.0000</td>
</tr>
<tr>
<td>Pretest</td>
<td>0.42726606</td>
<td>0.49991720</td>
<td>0.0806</td>
<td>0.0807</td>
<td>38.3329</td>
<td>0.0000</td>
</tr>
<tr>
<td>Pretest MDP</td>
<td>0.22688868</td>
<td>13.86900077</td>
<td>0.0287</td>
<td>3.8603</td>
<td>12.9077</td>
<td>0.0004</td>
</tr>
<tr>
<td>Replication</td>
<td>-0.06921019</td>
<td>-2.81885261</td>
<td>0.0057</td>
<td>1.7798</td>
<td>2.5086</td>
<td>0.1139</td>
</tr>
</tbody>
</table>
Table VII is a breakdown of the absolute beta coefficients generated by the multiple linear-regression analysis of the Hypothesis Two variables.

The hypothesized relationships between informational delivery systems being judged most interesting by students and gain scores were not significant. The probability of chance relationships for informational delivery systems 1, 2, 3, and 4 being judged most interesting by students was 1.0000. The significant, critical relationships derived from Table VII are the following: (a) the relationship between the SAT and the SAT-MDP (companion variable controlling for missing data points) scores and (b) the relationship between the mean gains in student understanding of elementary economic concepts and the Pretest and the Pretest MDP (companion variable controlling for missing data points) scores.

Table VIII is a breakdown of the absolute beta coefficients generated by the multiple linear-regression analysis of the Hypothesis Three variables.

The hypothesized relationships between informational delivery systems being judged most helpful by students and gain scores were not significant. The probability of chance relationships for informational delivery systems 1, 2, and 3 being judged most helpful was .2482, .5664, and .4583, respectively. The significant, critical relationships
<table>
<thead>
<tr>
<th>Variable</th>
<th>Standard Weight</th>
<th>Beta</th>
<th>R' Square</th>
<th>Standard Error</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>-0.02809279</td>
<td>-0.96294111</td>
<td>0.0007</td>
<td>3.6445</td>
<td>0.0698</td>
<td>0.7922</td>
</tr>
<tr>
<td>Group 2</td>
<td>-0.01035076</td>
<td>-0.32259048</td>
<td>0.0001</td>
<td>3.3308</td>
<td>0.0094</td>
<td>0.9231</td>
</tr>
<tr>
<td>Group 3</td>
<td>-0.02767498</td>
<td>-0.81717073</td>
<td>0.0007</td>
<td>3.2414</td>
<td>0.0636</td>
<td>0.8015</td>
</tr>
<tr>
<td>SAT</td>
<td>0.93504482</td>
<td>0.02650508</td>
<td>0.0767</td>
<td>0.0095</td>
<td>7.8073</td>
<td>0.0063</td>
</tr>
<tr>
<td>SAT-MDP</td>
<td>0.94427277</td>
<td>26.42282939</td>
<td>0.0798</td>
<td>9.2556</td>
<td>8.1499</td>
<td>0.0053</td>
</tr>
<tr>
<td>Pretest</td>
<td>0.61874306</td>
<td>0.54481220</td>
<td>0.2026</td>
<td>0.1115</td>
<td>23.8777</td>
<td>0.0000</td>
</tr>
<tr>
<td>Pretest-MDP</td>
<td>0.27677386</td>
<td>13.17239937</td>
<td>0.0559</td>
<td>5.5843</td>
<td>5.5641</td>
<td>0.0204</td>
</tr>
<tr>
<td>Games and Simulations</td>
<td>0.16134209</td>
<td>0.97613728</td>
<td>0.0</td>
<td>27935382.4756</td>
<td>0.0000</td>
<td>1.0000</td>
</tr>
<tr>
<td>Closed-Circuit Television</td>
<td>0.21390109</td>
<td>1.40682808</td>
<td>0.0</td>
<td>27935382.4756</td>
<td>0.0000</td>
<td>1.0000</td>
</tr>
<tr>
<td>Programmed Learning</td>
<td>0.26624874</td>
<td>1.86906214</td>
<td>0.0000</td>
<td>27935382.4756</td>
<td>0.0000</td>
<td>1.0000</td>
</tr>
<tr>
<td>Lecture and Discussion</td>
<td>0.23052008</td>
<td>1.45518037</td>
<td>0.0</td>
<td>27935382.4756</td>
<td>0.0000</td>
<td>1.0000</td>
</tr>
<tr>
<td>Replication</td>
<td>-0.05287406</td>
<td>-1.58597209</td>
<td>0.0041</td>
<td>2.5507</td>
<td>0.3866</td>
<td>0.5356</td>
</tr>
</tbody>
</table>
### TABLE VIII

REGRESSION COEFFICIENTS ON A MEASURE OF A CHANGE IN ECONOMIC UNDERSTANDING
(Hypothesis Three)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Standard Weight</th>
<th>Beta</th>
<th>R' Square</th>
<th>Standard Error</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>-0.01631099</td>
<td>-0.55289344</td>
<td>0.0003</td>
<td>3.5452</td>
<td>0.0243</td>
<td>0.8764</td>
</tr>
<tr>
<td>Group 2</td>
<td>0.00268489</td>
<td>0.08414837</td>
<td>0.0000</td>
<td>3.3613</td>
<td>0.0006</td>
<td>0.9801</td>
</tr>
<tr>
<td>Group 3</td>
<td>-0.00397023</td>
<td>-0.11884300</td>
<td>0.0000</td>
<td>3.3608</td>
<td>0.0013</td>
<td>0.9719</td>
</tr>
<tr>
<td>SAT</td>
<td>0.84737397</td>
<td>0.02419245</td>
<td>0.0635</td>
<td>0.0096</td>
<td>6.3761</td>
<td>0.0132</td>
</tr>
<tr>
<td>SAT-MDP</td>
<td>0.83566679</td>
<td>23.55822731</td>
<td>0.0624</td>
<td>9.4192</td>
<td>6.2555</td>
<td>0.0141</td>
</tr>
<tr>
<td>Pretest</td>
<td>0.59623292</td>
<td>0.53258834</td>
<td>0.1895</td>
<td>0.1136</td>
<td>21.9739</td>
<td>0.0000</td>
</tr>
<tr>
<td>Pretest-MDP</td>
<td>0.26267088</td>
<td>12.55568244</td>
<td>0.0513</td>
<td>5.5719</td>
<td>5.0778</td>
<td>0.0266</td>
</tr>
<tr>
<td>Games and Simulations</td>
<td>-0.10150740</td>
<td>-5.71077546</td>
<td>0.0142</td>
<td>4.9151</td>
<td>1.3500</td>
<td>0.2482</td>
</tr>
<tr>
<td>Closed-Circuit Television</td>
<td>-0.04856656</td>
<td>-2.73233989</td>
<td>0.0035</td>
<td>4.7483</td>
<td>0.3311</td>
<td>0.5664</td>
</tr>
<tr>
<td>Programmed Learning</td>
<td>0.06610090</td>
<td>1.85907306</td>
<td>0.0059</td>
<td>2.4961</td>
<td>0.5547</td>
<td>0.4583</td>
</tr>
<tr>
<td>Replication</td>
<td>-0.04891899</td>
<td>-1.47612482</td>
<td>0.0036</td>
<td>2.5500</td>
<td>0.3351</td>
<td>0.5641</td>
</tr>
</tbody>
</table>
derived from Table VIII are the following: (a) the relationship between the SAT and the SAT-MDP (companion variable controlling for missing data points) scores and (b) the relationship between the mean gains in student understanding of elementary economic concepts and the Pretest and the Pretest MDP (companion variable controlling for missing data points) scores.

Additional multiple linear-regression analyses were run to determine whether there was a relationship between mean gains in student understanding of elementary economic concepts and the students' evaluations of the informational delivery systems they judged to be most interesting and the systems they judged to be most helpful in preparation for tests. These regression analyses were run on a speculative basis to test the relationship between students' attitudes toward informational delivery systems used in this research and cognitive performances when subjected to the various systems. This is contrasted to the previous analysis in which revealed preferences were regressed against aggregate scores without reference to the attitude toward a specific informational delivery system as it was being used.

Table IX is a breakdown of the absolute beta coefficients generated by the multiple linear-regression analysis of the relationship between mean gains in student understanding of elementary economic concepts and the students'
<table>
<thead>
<tr>
<th>Variable</th>
<th>Standard Weight</th>
<th>Beta</th>
<th>R' Square</th>
<th>Standard Error</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept 1</td>
<td>0.17973543</td>
<td>8.29654354</td>
<td>0.0320</td>
<td>4.6315</td>
<td>3.2088</td>
<td>0.0764</td>
</tr>
<tr>
<td>Concept 2</td>
<td>0.02965337</td>
<td>1.26105873</td>
<td>0.0009</td>
<td>4.3846</td>
<td>0.0827</td>
<td>0.7743</td>
</tr>
<tr>
<td>Concept 3</td>
<td>0.19087763</td>
<td>7.50218101</td>
<td>0.0329</td>
<td>4.1312</td>
<td>3.2978</td>
<td>0.0725</td>
</tr>
<tr>
<td>SAT</td>
<td>0.72937386</td>
<td>0.02685711</td>
<td>0.0421</td>
<td>0.0130</td>
<td>4.2641</td>
<td>0.0416</td>
</tr>
<tr>
<td>SAT-MDP</td>
<td>0.78200896</td>
<td>28.42536260</td>
<td>0.0486</td>
<td>12.7644</td>
<td>4.9592</td>
<td>0.0283</td>
</tr>
<tr>
<td>Pretest</td>
<td>0.49602673</td>
<td>0.56576730</td>
<td>0.1291</td>
<td>0.1492</td>
<td>14.3760</td>
<td>0.0003</td>
</tr>
<tr>
<td>Pretest-MDP</td>
<td>0.23899044</td>
<td>14.77518023</td>
<td>0.0386</td>
<td>7.4895</td>
<td>3.8919</td>
<td>0.0514</td>
</tr>
<tr>
<td>Most Interesting</td>
<td>-0.05486957</td>
<td>-0.43122823</td>
<td>0.0040</td>
<td>0.6943</td>
<td>0.3858</td>
<td>0.5360</td>
</tr>
<tr>
<td>Replication</td>
<td>-0.05626972</td>
<td>-2.19250214</td>
<td>0.0042</td>
<td>3.4184</td>
<td>0.4114</td>
<td>0.5228</td>
</tr>
</tbody>
</table>
evaluations of informational delivery system games and simulations, as being the most interesting informational delivery system employed in the study.

No significant, critical relationship between informational delivery system 1 being judged most interesting by students and mean gains in student understanding of elementary economic concepts, after using informational delivery system 1, was derived from Table IX. The probability of informational delivery system 1 being judged most interesting by chance was .5360.

Table X is a breakdown of the absolute beta coefficients generated by the multiple linear-regression analysis of the relationship between mean gains in student understanding of elementary economic concepts and the students' evaluations of informational delivery system 2--closed-circuit television, as being the most interesting employed in the study.

No significant, critical relationship between informational delivery system 2 being judged most interesting by students and the mean gains in student understanding of elementary economic concepts, after using informational delivery system 2, was derived from Table X. The probability of informational delivery system 2 being judged most interesting by chance was .7783.

Table XI is a breakdown of the absolute beta coefficients generated by the multiple linear-regression analysis of the
### TABLE X
REGRESSION COEFFICIENTS ON A MEASURE OF A CHANGE IN ECONOMIC UNDERSTANDING
(Closed-Circuit Television--Most Interesting)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Standard Weight</th>
<th>Beta</th>
<th>R' Square</th>
<th>Standard Error</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept 1</td>
<td>0.03106692</td>
<td>1.24625618</td>
<td>0.0009</td>
<td>4.2948</td>
<td>0.0842</td>
<td>0.7723</td>
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<tr>
<td>Concept 2</td>
<td>0.00468542</td>
<td>0.22074374</td>
<td>0.0000</td>
<td>4.9827</td>
<td>0.0020</td>
<td>0.9648</td>
</tr>
<tr>
<td>Concept 3</td>
<td>0.02693927</td>
<td>1.10152556</td>
<td>0.0007</td>
<td>4.3637</td>
<td>0.0637</td>
<td>0.8012</td>
</tr>
<tr>
<td>SAT</td>
<td>0.92854486</td>
<td>0.03489705</td>
<td>0.0687</td>
<td>0.0130</td>
<td>7.1605</td>
<td>0.0087</td>
</tr>
<tr>
<td>SAT-MDP</td>
<td>0.99901470</td>
<td>37.06319352</td>
<td>0.0800</td>
<td>12.7653</td>
<td>8.4299</td>
<td>0.0046</td>
</tr>
<tr>
<td>Pretest</td>
<td>0.47496172</td>
<td>0.55292731</td>
<td>0.1242</td>
<td>0.1491</td>
<td>13.7512</td>
<td>0.003</td>
</tr>
<tr>
<td>Pretest-MDP</td>
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<td>9.59573618</td>
<td>0.0167</td>
<td>7.4697</td>
<td>1.6502</td>
<td>0.2020</td>
</tr>
<tr>
<td>Most Interesting</td>
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<td>0.23066596</td>
<td>0.0008</td>
<td>0.8169</td>
<td>0.0797</td>
<td>0.7783</td>
</tr>
<tr>
<td>Replication</td>
<td>0.12619672</td>
<td>5.01868609</td>
<td>0.0218</td>
<td>3.4139</td>
<td>2.1612</td>
<td>0.1448</td>
</tr>
</tbody>
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### TABLE XI

REGRESSION COEFFICIENTS ON A MEASURE OF A CHANGE IN ECONOMIC UNDERSTANDING  
(Programmed Learning--Most Interesting)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Standard Weight</th>
<th>Beta</th>
<th>R' Square</th>
<th>Standard Error</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept 1</td>
<td>-0.05996682</td>
<td>-2.63642651</td>
<td>0.0029</td>
<td>4.9772</td>
<td>0.2806</td>
<td>0.5975</td>
</tr>
<tr>
<td>Concept 2</td>
<td>-0.03310943</td>
<td>-1.37128347</td>
<td>0.0009</td>
<td>4.5623</td>
<td>0.0903</td>
<td>0.7644</td>
</tr>
<tr>
<td>Concept 3</td>
<td>0.05232723</td>
<td>2.49709284</td>
<td>0.0021</td>
<td>5.4792</td>
<td>0.2077</td>
<td>0.6496</td>
</tr>
<tr>
<td>SAT</td>
<td>0.27814909</td>
<td>0.01058840</td>
<td>0.0052</td>
<td>0.0148</td>
<td>0.5091</td>
<td>0.4772</td>
</tr>
<tr>
<td>SAT-MDP</td>
<td>0.18625537</td>
<td>6.99916982</td>
<td>0.0024</td>
<td>14.5414</td>
<td>0.2317</td>
<td>0.6314</td>
</tr>
<tr>
<td>Pretest</td>
<td>0.44886616</td>
<td>0.52928925</td>
<td>0.0908</td>
<td>0.1701</td>
<td>9.6821</td>
<td>0.0024</td>
</tr>
<tr>
<td>Pretest-MDP</td>
<td>0.27058489</td>
<td>17.29415107</td>
<td>0.0412</td>
<td>8.4704</td>
<td>4.1686</td>
<td>0.0439</td>
</tr>
<tr>
<td>Most Interesting</td>
<td>0.16526449</td>
<td>1.55801491</td>
<td>0.0270</td>
<td>0.9500</td>
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<td>0.1042</td>
</tr>
<tr>
<td>Replication</td>
<td>-0.09519992</td>
<td>-3.83482292</td>
<td>0.0097</td>
<td>3.9304</td>
<td>0.9519</td>
<td>0.3317</td>
</tr>
</tbody>
</table>
relationship between mean gains in student understanding of elementary economic concepts and the students' evaluations of informational delivery system 3--programmed learning--as being the most interesting informational delivery system employed in the study.

The relationship between mean gains in student understanding of elementary economic concepts after using informational delivery system 3 and the degree to which students found informational delivery system 3 interesting was significant at the .1042 level only.

Table XII is a breakdown of the absolute beta coefficients generated by the multiple linear-regression analysis of the relationship between mean gains in student understanding of elementary economic concepts and the students' evaluations of informational delivery system 4--standard lecture and discussion--as being the most interesting informational delivery system employed in the study.

No significant, critical relationship between informational delivery system 4 being judged most interesting by students and mean gains in student understanding of elementary economic concepts, after using informational delivery system 4, was derived from Table XII. The probability of informational delivery system 4 being judged most interesting by chance was .7507.
TABLE XII
REGRESSION COEFFICIENTS ON A MEASURE OF A CHANGE IN ECONOMIC UNDERSTANDING
(Standard Lecture and Discussion--Most Interesting)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Standard Weight</th>
<th>Beta</th>
<th>R' Square</th>
<th>Standard Error</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept 1</td>
<td>-0.09677108</td>
<td>-4.04482266</td>
<td>0.0059</td>
<td>5.3406</td>
<td>0.5706</td>
<td>0.4507</td>
</tr>
<tr>
<td>Concept 2</td>
<td>-0.07176676</td>
<td>-2.94291394</td>
<td>0.0036</td>
<td>4.9405</td>
<td>0.3548</td>
<td>0.5528</td>
</tr>
<tr>
<td>Concept 3</td>
<td>-0.10077053</td>
<td>-4.47112140</td>
<td>0.0074</td>
<td>5.2737</td>
<td>0.7188</td>
<td>0.3986</td>
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<tr>
<td>SAT</td>
<td>0.73892410</td>
<td>0.02838773</td>
<td>0.0385</td>
<td>0.0144</td>
<td>3.8805</td>
<td>0.0517</td>
</tr>
<tr>
<td>SAT-MDP</td>
<td>0.76267845</td>
<td>28.92394401</td>
<td>0.0414</td>
<td>14.1376</td>
<td>4.1856</td>
<td>0.0435</td>
</tr>
<tr>
<td>Pretest</td>
<td>0.37551713</td>
<td>0.44686315</td>
<td>0.0701</td>
<td>0.1653</td>
<td>7.3070</td>
<td>0.0081</td>
</tr>
<tr>
<td>Pretest-MDP</td>
<td>0.07104348</td>
<td>4.58245549</td>
<td>0.0032</td>
<td>8.2444</td>
<td>0.3089</td>
<td>0.5796</td>
</tr>
<tr>
<td>Most Interesting</td>
<td>0.03175127</td>
<td>0.27164606</td>
<td>0.0010</td>
<td>0.8525</td>
<td>0.1015</td>
<td>0.7507</td>
</tr>
<tr>
<td>Replication</td>
<td>-0.11138279</td>
<td>-4.52798651</td>
<td>0.0141</td>
<td>3.8497</td>
<td>1.3835</td>
<td>0.2424</td>
</tr>
</tbody>
</table>
Table XIII is a breakdown of the absolute beta coefficients generated by the multiple linear-regression analysis of the relationship between mean gains in student understanding of elementary economic concepts and the students' evaluations of informational delivery system 1--games and simulations--as being the most helpful in preparation for tests.

No significant, critical relationship between informational delivery system 1 being judged most helpful in preparation for tests by students and mean gains in student understanding of elementary economic concepts, after using informational delivery system 1, was derived from Table XIII. The probability of informational delivery system 1 being judged most helpful by chance was .3555.

Table XIV is a breakdown of the absolute beta coefficients generated by the multiple linear-regression analysis of the relationship between mean gains in student understanding of elementary economic concepts and the students' evaluations of informational delivery system 2--closed-circuit television--as being the most helpful in preparation for tests.

No significant, critical relationship between informational delivery system 2 being judged most helpful in preparation for tests by students and mean gains in student understanding of elementary economic concepts after using
### TABLE XIII

REGRESSION COEFFICIENTS ON A MEASURE OF A CHANGE IN ECONOMIC UNDERSTANDING

(Games and Simulations--Most Helpful)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Standard Weight</th>
<th>Beta</th>
<th>R'Square</th>
<th>Standard Error</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept 1</td>
<td>0.18943252</td>
<td>8.39142139</td>
<td>0.0358</td>
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</tr>
<tr>
<td>Concept 2</td>
<td>0.03178228</td>
<td>1.34733388</td>
<td>0.0010</td>
<td>4.1712</td>
<td>0.1043</td>
<td>0.7474</td>
</tr>
<tr>
<td>Concept 3</td>
<td>0.19394811</td>
<td>7.76150529</td>
<td>0.0371</td>
<td>3.9360</td>
<td>3.8885</td>
<td>0.0513</td>
</tr>
<tr>
<td>SAT</td>
<td>0.75351037</td>
<td>0.02785551</td>
<td>0.0465</td>
<td>0.0126</td>
<td>4.9235</td>
<td>0.0287</td>
</tr>
<tr>
<td>SAT-MDP</td>
<td>0.80428720</td>
<td>29.07061066</td>
<td>0.0526</td>
<td>12.2857</td>
<td>5.6029</td>
<td>0.0198</td>
</tr>
<tr>
<td>Pretest</td>
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<td>0.54788885</td>
<td>0.1207</td>
<td>0.1471</td>
<td>13.8637</td>
<td>0.0003</td>
</tr>
<tr>
<td>Pretest-MDP</td>
<td>0.27027748</td>
<td>15.62744197</td>
<td>0.0465</td>
<td>7.0426</td>
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<td>0.0287</td>
</tr>
<tr>
<td>Most Helpful</td>
<td>-0.07853879</td>
<td>-5.80102570</td>
<td>0.0085</td>
<td>6.2493</td>
<td>0.8617</td>
<td>0.3555</td>
</tr>
<tr>
<td>Replication</td>
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<td>-3.20825659</td>
<td>0.0094</td>
<td>3.2800</td>
<td>0.9567</td>
<td>0.3303</td>
</tr>
</tbody>
</table>
**TABLE XIV**

REGRESSION COEFFICIENTS ON A MEASURE OF A CHANGE IN ECONOMIC UNDERSTANDING
(Closed-Circuit Television--Most Helpful)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Standard Weight</th>
<th>Beta</th>
<th>R' Square</th>
<th>Standard Error</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept 1</td>
<td>0.02275279</td>
<td>0.92785299</td>
<td>0.0005</td>
<td>4.2908</td>
<td>0.0468</td>
<td>0.8292</td>
</tr>
<tr>
<td>Concept 2</td>
<td>0.03800082</td>
<td>1.71537083</td>
<td>0.0014</td>
<td>4.5870</td>
<td>0.1398</td>
<td>0.7092</td>
</tr>
<tr>
<td>Concept 3</td>
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<td>0.0013</td>
<td>4.2833</td>
<td>0.1349</td>
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<td>0.04000634</td>
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<td>0.0128</td>
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<td>0.0011</td>
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<td>0.48620294</td>
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<td>0.1505</td>
<td>10.4374</td>
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<tr>
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<td>10.65833296</td>
<td>0.0211</td>
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<td>0.1433</td>
</tr>
<tr>
<td>Most Helpful</td>
<td>-0.01154343</td>
<td>-0.86883895</td>
<td>0.0002</td>
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<td>0.0190</td>
<td>0.8905</td>
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<tr>
<td>Replication</td>
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<td>3.85400052</td>
<td>0.0129</td>
<td>3.3533</td>
<td>1.3209</td>
<td>0.2531</td>
</tr>
</tbody>
</table>
informational delivery system 2 was derived from Table XIV. The probability of informational delivery system 2 being judged most helpful by chance was .8905.

Table XV is a breakdown of the absolute beta coefficients generated by the multiple linear-regression analysis of the relationship between mean gains in student understanding of elementary economic concepts and the students' evaluations of informational delivery system 3--programmed learning--as being the most helpful in preparation for tests.

The relationship between mean gains in student understanding of elementary economic concepts after using informational delivery system 3 and the degree to which students found informational delivery system 3 most helpful in preparation for tests was significant at the .0240 level, as shown in Table XV.

Table XVI is a breakdown of the absolute beta coefficients generated by the multiple linear-regression analysis of the relationship between mean gains in student understanding of elementary economic concepts and the students' evaluations of informational delivery system 4--standard lecture and discussion--as being the most helpful in preparation for tests.

No significant, critical relationship between informational delivery system 4 being judged most helpful in preparation for tests by students and mean gains in student
<table>
<thead>
<tr>
<th>Variable</th>
<th>Standard Weight</th>
<th>Beta</th>
<th>R' Square</th>
<th>Standard Error</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
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<td>-0.09386638</td>
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</tr>
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<tr>
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<tr>
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<td>0.0602</td>
</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
<td>Variable</td>
<td>Standard Weight</td>
<td>Beta</td>
<td>R' Square</td>
<td>Standard Error</td>
<td>F</td>
<td>P</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------</td>
<td>------------</td>
<td>-----------</td>
<td>----------------</td>
<td>-------</td>
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</tr>
<tr>
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</tr>
<tr>
<td>Concept 2</td>
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<tr>
<td>Concept 3</td>
<td>-0.04890255</td>
<td>-2.32514426</td>
<td>0.0018</td>
<td>5.4680</td>
<td>0.1808</td>
<td>0.6716</td>
</tr>
<tr>
<td>SAT</td>
<td>0.76452168</td>
<td>0.03169859</td>
<td>0.0407</td>
<td>0.0153</td>
<td>4.2880</td>
<td>0.0409</td>
</tr>
<tr>
<td>SAT-MDP</td>
<td>0.79045410</td>
<td>32.05511129</td>
<td>0.0438</td>
<td>14.9000</td>
<td>4.6283</td>
<td>0.0338</td>
</tr>
<tr>
<td>Pretest</td>
<td>0.36170986</td>
<td>0.45247911</td>
<td>0.0593</td>
<td>0.1793</td>
<td>6.3657</td>
<td>0.0132</td>
</tr>
<tr>
<td>Pretest-MDP</td>
<td>0.12109790</td>
<td>7.85313198</td>
<td>0.0082</td>
<td>8.5910</td>
<td>0.8356</td>
<td>0.3628</td>
</tr>
<tr>
<td>Most Helpful</td>
<td>0.11739155</td>
<td>4.81474302</td>
<td>0.0136</td>
<td>4.0743</td>
<td>1.3965</td>
<td>0.2401</td>
</tr>
<tr>
<td>Replication</td>
<td>-0.09331061</td>
<td>-4.04394030</td>
<td>0.0097</td>
<td>4.0653</td>
<td>0.9895</td>
<td>0.3222</td>
</tr>
</tbody>
</table>
understanding of elementary economic concepts, after using informational delivery system 4, was derived from Table XVI. The probability of informational delivery system 4 being judged most helpful by chance was .2401.

An analysis of variance was run on aggregate student evaluations of the informational delivery system used in the study which they judged most interesting. Table XVII is an analysis of the students' choices.

TABLE XVII

INFORMATIONAL DELIVERY SYSTEM
(Judged Most Interesting by Students)

<table>
<thead>
<tr>
<th>Info. Del. Sys.</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Order of Choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Games and Simulations</td>
<td>0.83178</td>
<td>2.30048</td>
<td>First</td>
</tr>
<tr>
<td>Standard Lecture and Discussion</td>
<td>0.38318</td>
<td>2.20482</td>
<td>Second</td>
</tr>
<tr>
<td>Closed-Circuit Television</td>
<td>-0.47664</td>
<td>2.11618</td>
<td>Third</td>
</tr>
<tr>
<td>Programmed Learning</td>
<td>-0.73832</td>
<td>2.20482</td>
<td>Fourth</td>
</tr>
</tbody>
</table>

Table XVIII contains the variance data for the mean scores reported in Table XVII above.
The analysis of variance revealed a significant difference at the 0.0000 level in the choices of specific informational delivery systems as being most interesting. Table XIX reports Fisher's $t$ scores reflecting the significance of the differences between the mean scores of informational delivery systems judged most interesting.

**TABLE XIX**

**FISHER'S $t$ SCORES OF INFORMATIONAL DELIVERY SYSTEMS**
*(Judged Most Interesting by Students)*

<table>
<thead>
<tr>
<th>Info. Del. Sys.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Games and Simulations</td>
<td>0.0</td>
<td>4.4426*</td>
<td>5.3311*</td>
<td>1.5232</td>
</tr>
<tr>
<td>Closed-Circuit Television</td>
<td>4.4426*</td>
<td>0.0</td>
<td>0.8885</td>
<td>-2.9194*</td>
</tr>
<tr>
<td>Programmed Learning</td>
<td>-5.3311*</td>
<td>-0.8885</td>
<td>0.0</td>
<td>-3.8079*</td>
</tr>
<tr>
<td>Lecture and Discussion</td>
<td>-1.5232</td>
<td>2.9194*</td>
<td>3.8079*</td>
<td>0.0</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.
Significant differences were found between students' rankings of informational delivery systems 1 and 2, 1 and 3, 2 and 4, and 3 and 4. Students preferred delivery systems 1 (games and simulations) and 4 (standard lecture and discussion) over 2 (closed-circuit television) and 3 (programmed learning). There were no significant differences between 1 and 4 and between 2 and 3.

An analysis of variance was run on aggregate student evaluations of the informational delivery systems used in the study which they judged most helpful in preparation for tests. Table XX is a description of the students' preferences.

**TABLE XX**

INFORMATIONAL DELIVERY SYSTEM
(Judged Most Helpful in Preparation for Tests by Students)

<table>
<thead>
<tr>
<th>Info. Del. Sys.</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Order of Choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed-Circuit Television</td>
<td>0.11538</td>
<td>0.32581</td>
<td>First</td>
</tr>
<tr>
<td>Games and Simulations</td>
<td>0.08696</td>
<td>0.28810</td>
<td>Second</td>
</tr>
<tr>
<td>Programmed Learning</td>
<td>0.03226</td>
<td>0.17961</td>
<td>Tie of Third and Fourth</td>
</tr>
<tr>
<td>Standard Lecture and Discussion</td>
<td>0.03226</td>
<td>0.17961</td>
<td>Tie of Third and Fourth</td>
</tr>
</tbody>
</table>
Table XXI contains the variance data for the mean scores reported in Table XX above.

**TABLE XXI**

ANALYSIS OF VARIANCE DATA FOR TABLE XX

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum Squares</th>
<th>Degrees of Freedom</th>
<th>Variance Estimate</th>
<th>F Ratio</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td>0.1431</td>
<td>3.</td>
<td>0.0477</td>
<td>0.7958</td>
<td>0.4989</td>
</tr>
<tr>
<td>Within</td>
<td>6.4154</td>
<td>107.</td>
<td>0.0600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>6.5586</td>
<td>110.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The analysis of variance revealed no significant differences in the choices of specific informational delivery systems as being most helpful in preparation for tests. The probability of chance relationships for informational delivery systems being judged most helpful in preparation for tests was 0.4989.
CHAPTER V

FINDINGS, CONCLUSIONS, IMPLICATIONS
AND RECOMMENDATIONS

Findings

Findings Directly Related to Hypotheses

Hypothesis One, which stated that, *ceteris paribus*, informational delivery systems $T_1$, $T_2$, $T_3$, and $T_4$ will produce no significantly different mean gains in student understanding of elementary economic concepts as measured by the TUCE, is accepted. (See Table VI.)

Hypothesis Two, which stated that, *ceteris paribus*, students' revealed preferences for a specific informational delivery system will show no significant relationship between positive attitudes and increased economic understanding, is accepted. (See Table VII.)

Hypothesis Three, which stated that, *ceteris paribus*, students' evaluations of the informational delivery system considered most effective in preparing for class examinations will show no significant relationship between positive attitudes and increased economic understanding, is accepted. (See Table VIII.)
Additional Findings

In testing Hypothesis One, a nonhypothesized relationship emerged: when students were studying Concept 3, factor markets and income distribution, the probability that the relationship between the mean gains in student understanding of elementary economic concepts and Concept 3 being a chance relationship was 0.0673. (See Table VI.)

For Hypotheses One, Two, and Three, significant, critical relationships exist between previous knowledge of economics, as measured by the TUCE as a pretest, and academic ability, as measured by SAT. (See Tables VI, VII, and VIII.)

Additional multiple linear-regression analyses were run on a speculative basis to test whether students' judgments of informational delivery systems as most interesting and most helpful in preparation for tests were having some impact on mean gains in student understanding of elementary economic concepts, after using the informational delivery system judged most interesting and most helpful. These analyses revealed the following:

There was no significant relationship between an increase in knowledge of economics after the use of games and simulations and students' judgment of games and simulations as the most interesting informational delivery system used. (See Table IX.)

There was no significant relationship between an increase in knowledge of economics after the use of closed-circuit
television and students' judgment of closed-circuit television as the most interesting informational delivery system used.

(See Table X.)

There was a significant relationship at the .10 level only between an increase in knowledge of economics after the use of programmed learning and students' judgment of programmed learning as the most interesting informational delivery system used.

(See Table XI.)

There was no significant relationship between an increase in knowledge of economics after the use of standard lecture and discussion and students' judgment of standard lecture and discussion as the most interesting informational delivery system used. (See Table XII.)

There was no significant relationship between an increase in knowledge of economics after the use of games and simulations and students' judgment of games and simulations as the most helpful informational delivery system used in preparation for tests. (See Table XIII.)

There was no significant relationship between an increase in knowledge of economics after the use of closed-circuit television and students' judgment of closed-circuit television as the most helpful informational delivery system used in preparation for tests. (See Table XIV.)

There was a significant relationship at the .0240 level between an increase in knowledge of economics after the use of programmed learning and students' judgment of programmed
learning as the most helpful informational delivery system used in preparation for tests. (See Table XV.)

There was no significant relationship between an increase in knowledge of economics after the use of standard lecture and discussion and students' judgment of standard lecture and discussion as the most helpful informational delivery system used in preparation for tests. (See Table XVI.)

Students judged informational delivery systems most interesting in this order: first, games and simulations; second, standard lecture and discussion; third, closed-circuit television; and, fourth, programmed learning. (See Table XVII.)

Analysis of variance revealed significant differences at the 0.0000 level in the choices of specific informational delivery systems as most interesting. (See Table XVIII.)

Significant differences were found in aggregate student evaluations of games and simulations and standard lecture and discussion as more interesting than closed-circuit television and programmed learning. (See Table XIX.)

Students judged informational delivery systems most helpful in preparation for tests in this order: first, closed-circuit television; second, games and simulations. Programmed learning and standard lecture and discussion tied for third choice. (See Table XX.)

Analysis of variance revealed no significant differences in the choices of specific informational delivery systems being
considered most helpful in preparation for tests. The probability of a chance relationship was 0.4989. (See Table XXI.)

Conclusions

Findings directly related to hypotheses suggest the following conclusions to the cautious researcher. First, there was no significant differential impact attributable to informational delivery systems (games and simulations, closed-circuit television, programmed learning, and standard lecture and discussion) on the understanding of certain defined elementary economic concepts by students in a beginning economics course of microeconomic theory (See Table VI.)

Second, there was no significant differential impact attributable to students' judgment of a specific informational delivery system as most interesting on the understanding of certain defined elementary economic concepts by students in a beginning economics course of microeconomic theory. (See Table VII.)

Third, there was no significant differential impact attributable to students' judgment of a specific informational delivery system as the most helpful informational delivery system used in preparation for tests on the understanding of certain defined elementary economic concepts by students in a beginning economics course of microeconomic theory. (See Table VIII.)

Additional findings suggest the following conclusions to the cautious researcher. First, even though informational
delivery systems showed no significant impact on cognition, there was a significant relationship between how well students scored on posttests after the use of programmed learning and the degree to which they found programmed learning interesting and helpful. (See Tables XI and XV.)

Second, the evaluations of informational delivery systems as most interesting did not occur by chance. (See Tables XVII and XVIII.) No significant difference was found between how students ranked games and simulations and standard lecture and discussion. No significant difference was found between how students ranked closed-circuit television and programmed learning. Significant differences were found, however, in students' choice of games and simulations and lecture and discussion over closed-circuit television and programmed learning.

Implications

The pedagogical implication that attitudes toward informational delivery systems are critical is derived from the additional finding stated above that a relationship exists between how well students scored on posttests after the use of a specific informational delivery system and the degree to which they found that system interesting and helpful. If students see specific pedagogy as interesting and helpful, then significant differences in cognition may result. A concomitant implication is that, if attitudes toward methods are critical, teachers must "sell" whatever informational delivery system they choose to utilize.
Recommendations

It is suggested that further research using the Separate-Sample Pretest-Posttest Control Group Design 13a (1, pp. 55-56) with randomized teachers and classes be conducted to test for interaction effects of such factors as sex and academic ability on informational delivery systems. Such a study would be free of the weaknesses characteristic of a study assuming no interaction.

Further, a researcher-developed criterion-referenced instrument would more likely detect significant differences in cognition attributable to informational delivery systems used in such a study.
CHAPTER BIBLIOGRAPHY

APPENDIX A
TEST OF UNDERSTANDING IN COLLEGE ECONOMICS—Part II

DIRECTIONS

On the separate answer sheet follow the instructions for entering your name and other requested information on the answer sheet. Use only a regular #2 or #2½ pencil. Do not use a ballpoint pen. Indicate on the answer sheet in the proper space that this is Test Form A, Part II.

Each question on this test has four choices for an answer. Read each question and decide which is the one best answer. On the answer sheet find the row which has the same number as the question you are answering. In that row blacken the circle under the number which is the same as the one in front of the answer you choose. Make sure that you darken the complete circle. If you make a mistake, erase completely the answer you wish to change.

Look at the example below:

99. In the U.S., control of the money supply is exercised by the
   1. Federal Reserve System.
   3. Department of Commerce.
   4. Department of Agriculture.

Sample of Answer Sheet

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>99</td>
</tr>
</tbody>
</table>

Do not open this test booklet until you are told to do so.

Make no marks in this booklet.

Prepared by

The Committee for a College-Level Test of Economic Understanding of the Joint Council on Economic Education

Rendigs Fels, Chairman  Paul L. Dressel, Executive Director
G. L. Bach  Bernard F. Haley
William G. Bowen  Paul A. Samuelson
R. A. Gordon  George J. Stigler
John M. Stainaker, Consultant

The test contained in this booklet has been designed for use with answer forms published or authorized by The Psychological Corporation. If other answer forms are used, The Psychological Corporation takes no responsibility for the meaningfulness of scores.
1. The demand for a factor of production depends largely on
   1. the supply of the factor.
   2. the supply of other factors of production.
   3. the demand for other factors of production.
   4. the demand for the product or products which it helps produce.

2. Suppose the subway fare in a city is raised from 15¢ per ride to 25¢ per ride while the bus fare is unchanged at 15¢. How would total fare revenue be affected by the subway fare increase?
   1. It would increase for buses but might increase or decrease for subways.
   2. It would increase for subways but might increase or decrease for buses.
   3. It would increase for both subways and buses.
   4. It would decrease for both subways and buses.

Questions 3 and 4 are based on the following quotation:
"A striking and for some reason almost unknown fact about the American Telephone and Telegraph Company is that its earnings have often gone up whenever the Government has ordered its prices down."

3. Below are listed four possible combinations of price elasticity of demand and marginal cost (relative to average cost) for telephone and telegraph services. Which of the four would, if true, best explain the "almost unknown fact" stated in the quotation?
   1. Elastic demand, high marginal cost
   2. Inelastic demand, high marginal cost
   3. Elastic demand, low marginal cost
   4. Inelastic demand, low marginal cost

4. Why does the Government order changes in prices instead of allowing the American Telephone and Telegraph Company to decide what to charge?
   1. The Government owns the telephone company.
   2. There would be cut-throat competition if the Government did not intervene.
   3. The telephone industry is a natural monopoly of a service important for the public interest.
   4. The private cost of telephone and telegraph services exceeds the social (i.e. total) cost.

5. If, at full employment, demand shifts toward the product of a capital-intensive industry and away from the product of a labor-intensive industry, which of the following is likely to occur in the short run?
   1. Returns to owners of capital increase, returns to labor fall
   2. Returns to labor increase, returns to owners of capital fall
   3. Returns to both labor and owners of capital fall
   4. Returns to both labor and owners of capital increase

6. Use of a price system for rationing economic goods is a distinguishing characteristic of the economy of which of the following?
   1. U.S.
   2. England
   3. Russia
   4. More than one of the above

Questions 7 and 8 are based on the following information:

<table>
<thead>
<tr>
<th>Amount of X</th>
<th>Price Per Unit</th>
<th>Amount of X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumers</td>
<td>will purchase</td>
<td>Producers</td>
</tr>
<tr>
<td>4</td>
<td>$4</td>
<td>18</td>
</tr>
<tr>
<td>9</td>
<td>$3</td>
<td>15</td>
</tr>
<tr>
<td>11</td>
<td>$2</td>
<td>11</td>
</tr>
<tr>
<td>15</td>
<td>$1</td>
<td>9</td>
</tr>
</tbody>
</table>

7. How many units of Product X will be sold?
   1. 18
   2. 15
   3. 11
   4. 9

8. Which of the following would result from a government law stating that Product X could not be sold for less than $3.00?
   1. There would be a shortage of Product X.
   2. Consumers would not be able to buy all they would like of Product X at a price of $3.00.
   3. Producers would not be able to sell all they would like of Product X at a price of $3.00.
   4. The minimum price set by the government would make it possible for more consumers to purchase Product X.
9. Both the Sherman and Clayton Acts were based on the assumption that
   1. labor unions were monopolies in the same sense that trusts were.
   2. legislation could function as an incentive for labor-management cooperation.
   3. the standard of living could be raised by government regulation of wages and prices.
   4. competitive business conditions could be promoted through government intervention.

10. With a given quantity of labor and capital, Country A can produce 10 tons of coal or 10 tons of steel, but Country B can produce only 8 tons of coal or 5 tons of steel. Assuming constant costs, Country B should
   1. import coal and export steel.
   2. export coal and import steel.
   3. export both coal and steel.
   4. import both coal and steel.

11. Assume that the United Steel Workers succeeded in raising wages in the steel industry. Under which of the following conditions, if any, will employment in the steel industry drop substantially (other things being equal)?
   1. Management increases prices, and the demand is inelastic.
   2. Labor cost is a relatively small percentage of the final cost of steel.
   3. The possibilities of substituting capital for labor are low for technical reasons.
   4. None of the above is likely to cause a substantial decline of employment in the steel industry.

12. Suppose a large city is investigating the elimination of rent controls on housing at a time when the vacancy rate is extremely low — only 1% of all apartments in the city are vacant. Which of the following is most likely to occur if rent controls are eliminated?
   1. An increase in the demand for housing, followed by a decrease in the supply of housing
   2. An increase in rents, perhaps followed later by an increase in the supply of housing
   3. A decrease in rents and a decrease in the supply of housing
   4. No change in rents, since price controls are usually set where supply and demand intersect

13. In perfect competition, how is the market price (P) related to marginal revenue (MR) for each supplying firm?
   1. P is the same as MR at all output levels.
   2. P is less than MR at all (or most) output levels.
   3. P is greater than MR at all (or most) output levels.
   4. P is either greater than MR or less than MR at particular output levels, but never the same as MR.

14. Is $8,000 or $4,000 per year the better measure of the cost to society of the man's service in the Army? Why?
   1. $4,000, because this is what he is being paid for his Army service.
   2. $8,000, because this would be the value to society of his labors if he were not in the Army.
   3. $4,000, because if he were not in the Army (and no one else was in the Army in his place) the government would be spending $4,000 less per year.
   4. $8,000, because he pays less federal income tax while in the Army than he would in civilian life.

15. "If the value of output in an industry increases by 4% per year, and workers receive a wage increase of 4% per year, then nothing is left for increasing the compensation of other factors of production." Which of the following best describes this quotation?
   1. It is essentially correct.
   2. It is incorrect because it confuses income with output.
   3. It is incorrect because wages are less than 100% of the total factor payments.
   4. It is incorrect because the increase in wages actually reduces the real income of all other factors of production.
16. Which of the following would result from a reorganization of world production to exploit more fully the principle of comparative advantage?

1. The countries with a comparative disadvantage would gain at the expense of the countries with a comparative advantage.

2. There would be a larger output for the comparatively efficient countries, but a smaller output for the comparatively inefficient countries.

3. There would be a larger world output in the short run, but there would be some long-run structural problems.

4. There would be a larger world output in the long run, but there would be some short-run structural problems.

19. "The bigger the volume, the lower the cost; that is the first law of all industry." Which of the following best describes this quotation?

1. The quotation correctly states one of the laws of economics.

2. Although not a scientific law, the statement embodies a well-established generalization applying to most products, but not to all of them.

3. Although true for a limited number of products, the statement is not generally correct.

4. Although true up to a point for virtually all products, the statement is inconsistent with a well-established finding of economics.

17. Which of the following is true at the quantity of output where average cost per unit has reached its minimum level?

1. Average variable cost equals fixed cost.

2. Marginal cost equals average variable cost.

3. Marginal cost equals average cost.

4. Average total cost equals average fixed cost.

18. Which of the following statements about income distribution in different kinds of economies is most accurate?

1. Inequality of incomes tends to be less in underdeveloped countries, where nearly everybody is poor, than in the U.S. or Russia.

2. Incomes from wages and salaries in modern communist countries may be as unequal as in private enterprise economies.

3. Inequality in the distribution of incomes is a feature of capitalism, on account of property incomes, but not of socialism or communism.

4. Although there is still inequality in the distribution of incomes in modern communist countries, their ultimate ideal is for every man, woman, and child to have the same real income.

20. This report of changes taking place in many of the Soviet bloc countries supports the view of many Western economists that

1. even when a socialist economy relies on supply and demand to get most prices, the prices of staples must be centrally controlled to avoid inflation.

2. a freely-operating market system can perform efficiently the function of allocating scarce resources to satisfy competing wants under socialism as well as under capitalism.

3. socialism cannot work because it requires rigid central planning and unrealistic prices which cannot allocate resources efficiently.

4. a free enterprise system is essentially the same as socialism.

21. Which of the following taxes is most closely related to the "benefits received" principle?

1. Poll

2. Gasoline

3. Federal Income

4. Personal Property
Question 22 is based on the following quotation:

“If you live in a small city, get a good mechanical buy, pay cash, and don’t drive very much, a car bought for $500 will cost about $1,173 if kept for one year:

| Purchase price, including fees, taxes, etc. | $ 500 |
| Insurance | 175 |
| Gas and oil | 333 |
| Routine maintenance | 50 |
| License and registration | 15 |
| Depreciation | 100 |
| **Total** | **$1,173** |

22. Which of the following is the best appraisal of this estimate of the yearly cost of a $500 automobile?

1. If the dollar amounts shown for each item listed are correct, the total gives a correct estimate of the yearly cost.
2. There is only one error — omission of the interest that could have been obtained by lending the money actually spent on buying the car.
3. There is only one error — inclusion of the purchase price of the automobile.
4. There are two errors — inclusion of the purchase price and omission of the interest forgone by buying the car.

23. A firm’s present output position is: marginal-physical-product of factor A = 2; marginal-physical-product of factor B = 5; price of A = $1; price of B = $4; marginal revenue = $3. To reach a “best-profit” output the firm should employ

1. more of both A and B.
2. less of both A and B.
3. more of A, less of B.
4. more of B, less of A.

24. If a monopoly is attempting to maximize profits, which of the following, if any, should it attempt to do?

1. Maximize revenues
2. Maximize profit per unit
3. Select that output at which average total cost is at a minimum
4. None of the above would maximize profits

Questions 25 and 26 are based on the following editorial:

“Protectionists in Congress are trying to impose import quotas on a variety of commodities. Such action would be detrimental to our national interest. Trade is a two-way street. Unreasonable restrictions made on the sale of foreign goods in this country can only lead to similar unreasonable restrictions on the marketing of U.S. products abroad. One swift result would be an increase in the deficit of the nation’s payment balance abroad, and the inevitable weakening of the dollar.”

25. If there were no retaliation by other countries, what would be the direct effect, if any, of the proposed protectionist measures on the deficit in the American payment balance abroad, aside from indirect effects, for instance via changes in the rate of inflation (other things remaining the same)?

The protectionist measures would

1. reduce the deficit.
2. increase the deficit.
3. have no direct effect on the deficit.
4. either increase or reduce the deficit, depending on circumstances prevailing at the time.

26. Assume that adoption of the proposed protectionist measures by the U.S. would provoke retaliation by foreign countries. Is the editorial correct in concluding that the deficit of the nation’s payment balance abroad would increase? Why?

1. Yes. The retaliation would reduce American exports.
2. No. The deficit would in fact be reduced because the protectionist measures adopted by the U.S. would reduce American imports.
3. No. There would be no change in the deficit because the American measures would be offset by the retaliation.
4. The editorial may be correct or incorrect. The outcome is uncertain because the measures produce conflicting effects.
Question 27 is based on the following information:

To pay for services at Washington, D.C. airports, which are government-owned, the airlines are charged a fee each time one of their planes lands. The fees are different at Washington National Airport, where traffic is heavy, and at Dulles International Airport, where traffic is light. In each case the fee is set to cover the average cost of using the airport.

27. If the total cost of each airport is the same, how does the policy of charging different fees at the two airports compare with the alternative of charging a single fee set to cover the average cost of the two airports combined?

The actual fees make traffic
1. more congested at the heavily-used airport.
2. less congested at the heavily-used airport.
3. the same as with a uniform fee.
4. different, but the direction of change is unpredictable.

28. If prices rise in a perfectly competitive industry, the firms in that industry in the short run will

1. bid for more resources.
2. reduce marginal costs.
3. decrease production.
4. increase plant capacity.

29. Which of the following is the most accurate statement of the short-run effects on the U.S. balance of payments of requiring that countries receiving foreign aid use the money to purchase U.S. goods and services?

1. The drain on the U.S. balance of payments would be intensified because the demands for further aid would be increased proportionally.
2. The deficit in the U.S. balance of payments would decrease by the amount of the loan because it would increase U.S. exports without increasing U.S. imports.
3. The deficit in the balance of payments would not be materially affected since the outflow of capital is matched by equivalent exports of goods and services; however, the restriction means that the aided country will not be able to use the loan efficiently.
4. If the U.S. lends money abroad, and as a result of the loan, also sends goods and/or services to the aided country, the deficit in U.S. balance of payments is increased first by the amount of the loan, and second by the reduction in goods and services available to the American consumer.

30. If a firm under imperfect competition could find buyers for nine units at a price of $5.00 (no excess quantity demanded), and if the marginal revenue due to the tenth unit were $2.00, the highest price at which a firm could find buyers for ten units must be

1. $2.00.
2. $3.00.
3. $4.70.
4. $4.80.

Question 31 is based on the following information:

During the first year that the Salk vaccine for infantile paralysis became available, the quantity produced was too small to inoculate all those in susceptible age groups. Although the cost of production and the price were not particularly high, production could not be expanded rapidly enough to meet the demand. The government, therefore, intervened to regulate its distribution.

31. Which of the following was true of the price of the Salk vaccine during the first year it was available?

1. It was above equilibrium.
2. It was below equilibrium.
3. It was at equilibrium.
4. The relation to equilibrium cannot be determined from the information given.

32. If demand conditions are such that there is no output at which a firm can make any profit, which of the following would be the best short-run policy for the firm to adopt?

1. Shut down
2. Continue to operate so long as there is some output at which it can more than cover its fixed costs
3. Continue to operate so long as there is some output at which it can more than cover its variable costs
4. Discard the rule of equating marginal revenue and marginal cost

33. Country X does not have a national currency; the U.S. dollar is used in economic transactions in X rather than a different national monetary unit. If Country X's imports of goods and services exceed its exports for some period of time, how will this excess tend to affect interest rates and prices in the X economy, other things remaining the same?

1. Interest rates will tend to rise; prices will tend to fall.
2. Interest rates will tend to fall; prices will tend to rise.
3. Interest rates will tend to rise; prices will tend to rise.
4. Interest rates will tend to fall; prices will tend to fall.
TEST OF UNDERSTANDING IN
COLLEGE ECONOMICS—Part II

DIRECTIONS

On the separate answer sheet follow the instructions for entering your name and other requested information on the answer sheet. Use only a regular #2 or #2½ pencil. Do not use a ballpoint pen. Indicate on the answer sheet in the proper space that this is Test Form B, Part II.

Each question on this test has four choices for an answer. Read each question and decide which is the one best answer. On the answer sheet find the row which has the same number as the question you are answering. In that row blacken the circle under the number which is the same as the one in front of the answer you choose. Make sure that you darken the complete circle. If you make a mistake, erase completely the answer you wish to change.

Look at the example below:

99. In the U.S., control of the money supply is exercised by the
1. Federal Reserve System.
3. Department of Commerce.
4. Department of Agriculture.

Sample of Answer Sheet

99 1 2 3 4

Do not open this test booklet until you are told to do so.
Make no marks in this booklet.

Prepared by
The Committee for a College-Level Test of Economic Understanding
of the
Joint Council on Economic Education

Rendigs Fels, Chairman
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The test contained in this booklet has been designed for use with answer forms published or authorized by The Psychological Corporation. If other answer forms are used, The Psychological Corporation takes no responsibility for the meaningfulness of scores.

PUBLISHED BY THE PSYCHOLOGICAL CORPORATION, 304 EAST 45th STREET, NEW YORK, N.Y. 10017
1. When dealing with the economics of the business firm, the short run is defined as a period long enough to
   1. vary output but not plant capacity.
   2. vary output and plant capacity.
   3. gather cost data but not production data.
   4. gather cost data and production data.

Question 2 is based on the following information:

<table>
<thead>
<tr>
<th>Amount of X Consumers will purchase</th>
<th>Price Per Unit $5</th>
<th>Amount of X Producers will sell</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>$5</td>
<td>$4</td>
<td>$2</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>13</td>
</tr>
</tbody>
</table>

2. What will be the prevailing price for Product X in this market?
   1. $5
   2. $4
   3. $3
   4. $2

3. An increase in output cannot be accompanied by an increase in
   1. total cost.
   2. average fixed cost.
   3. average total cost.
   4. average variable cost.

4. "Numerous basic industries have been brought under government ownership with compensation for former owners." This statement is a distinguishing characteristic of the economy of which of the following countries?
   1. U.S.
   2. England
   3. Russia
   4. More than one of the above

5. The price system in a market economy reacts to a shortage of a commodity by
   1. raising the price and producer profits.
   2. lowering the price and producer profits.
   3. raising the price, but lowering producer profits.
   4. lowering the price, but increasing producer profits.

Question 6 is based on the following quotation:

"In private-enterprise economies, long-run prices must cover rent, interest, and labor cost of production plus a profit return to the enterprise owners. On the other hand, in completely socialized economies all natural resources and all capital goods are owned by the government, and all production takes place in government enterprises. Hence, in socialized economies labor costs are the only costs of production, and goods can be sold at lower prices than in private-enterprise economies. The lower prices of the socialized economies indicate that they are economically more efficient than private-enterprise economies."

6. Is the conclusion essentially correct or incorrect and why?
   1. Correct. The lower prices found in socialized economies indicate that the real incomes of households are larger than in private-enterprise economies. Therefore, the socialized economies are more efficient.
   2. Incorrect. The relative efficiency of different forms of economic organization depends on the allocation of all scarce resources — not on the prices assigned to resources.
   3. Correct. The lower prices found in socialized economies indicate that the real cost of production in socialized economies is less than in private-enterprise economies and that socialized economies are more efficient.
   4. Incorrect. The higher prices which are found in private-enterprise economies indicate that their output is more valuable than that of socialized economies. Therefore, private-enterprise economies are more efficient than socialized economies.

7. The U.S. produces wheat with relatively little labor but with relatively large amounts of land. European countries produce wheat with relatively large amounts of labor and relatively small amounts of land. Which of the following best explains this difference?
   1. In absolute terms, European labor is very cheap.
   2. European labor is relatively less efficient than U.S. labor.
   3. The relative prices of land and labor in the two regions are different.
   4. The comparative advantage of European countries in the production of wheat is very low.
Questions 8 and 9 are based on the following information:
Smog in the Central City area is largely caused by automobile exhaust fumes. The smog problem could be virtually eliminated if approximately 100 air-purification plants were built in the area. These plants would simply draw in smog-filled air, remove the smog, and pump the clean air back into the Central City atmosphere. It is estimated that the cost of operating each plant would be $10,000 per year.

8. It is highly unlikely that private business firms would build and operate the plants and sell their services directly to individual residents of the Central City area because
1. the cost of operating the plants would be too great.
2. people are unlikely to be willing to pay for smog-free air.
3. it would be less costly for the government to build and operate the plants than for private business firms to do so.
4. it would probably be impossible to provide smog-free air to those who are willing to pay for it while withholding it from those who refuse to pay.

9. Suppose that the government of Central City were to build and operate the air-purification plants. From the standpoint of achieving efficiency in the allocation of economic resources, which of the following taxes should be increased to provide the additional tax revenues needed to finance the operation of the air-purification plants?
1. Motor vehicle fuel
2. General sales
3. Property
4. Income

10. If an imperfectly competitive firm is presently producing at a point where average revenue exceeds marginal cost, which of the following policies should management adopt in order to maximize profit?
1. Expand output and lower price
2. Contract output and raise price
3. Contract output and leave price unchanged
4. Not necessarily do any of the above, since it already may be maximizing its profit

Question 11 is based on the following quotation:
"Multilateral tariff reductions benefit the economies of foreign countries at the expense of American workers and their employers."

11. Is this quotation essentially correct or incorrect and why?
1. Correct, since tariff reductions on imports will hurt American producers and benefit the economies of foreign exporting countries
2. Incorrect, because no American industry can be hurt by a tariff reduction
3. Incorrect, because the "economies of foreign countries" would not benefit from negotiating reductions in their tariffs
4. Incorrect, because it ignores the fact that "American workers and their employers" includes producers in industries which would benefit from increased exports

12. In "tight" housing markets, rent controls are often applied to hold the price of housing to a "reasonable" level. How does this policy affect the relative gains of tenants and landlords, and the allocative function of prices?
1. It prevents tenants from gaining at the expense of landlords; the allocative function of prices is impaired.
2. It prevents tenants from gaining at the expense of landlords; the allocative function of prices is not impaired.
3. It prevents landlords from gaining at the expense of tenants; the allocative function of prices is impaired.
4. It prevents landlords from gaining at the expense of tenants; the allocative function of prices is not impaired.

13. The most important economic function of rental payments for the use of land is to
1. assure owners of land some return for its use.
2. influence how land will be used.
3. assure an adequate supply of land in the society as a whole.
4. equalize the distribution of factor payments.
Questions 14, 15, and 16 are based on the following news report:

“A federal grant will be sought by New York City to test a plan for providing a discount fare on the city’s rapid transit lines for persons 65 years of age or older. The discount fare would enable the city’s aged to ride buses in off-peak hours for 10 cents instead of 25 cents. Detroit’s experience with such a fare shows that it not only reduces costs for older persons and leads to more use of facilities, but it also changes travel habits on buses and subways, reducing loads during rush hours and taking some cars off crowded city streets. It could become a precedent for discounts for older people in other fields such as cut-rate baseball or movie tickets. ‘There’s no reason why there should be vacant seats in Shea or Yankee Stadium if older people could get in at discount rates on slow days,’ a New York City official said.”

14. How would lower rapid transit fares at off-peak hours and lower prices for stadium seats on slack days change the real income of older persons who use these facilities?
1. Real income would rise.
2. Real income would fall.
3. Real income would remain the same.
4. Real income cannot be determined from the information given.

15. What does the news report imply about the relation between short-run incremental (i.e. marginal) cost and average cost for stadium seats on slow days?
Short-run incremental cost on slow days is
1. higher than average cost.
2. the same as average cost.
3. lower than average cost.
4. indeterminate.

16. To the extent that reduced prices for older persons at slack times reduces the number of vacant stadium seats, what would be the effect on real GNP (i.e., total output of goods and services in the nation)? Assume that other things, including costs of operating the stadium and demand for other goods and services, remain the same.
1. It would increase.
2. It would decline.
3. It would remain the same.
4. It may change in either direction, depending on information not given.

17. A state representative recently introduced a bill in the state legislature to increase the tax on beer sold within the state from $.30 to $.60 per gallon. His statement on the effect of the tax increase would be correct only if it could be shown that
1. the quantity of beer purchased within the state is highly responsive to changes in its price.
2. people with small incomes tend to buy more beer each year than people with larger incomes.
3. people with large incomes tend to buy more beer each year than people with smaller incomes.
4. people with large incomes tend to spend a larger proportion of their incomes on beer each year than people with smaller incomes.

18. Which of the following is true if marginal cost is above average total cost as output rises?
1. Average total cost must be falling.
2. Average fixed cost must be rising.
3. Average variable cost must be falling.
4. Average total cost must be rising.

Question 19 is based on the following quotation:

“In its taxation policy the Soviet government emphasizes sales taxes rather than income taxes as a main source of revenue. In its wage policy the trend has been to increase the spread between the incomes of different groups of workers.”

19. The two policies might be designed to produce the economic effects of
1. acquiring funds to run the large government sector of the economy without interfering with resource allocation.
2. promoting income inequality through both tax and wage policies to encourage high levels of consumption and saving.
3. rationing scarce consumer goods and inducing high output levels through monetary wage incentives.
4. inducing high output levels through monetary incentives and correcting resulting income inequalities through tax policies bearing evenly on all.
20. In a perfectly competitive economy, which of the following is not necessary for economic efficiency?

1. Consumers are free to spend their incomes as they wish.
2. The capital stock is increasing through investment.
3. Output of each product is at the point where price equals marginal cost.
4. Each producing unit is using the method of production which yields the least cost.

Question 21 is based on the following quotation:
"If at the initial price there is excess demand, the price will rise. The price increase has two effects: it tends to shift the demand curve down because people are willing to buy a smaller quantity at a higher price; and, it tends to shift the supply curve up because producers find it profitable to produce a greater output at a higher price. The price will adjust until there is no excess demand."

21. Which of the following is true of the quotation?

1. The analysis in the quotation is correct.
2. The quotation confuses shifts in curves with movements along the curves.
3. The quotation would be correct if "excess supply" were substituted for "excess demand."
4. The quotation is free of logical error, but does not describe the way prices behave in actual, competitive markets.

22. "Since 1929 agricultural output has increased only about 50 per cent. But, output per man-hour has skyrocketed 300 per cent." The most likely effect of the sum of these changes has been to

1. increase the demand schedule (curve) for farm labor.
2. increase the quantity demanded of farm labor, but not the demand schedule (curve).
3. lower the demand schedule (curve) for farm labor.
4. lower the quantity demanded of farm labor, but not the demand schedule (curve).

23. An economic organization is said to have a solvency problem if its total liabilities (excluding net worth) approach its total assets, and a liquidity problem if its short-term liabilities approach its short-term assets. Applying these definitions to the international balance of payments, the U.S. in the 1960's has been concerned with

1. neither a solvency problem nor a liquidity problem.
2. both a solvency problem and a liquidity problem.
3. a solvency problem but not a liquidity problem.
4. a liquidity problem but not a solvency problem.

24. If a firm finds that its marginal revenue exceeds its marginal cost, the maximum-profit rules require the firm to

1. increase its output in perfect, but not necessarily in imperfect, competition.
2. increase its output in imperfect, but not necessarily in perfect, competition.
3. increase its output in both perfect and imperfect competition.
4. decrease its output in both perfect and imperfect competition.

25. Which of the following is a valid argument supporting an increase in the world's supply of international monetary reserves by creating a new international currency ("paper gold")?

1. The demand for gold and reserve currencies is growing faster than the supply.
2. An increase in the dollar price of gold would not add to the world's monetary reserves but would only help gold-producing countries.
3. Large deficits in the U.S. balance of payments with key countries are likely to continue for some time and have been draining the world of its supply of international monetary reserves.
4. International agencies such as the World Bank and the International Monetary Fund hold large amounts of gold and convertible currencies and thus have reduced the available quantity of international reserves.

26. Assume that the country that produces 50% of the world's coffee limits its coffee exports in order to increase its income from sales abroad. Which of the following would be most likely to contribute to the success of the policy?

1. Elastic demand by coffee importers; inelastic supply by other coffee producers
2. Inelastic demand by coffee importers; inelastic supply by other coffee producers
3. Elastic demand by coffee importers; elastic supply by other coffee producers
4. Inelastic demand by coffee importers; elastic supply by other coffee producers
27. Two countries, X and Y, can produce only peanuts and chocolate bars, under constant costs according to the following schedule. What will be the result of free trade policies between the two countries (assuming no transportation costs)?

<table>
<thead>
<tr>
<th>Unit of Product</th>
<th>Costs in Labor Time per unit of product</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Country X</td>
</tr>
<tr>
<td>1 lb. peanuts</td>
<td>1 hour</td>
</tr>
<tr>
<td>1 doz. chocolate bars</td>
<td>3 hours</td>
</tr>
</tbody>
</table>

1. No trade will take place since X can produce both peanuts and chocolate bars more inexpensively than Y.
2. Country X will export chocolate bars and peanuts to Y.
3. Country X will export chocolate bars and import peanuts from Y.
4. Country X will export peanuts and import chocolate bars from Y.

28. How does the presence of a monopoly in an otherwise competitive full-employment economy tend to affect output of monopoly and competitive products?

1. The output of the monopoly products is too large and the output of the competitive products is too small.
2. The output of the monopoly products is too small and the output of the competitive products is too large.
3. The output of both is too small.
4. The output of both is too large.

29. These figures show that the country had a(n)

1. favorable balance of trade but a deficit in the balance of payments.
2. unfavorable balance of trade and a surplus in the balance of payments.
3. favorable balance of trade and a surplus in the balance of payments.
4. unfavorable balance of trade and a deficit in the balance of payments.

30. “I’m losing money, but with my investment in equipment I can’t afford to shut down at this time.” If this entrepreneur is attempting to maximize profits, his behavior is

1. rational if the firm is covering its variable costs.
2. rational if the firm is covering its fixed costs.
3. irrational since plant closing is necessary to eliminate losses.
4. irrational since fixed costs are eliminated if a firm shuts down.

31. Which of the following is a principle generally accepted by laissez-faire economists which evidently is also regarded as valid by the Russian Communists?

1. The measure of the value of a commodity is the labor expended upon it.
2. Scarce abilities should be given a higher monetary reward than less scarce abilities.
3. Rent and interest represent an unearned reward for private owners of land and capital.
4. The pursuit of individual economic self-interest should not be the chief motivating force in the economy.

32. Consider an income tax system in which the first $9,000 of annual wage income is exempted and the remainder is taxed at a 90% rate. Smith, who commands a wage rate of $5 per hour, chooses to work 2,000 hours per year. If the exemption were decreased to $1,000 and the rate on income over $1,000 were decreased to 10%, Smith would

1. be no better off and work no fewer than 2000 hours.
2. be no better off and work no more than 2000 hours.
3. be no worse off and work no fewer than 2000 hours.
4. be no worse off and work no more than 2000 hours.

33. In a free-enterprise economy, the presumed harmony between individual and public interest depends upon

1. a strong desire for profit maximization.
2. careful planning and coordination of economic activity.
3. the exercise of social responsibility by private businessmen.
4. competitive markets and pursuit of self-interest by individuals.
Student Preferences for Informational Delivery Systems

Name __________________________________________

Social Security Number ___________________________

Home Mailing Address __________________________________________

________________________________________

School or College Enrolled in at NTSU ___________________________

You participated in four different activities in the lab sessions for this course. Please use these code numbers to answer two questions:

- Games and simulations 1
- Closed-circuit television 2
- Programmed text 3
- Lecture and discussion 4

1. Please rank the four different activities in order of preference (what you enjoyed most).

   First _______
   Second _______
   Third _______
   Fourth _______

2. Please indicate which one of the four you think was most effective in preparing you for your examinations.

   (please use code number as given above) _______
GAME: THE COMMUNITY

Materials:

1. "The Community" to be distributed to each student
2. Worksheets I, II, III, and IV to be given each student

Activities:

1. Pre-game activities 6:30-7:00

   a. Introductory comments

      (1) Function and limitations of games

         (a) The game is to be a learning experience.
         (b) The game is intended to acquaint the students with
             the public sector of the economy.
         (c) Discuss the concepts of the game.

         (11) There are various kinds of taxes, including:
              personal income tax, corporate income (profits)
              tax, sales tax, and property tax. It would
              help to have a discussion on the use of these
              taxes by the three levels of government--federal,
              state, and local. In this game the economic
              forces influencing local government are drama-
              tized; however, the students should understand
              that local taxes are usually not the most impor-
              tant ones to individuals or businesses.

         (22) People disagree about the amount of taxes that
              should be paid, who should pay them, and how they
              should be collected. They also disagree about
              whether government or private business should
              render certain services. The costs of government
              are high, and most people do not enjoy paying
              taxes. Equitable tax policies do much to reconcile
              the taxpayer to the fact that services cost
              money. In the United States, the following
              principles regulating taxes have become accepted.
              They state that taxes should be related to:

              (aa) Ability to pay. People with greater
                   wealth or greater income, or both, should
                   pay more taxes than those with less wealth
                   or income.
(bb) Benefits received. Those who receive most of the benefit of a government service should bear more than the average share of its cost.

(cc) Equal treatment for those equally or similarly situated. An important consideration in fair treatment should be relative to social and economic positions, involving such factors as family size, health needs, and age.

Tax policies in the United States adhere to at least one of these principles, but not rigidly. For example, taxing on the basis of benefits received would not be a useful way to support a public welfare program.

(33) Expenditures on the local level are made primarily for fire and police departments, schools, and local administration. The states use a large proportion of their revenues for aid to municipalities, for higher education, and for state highways. Federal taxes are used mostly for national defense, nation-wide programs related to such activities as conservation, grants to states for education, welfare, cultural development, and urban redevelopment.

(2) Assumptions of the game

(a) The community has only three industries and no other stores or businesses. It might be helpful to point out that industries does not necessarily mean "manufacturers."

(b) Wages and profits are rigidly tied to each other in an uncomplicated relationship. Wages and profits rise together as long as both labor and management exercise restraint. This is a realistic assumption, since productivity improvements are usually distributed between labor and entrepreneurs. Also, if an industry is managed prudently, its productivity will improve year after year. Without sufficient productivity, profits will decrease if wage levels rise.

(c) Federal and state taxes together equal exactly 50 percent of the net income of businesses, that is, income after local taxes have been paid.
(1) A government can tax its citizens in many different ways. It can collect a percentage of income, a percentage of retail sales, a fixed fee for certain activities (car license, hunting license), a proportion of the value of real estate, and so on. In the United States, the local, state, and federal governments have traditionally relied on different forms of taxes. Generally speaking, the local governments collect real estate and personal property taxes. The states receive the largest share of their revenue from sales and income taxes. Most of the federal income is from corporate and personal income taxes.

(2) Government decisions, especially on the state and local levels are usually made by the people who must also raise the money needed to make their programs a reality.

(3) The government spends money for those goods and services that most individuals cannot provide for themselves or that would not be profitable for businesses to produce. These goods and services are called the public sector of the economy. In the private sector of the economy, the people as consumers decide for themselves how to spend their income. People as individuals, then, either spend their money on private consumption (including their personal savings) or pay it in taxes.

(4) The money that the government receives through taxes diminishes people's income. In this way, part of people's income is spent in the public sector for government services and not on consumer goods and services. We have seen, however, that each individual needs government services. Thus, everyone receives at least some benefits from taxes.

(5) Members of society can express their opinions on how their tax money is being spent. When they vote for officials or for budgets and special bond issues, they voice approval or disapproval of a certain fiscal policy. (Bond issues affect future spending through interest charges.) In elections each citizen has one vote regardless of the level of his income. This is different from the market, where each dollar has one vote, and people with a larger income have a greater voice.

(6) When people are unemployed, they contribute nothing to society's wealth. Since much unemployment is the result of technological improvement, which benefits all of society, many people reason that society should be largely responsible for helping the unemployed reestablish themselves as productive members of society. Such an argument is partly motivated by self-interest, since unemployment decreases the goods and services available to society.
(d) In spite of efforts to reduce the cost of regular municipal services, it rises regularly, regardless of changes in business conditions. The game assumes further, however, that the cost of maintenance of new services does not increase with time.

(e) A business will discontinue operations as soon as its return on investment falls below a specified figure. The game also assumes that the same business will open just as promptly when it anticipates an adequate return. In other words, after adjustments of tax rates and wage rates, the industry tries again in the next round to make adequate return. If it fails, it closes again. When an industry reopens, there is no change in previous relations with customers and employees—that is, they will be able to pick up work and buy as if nothing happened.

(f) Businesses stop paying taxes as soon as they shut down, and they do not pay the taxes for the shutdown period when they reopen. The community loses that source of revenue for the period.

(Put on blackboard before class)

(3) Explain scoresheet.

(Put on blackboard before class)

b. Activities

(1) Divide the students into 3 groups of 4 each
(2) Distribute "The Community" and the Worksheets. Have students read pages 1-4.
(3) Play the sample game. Have the students underline and number the steps.

2. Game 7:00-9:00

a. Announce business conditions at beginning of each year.
b. Team decides on wage level and tax rate.
c. Students proceed with game.
d. At end of year, post scores of each team.

3. Post-game activities

a. Determine the winner.
b. Have a concluding discussion including the following topics:
A government can tax its citizens in many different ways. It can collect a percentage of income, a percentage of retail sales, a fixed fee for certain activities (can license, hunting licence), a proportion of the value of real estate, and so on. In the United States the local, state, and federal governments have traditionally relied on different forms of taxes. Generally speaking, the local governments collect real estate and personal property taxes. The states receive the largest share of their revenue from sales and income taxes. Most of the federal income is from corporate and personal income taxes.

Government decisions, especially on the state and local levels, are usually made by the people who must also raise the money needed to make their programs a reality.

The government spends money for those goods and services that most individuals cannot provide for themselves or that would not be profitable for businesses to produce. These goods and services are called the public sector of the economy. In the private sector of the economy, the people as consumers decide for themselves how to spend their income. People as individuals, then, either spend their money on private consumption (including their personal savings) or pay it in taxes.

The money that the government receives through taxes diminishes people's income. In this way, part of people's income is spent in the public sector for government services and not on consumer goods and services. We have seen, however, that each individual needs governmental services. Thus everyone receives at least some benefits from taxes.

Members of society can express their opinions on how their tax money is being spent. When they vote for officials or for budgets and special bond issues, they voice approval or disapproval of a certain fiscal policy. (Bond issues affect future spending through interest changes.) In elections each citizen has one vote regardless of the level of his income.
This is different from the market, where each dollar has one vote, and people with a larger income have a greater voice.

(6) When people are unemployed, they contribute nothing to society's wealth. Since much unemployment is the result of technological improvement which benefits all of society, many people reason that society should be largely responsible for helping the unemployed reestablish themselves as productive members of society. Such an argument is partly motivated by self-interest, since unemployment decreases the goods and services available to society.

Those who support the opposite view—that society is not responsible for the unemployed—argue that a free society has many jobs available. The unemployed could have these jobs if they were willing to retrain themselves, to move to new locations, or to accept lower-paying positions.
CLOSED-CIRCUIT TELEVISION

April, 18, 1973

1. Distribute "Instructions for Group I for Lab on April 25" to students before class.

2. Meet with Group I after class to discuss the instructions for the lab, to answer any questions and to provide time for the sub-groups to meet.

Prior to April 25, 1973

1. Insure that all necessary equipment is available and will be set up before 6:30 on April 25.

2. Review or learn how to operate the equipment.

Tentative Schedule for April 25, 1973

6:15-6:30  Set up equipment
6:30-7:40  Tape groups A, B, and C
7:40-8:00  Break. Set up the equipment for "playing"
8:00-9:15  Play the video-tape. The tape should be stopped to allow for corrections, additions, and questions.
9:15-9:30  Have students complete the evaluations.
Instructions for Group I for Lab on April 25

I. Chapters

7--The Role of Government in the Economy
34--The Economics of Pollution
37--The Economics of Poverty and Discrimination
38--The Economics of Urban Problems
39--The Agricultural Problem

II. Group Assignments

<table>
<thead>
<tr>
<th>Group</th>
<th>Members</th>
<th>Chapters</th>
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<tbody>
<tr>
<td>A</td>
<td>Corbin Anderson</td>
<td>7, 37, 38</td>
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<tr>
<td></td>
<td>Gene Diamond</td>
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<td></td>
<td>Richard Egan</td>
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<td>Mark Simpson</td>
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<td></td>
<td>Randy Brown</td>
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<td>B</td>
<td>John Canavan</td>
<td>7 &amp; 39</td>
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<tr>
<td></td>
<td>Arlethin Dupree</td>
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<td></td>
<td>Mike Pitman</td>
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<td></td>
<td>Earl Wellborn</td>
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<tr>
<td>C</td>
<td>Glen Edwards</td>
<td>7 &amp; 34</td>
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</tbody>
</table>

III. Lab Activity: Closed-circuit television

Each group will present a lesson of approximately 20 minutes on the assigned chapters. The presentations will be taped and then played for the class to discuss. Keep in mind that the lessons should be both informative and entertaining.

IV. Suggestions for Preparing the Lesson

A. Possible formats
   1. panel discussion
   2. question and answer
   3. role playing: interviewing "experts"

B. Resources
   1. charts and posters
   2. blackboard
   3. newspaper articles

C. Content
   1. do not read from the text
   2. find current examples and/or issues not considered in the book
PROGRAMMED LEARNING

Materials:
2. Pencils
3. Index cards to cover responses

Activities:
1. Distribute pencils and index cards
2. Discuss procedures for using the programmed materials
   a. Keep responses covered
   b. Commit yourself to an answer by writing it
   c. Start with the first frame and work through the section
   d. Do not skip frames
   e. If you make a mistake,
      (1) Look at the question to see if you misread it or made a careless mistake. If you understand the correct answer, proceed to the next question.
      (2) If you didn't misread the question or make a careless mistake, go back several frames and review them.
      (3) If the review does not clarify the concept, ask for help.
   f. Work at your own speed
   g. If you are beginning to make several mistakes, you are probably going too fast or you need to take a break. Feel free to stop for a few minutes.

3. Assignment: Section 1, pp. 1-33
LECTURE AND DISCUSSION
Outline of Points to be Covered
Chapter 26

I. Elasticity of demand
   A. Definition
   B. Calculating elasticity of demand
   C. Elasticity of demand for a given product is not the same at every point on the demand curve
   D. Determinants of elasticity
      1. Availability of substitutes
      2. Number of uses of the product
      3. Degree of necessity of the good
      4. Cost of the good relative to income
   E. Elasticity and total revenue

II. Theories of consumer demand
   A. Demand and utility
      1. Total utility
      2. Marginal utility
         a. The consumer will continue purchasing a good until the utility of an additional unit equals product price
         b. The consumer's surplus
   B. Condition for maximizing utility \( \frac{\text{MU}}{P} = \frac{\text{MU}}{P} = \frac{\text{MU}}{P} \)
   C. Are there exceptions to the law of demand?
      1. The substitution effect
      2. The income effect
      3. Apparent exceptions to the law of demand
         a. Giffen (inferior) goods
         b. "Snob goods"

III. Government action and consumer demand
   A. The effects of sales taxes
      1. If demand is inelastic
      2. If demand is elastic
B. Government regulation of prices
   1. Price ceilings
   2. Rationing
   3. Short-term and long-term effects

Chapter 27

I. Defining costs: some important considerations
   A. Explicit and implicit costs
   B. Fixed and variable inputs
   C. Short run and long run

II. Product curves
   A. Total product curve
   B. Marginal product curve
   C. Average product curve

III. Short-run cost curves
   A. Total cost curves--\( TC = TFC + TVC \)
   B. Marginal cost curve--\( MC = \frac{\text{change in } TC}{\text{change in output}} \)
   C. Average cost curves--\( AC = \frac{\text{total cost}}{\text{total product}} \)
   D. Average cost and marginal cost

IV. Long-run costs
   A. Short-run average total costs (SATC) curves for different sizes of plant
   B. Shape of the long-run cost curve due to the initial economies of scale and eventual diseconomies of scale as production capacity continues to expand

Chapter 28

I. The Characteristics of perfect competition
   A. Basic functions of the market
   B. Assumptions of the perfect competition model
      1. There are many demanders and many suppliers in the market
      2. No single buyer or seller is able to influence the market price of the good
      3. The good being traded is a standardized, uniform product
4. All buyers and sellers have perfect knowledge of the market
5. All input resources are perfectly mobile and adaptable

II. The competitive firm in the short run

A. Price in the perfectly competitive market
   1. The market price is the equilibrium point of the market demand and supply curves
   2. The demand curve facing an individual firm is perfectly elastic—a straight, horizontal line

B. Maximizing short-run profits
   1. Comparing total cost and total revenues for each level of output
   2. Comparing marginal cost and marginal revenue for various levels of output

C. The firm’s short-run supply curve
   1. The firm will elect to produce at the point for which MC = MR
   2. The firm’s supply curve is its MC curve above the AVC curve

D. Minimizing short-run losses
   1. Operating at a loss
   2. The shutdown point

III. Short-run equilibrium: the firm and the industry

A. In the short run, the firm will produce at the quantity of output for which MC = MR
B. In the short run, there are only movements along the supply curve to a higher or lower level of output

IV. Long-run equilibrium: the firm and the industry

A. If firms are making excess profits, they can increase total profits by expanding plant capacity
B. In the case of losses, firms will cut back production or leave the industry

V. Long-run industry supply curve

A. Constant cost industry
B. Increasing costs industries

VI. Evaluating the competitive price system

A. The competitive firm reaches long-run equilibrium when MR = MC = ATC = LRATC
B. Benefits of the competitive price system
VII. Problems of the competitive price system

A. New products or methods or methods of production
B. Social costs resulting from the production process

Chapter 29

I. Imperfect competition

A. Monopoly
B. Monopsony

II. Characteristics of the monopoly market

A. The supply curve
B. A complete monopoly can exist only when there is no near substitute for the product being sold
C. Barriers to entry
   1. High setup costs
   2. Indivisibility
   3. Ownership of essential materials
   4. Legal restraints

III. The monopolist's decisions about price and production

A. Demand in the monopoly model
B. Marginal costs and marginal revenue
   1. The point of profit maximization is the point at which MC = MR
   2. The marginal revenue curve for a monopoly is below the demand curve
C. Market equilibrium--short and long run

IV. Economic costs of monopoly

V. Regulation of the monopoly market

A. Preventing monopolistic market
   1. Reducing barriers
   2. Laws to prevent intentional monopolizing
   3. More recently, there has been a change in emphasis to measures that are aimed at the market structure
B. Regulating monopoly prices and output
   1. Typically, the government will try to regulate the price to eliminate the monopolist's excess profits. The point is set where demand intersects with ATC.
2. The only way to achieve optimum allocation in this case is to subsidize the firm so it can produce at the point where \( MC = P \)

Chapter 30

I. Oligopoly

A. The oligopoly model assumes "few" suppliers
B. Products can be either uniform or differentiated
C. Formation of an oligopolistic market
D. Price and output decisions in an oligopoly market

1. Noncollusive oligopoly
2. Oligopoly and collusion

II. Monopolistic competition

A. Monopolistic competition: many firms selling a differentiated product
B. Price and output decisions in a monopolistically competitive market

1. Point of profit maximization is where \( MC = MR \)
2. Long-run equilibrium

III. The role of product differentiation in imperfect competition

A. Monopoly: no near substitutes
B. Perfect competition: perfect substitutes are available
C. Nonprice competition designed to make demand more inelastic
D. Product development
E. Advertising

IV. Resource allocation under imperfect competition
APPENDIX C
The text used by the regular full-time professor in this course was *Economics* by Lewis C. Solmon. It was published by Appleton Century Crofts of New York in 1972. The syllabus for the course included the following chapters:

- **Concept 1**  Chapters 1, 2, 3, 4
- **Concept 2**  Chapters 26, 27, 28, 29, 30
- **Concept 3**  Chapters 31, 32, 33, 35, 36
- **Concept 4**  Chapters 7, 34, 37, 38, 39
APPENDIX D
The programmed text used in this research was *Economic Concepts: A Programmed Approach* by Robert C. Bingham. It was published by McGraw-Hill Book Company of New York in 1972. The following is a list of the material used in this study:

<table>
<thead>
<tr>
<th>Concept</th>
<th>Topic/Topics</th>
<th>Pages</th>
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<tbody>
<tr>
<td>Concept 1</td>
<td>Demand and supply</td>
<td>pp. 1-33</td>
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<tr>
<td>Concept 2</td>
<td>Elasticity and marginal revenue</td>
<td>pp. 33-57</td>
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<td>The costs of production</td>
<td>pp. 175-202</td>
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<td>Product prices and output</td>
<td>pp. 203-232</td>
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<td>Concept 3</td>
<td>The prices and employment of resources</td>
<td>pp. 233-264</td>
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<td>The prices and employment of resources</td>
<td>pp. 233-264</td>
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APPENDIX E
GAMES AND SIMULATIONS--CONCEPT CORRELATION

Concept 1

Competitive markets (including supply and demand, elasticity, and agriculture)

Game Source

ECONOMIC SYSTEM
Western Publishing Company, Inc.
School and Library Department
850 Third Avenue
New York, New York 10022

Subject

Competitive economic system

"Economic System is based on the interrelationship of a competitive economic system. Mine owners, manufacturers, workers, and farmers produce, market and consume goods while trying to make a profit and maintain a high standard of living. The game attempts to provide a graphic illustration of concepts relating to the operation of economic systems, including the dependence of each part of the system on the activities of other parts; ways in which group demands can cause the individual to modify his behavior; and how players can use their power to see to it that their own interests play a role in any group demands and collective goals that may be formulated. Players can also learn about the problems of international trade, the problems of taxation and the provision of public goods."1

Concept 2

Theory of the firm, markets, and anti-monopoly policy

Game Source

FIRM
Science Research Associates
165 University Avenue
Palo Alto, California 94031

Subject

Business management

"The purpose of this exercise is to teach the economic principles of running a firm, and the fundamental relationships between assets, liabilities,
revenue, cost, profits, and net worth. Teams represent store owners and players represent the president, operation manager, buyer, controller, assistant controller and public accountant. They must decide at what price to sell merchandise, whether to take on additional loans, and what to do with profits."

Concept 3
Factor markets and income distribution

Game Source
COMMUNITY
Science Research Associates
165 University Avenue
Palo Alto, California 94031

Subject
Economics, community affairs

"Through the use of a model, this game helps students become aware of some of the economic principles and problems involved in running a community, relationships between wages and profits generated by local industry, and the tax-expenditure problems of local government. The objective of the game is to create the most attractive, progressive community possible. Players measure success by the number of improvements in the community, by wage rates, and by the prosperity of local industry. The game is intended to acquaint students with the public sector of the economy and illustrate the basic problems of selecting and financing public services."

Concept 4
Government and the allocation of resources

Game Source
ECOLOGY
Urban Systems, Inc.
1033 Massachusetts Avenue
Cambridge, Massachusetts 02138

Subject
Ecology

"This game allows players to begin the world over again. They must guide the human population through four stages of mankind's development:
Hunting, Agriculture, Industrial, and Environmental. Each player must attempt to bring his population, his technology and his natural environment into a workable balance."4

Game Source  
SMOG  
Urban Systems, Inc.  
1033 Massachusetts Avenue  
Cambridge, Massachusetts 02138

Subject  
Air pollution

"In this game, each player assumes the role of an elected official in his town who is responsible for managing the quality of air. He confronts the problems of air pollution control as he moves along a 'Decision Tree' making decisions which affect his financial status, popularity and the growth of the town as well as the air quality. An element of chance is also included. A player wins the game by accumulating a certain number of 'Management Credits' which are gained by his successful management of families and industries, money and votes, and the air quality of his town. The purpose of the game is to teach the problems of air pollution, city management, and the intricacies of the decision-making process."5

2 Ibid., p. 44.
3 Ibid., p. 39.
4 Ibid., p. 42.
5 Ibid., p. 55.
CLOSED-CIRCUIT TELEVISION--CONCEPT CORRELATION

Group Assignments

Concept 1
The concept of demand
The concept of supply
How price system answers production questions
Assumptions of a competitive market economy
Explanation of the circular flow

Concept 2
Monopoly
Oligopoly
Monopolistic competition
Perfect competition
Elasticity

Concept 3
The economic effects of unions
Labor unions in the United States: past and present
Big business in the American economy
Demand in the factor market
Supply in the factor market

Concept 4
The role of government in the economy
The economics of pollution
The economics of poverty and discrimination
The economics of urban problems
The agricultural problem
STANDARD LECTURE AND DISCUSSION--CONCEPT CORRELATION

Specific points to be included with each concept (for an example of the complete outline used, see the representative lesson plan on lecture and discussion in Appendix B)

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<td>The fundamentals of economic study</td>
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<td>Unlimited desires as a postulate of economics</td>
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<td>Spending household revenue</td>
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<td>Trends in households that affect economic behavior</td>
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<td>Economic implications of decisions made in households</td>
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<td>What is a business enterprise</td>
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<td>The organization of business firms</td>
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Characteristics of the monopoly market
The monopolist's decisions about price and production
Economic costs of monopoly
Regulation of the monopoly market
Oligopoly
Monopolistic competition
The role of product differentiation in imperfect competition
Resource allocation under imperfect competition

Concept 3
Derived demand
Marginal revenue product
Marginal physical product
Economic rent
Backward bending supply curve of labor
Vertical integration
Horizontal integration
Escalator
Yellow-dog contract
Sherman Anti-trust Act
Equation which defines an optimum resource mix condition
Partial equilibrium analysis
General equilibrium analysis

Concept 4
The role of government in the classical model
Ways government has intervened in the economy
Degree of government intervention
Major sources of government revenue
Major government expenditures
Why has government intervened
The problem of pollution
The problem of poverty and discrimination
The urban problem
The agriculture problem
The assumptions of classical economics
The solutions of classical economics
Comparison of assumptions with reality
Opportunity costs associated with not solving social problems
Price to society
Proposed solutions
Possible roles for government
Factors that must be included in workable solutions
APPENDIX H
POSTTESTS--CONCEPT CORRELATION

(Questions taken from Form A and B of TUCE, Part II)

<table>
<thead>
<tr>
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<th>Form A</th>
<th>Form B</th>
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<td>Concept 4</td>
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<td>8, 9, 17, 32</td>
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BIBLIOGRAPHY

Books


**Articles**


**Reports**


Publications of Learned Organizations


Encyclopedia Articles


Unpublished Materials


Tests


Interviews

Hartley, H. O., Director of Statistics Institute, Texas A & M University, College Station, Texas, Interview, April 6, 1973.