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# Effects of computer-assisted instruction in macroeconomics education: An experimental course design

Haley, Mary Lewis Purnell, D.A.

Middle Tennessee State University, 1991

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EFFECTS OF COMPUTER-ASSISTED INSTRUCTION

IN MACROECONOMICS EDUCATION:  AN

EXPERIMENTAL COURSE DESIGN


Mary Lewis Purnell Haley


A dissertation submitted to the
Graduate Faculty of Middle Tennessee State University
in partial fulfillment of the requirements
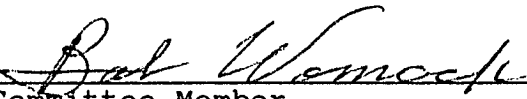for the degree Doctor of Arts

May, 1991

# EFFECTS OF COMPUTER-ASSISTED INSTRUCTION

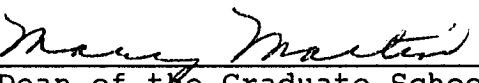## IN MACROECONOMICS EDUCATION:  AN

## EXPERIMENTAL COURSE DESIGN

APPROVED:

Graduate Committee:

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Major Professor

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Committee Member

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Dean of the Graduate School

ABSTRACT

EFFECTS OF COMPUTER-ASSISTED INSTRUCTION

IN MACROECONOMICS EDUCATION:  AN

EXPERIMENTAL COURSE DESIGN

Mary Lewis Purnell Haley

The primary purpose of this study was to determine the effectiveness of using computer-assisted tutorials and examinations as supplements to the basic lecture and discussion course in macroeconomics.  Secondary considerations included college grade point averages, scores on the American College Test, and sex as possible determinants of student learning.

The research study was conducted at Cumberland University, Lebanon, Tennessee during the fall semester of 1990.  Two sections of Principles of Macroeconomics were used with forty-one students participating.  One section performed as the control group and the other section as the experimental group.

The computer-assisted instructional materials used were prepared to be used in conjunction with Economics, 11th edition by Campbell R. McConnell and Stanley L. Brue.  Six graphics-based tutorials and seventeen exams were completed by students in the experimental group.  Students received an

Mary Lewis Purnell Haley

on-screen evaluation of their performance showing the percent correct and page references for questions missed.

Effectiveness of computer-assisted instructional materials on macroeconomic understanding was measured by administering four instructor-generated examinations and the "Revised Test of Understanding in College Economics, Macro Form B" prepared by the Committee for a College-Level Test of Economic Understanding of the Joint Council on Economic Education which was used as both a pretest and a posttest. Secondary data were collected by administering a student questionnaire.

The Ordinary Least Squares Regression model was used to determine the relationship between the independent and dependent variables. The t-statistic was calculated and tested at the .05 and .01 levels of significance.

Results of the regression analysis showed no significant positive relationship between students' cognitive achievement in Principles of Macroeconomics and their use of computer-assisted instruction. The only independent variable that was consistently positively related to students' cognitive achievement in Principles of Macroeconomics was college grade point average. Males were shown to be superior to females in terms of cognitive achievement in macroeconomics.

# ACKNOWLEDGMENTS

The writer wishes to express her appreciation to those who made a contribution to this study. This assistance is acknowledged to:

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# TABLE OF CONTENTS

LIST OF TABLES

# LIST OF APPENDICES

# CHAPTER I

## INTRODUCTION

During the past two decades, technology has provided the educator with many new, innovative methods of instruction. Unfortunately, many studies have shown that the typical economics instructor has chosen to rely primarily on the lecture method. In Mark S. Walbert's article, "Writing Better Software for Economics Principles Textbooks", he sites an old adage, "I hear and I forget; I see and I remember; I do and I understand".[1]

Many researchers agree with this adage that learning takes place most effectively when students are actively involved in the process; when they are doing rather than hearing or seeing.

### The Problem

The primary purpose of this study is to determine the effectiveness of using computer-assisted tutorials and examinations as supplements to the basic lecture and discussion course. Secondary considerations include college grade point averages, scores on the American College Test, and sex of students.

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[1]Mark S. Walbert, "Writing Better Software for Economics Principles Textbooks," The Journal of Economic Education 20 (Summer 1989): 281.

## Hypothesis

A null hypothesis is proposed for this study.  The null hypothesis asserts that, after completing a Principles of Macroeconomics course, no statistically significant differences will be found between student learning of macroeconomics by a group of students using supplementary computer-assisted instructional materials and a group not using the computer materials.

## Justification for the Study

Many research studies have been undertaken to identify alternatives or supplements to the lecture method of instruction in economics.  Some of the alternatives or supplements include discussion sessions, use of a mandatory study guide, and computer-assisted instruction.  Computer use in economics instruction began during the late 1960s and continued to be used extensively through the middle 1970s. Hundreds of studies were undertaken during this period, mostly on mainframe computer systems and results generally suggested that CAI was effective in increasing student learning and improving student attitudes.[2]  Until the middle 1970s, the computer was expected to continue to be a

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[2]Bruce Dalgaard, Darrell R. Lewis, and Carol M. Boyer, "Cost and Effectiveness Considerations in the Use of Computer-Assisted Instruction in Economics," Journal of Economic Education 15 (Fall 1984):  310.

valuable learning aid throughout the 1980s for several reasons:

    1.  As microcomputer hardware and software prices fell, many schools could now utilize computer-assisted instruction at little or no additional expense.[3]

    2.  Computers required that the student become involved in and take responsibility for his or her mastery of the subject of macroeconomics.[4]

    3.  CAI could increase the amount of individual attention each student received.  Computer lessons automatically respond to the needs of the student by providing immediate feedback, in the form of either an explanation of the reason why an answer is an incorrect choice or positive reinforcement for a correct response.[5]

    4.  Even in situations where increases in learning were not achieved, using the computer as a learning tool has been shown to decrease study time required to master the subject matter.  In a 1980 study by Paden and Barr, CAI students in economics were found not only to perform better than non-CAI students, but they did so by spending an average of six to seven hours less study time over a semester.[6]

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    [3]Gerald V. Post, "Microeconomics in Teaching Economics," <u>Journal of Economic Education</u> 16 (Fall 1985):  310.

    [4]Walbert, 283.

    [5]Post, 310.

    [6]Dalgaard, Lewis, and Boyer, 312.

5. Computers can help to provide the connection between theory and practice, giving students the opportunity to apply their knowledge of economic concepts to specific "real world" problems.[7]

6. CAI has been shown to be particularly effective when the subject requires practice for mastery or comprehension.[8] Several economic topics, such as demand and supply analysis, lend themselves very well to this type of instruction.

During the 1980s studies on the effectiveness of computer-assisted instruction in economics education generally were in disagreement with earlier studies. The consensus was that the computer was not the "dream" teaching tool it was earlier thought to be.[9] Evaluating the effectiveness of CAI though did not consider the possibility that the material was of poor quality or that the programs were improperly used.

As the 1990s begin, the microcomputer is being used much more extensively as a supplementary learning aid as more software packages become available at low or no costs with economics textbooks.[10] Few studies have been conducted though using materials that accompany the adopted

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[7]Post, 310.

[8]Walbert, 283.

[9]Ibid., 281.

[10]Ibid.,282.

textbook. Most researchers have chosen to develop their own
computer materials for use in their studies. The writer's
study will attempt to determine the effectiveness of using a
computer package accompanying the textbook Economics, the
eleventh edition by Campbell R. McConnell and Stanley L.
Brue. The writer hopes this study will be beneficial to
other economics instructors in choosing whether to use a
computer package accompanying their adopted textbook.

### Assumptions

Several assumptions were made as a part of this
project. It was assumed that the internally generated
examinations and the TUCE examination were appropriate
measures of student learning. It was assumed that
differences in meeting times, classrooms, and class size did
not affect student learning. It was assumed that neither
the age of the student nor classification in college would
affect the student's ability to learn macroeconomics.

### Definitions and Abbreviations

Several definitions and abbreviations are advanced as a
part of this study.

Macroeconomics. The part of economics concerned with
the economy as a whole; with such major aggregates as the
household, business, and governmental sectors and with

totals for the economy.[11]

Computer-assisted instruction. Often abbreviated CAI.

Test of Understanding in College Economics. Often abbreviated TUCE.

Limitations of the Study

Several limitations were an inherent part of this study. Only two sections of one course--Principles of Macroeconomics--were used in the Fall Semester of 1990 at one university, Cumberland University. This sample, therefore, may not be a representative one.

The experimental section consisted of only seventeen students, while the control section had twenty-four students. Using other classes with additional students might produce different results.

One section of the course met at nine o'clock, while the second section met immediately afterwards, at ten o'clock. This time schedule was designed to promote uniformity of information presented in each section. The instructor was careful to present the same type and amount of information to each section on a particular day; however, it is possible that the instructor presented some material to one section that was not made available to the other section.

Evaluation of student learning was based on two

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[11]CampbellR. McConnell and Stanley L. Brue, Economics, 11th edition (New York: McGraw Hill, 1990): 5-6.

instruments:  four internally generated examinations prepared by the instructor and the TUCE exam.  Using other forms of evaluation might have produced different results.

The TUCE exam score did not become a factor in determining the student's final course grade.  It is therefore possible that a student may not have taken the exam seriously.

The CAI materials were used on computers in a student computer lab.  Practically, it was impossible to deny students in the control group access to the materials, even though students in the control group understood that they were part of a study and that they were not allowed to use the tutorials and examinations.

Any increases in learning by the experimental group above those achieved by the control group may have been due solely to the extra work assigned.  Similar results may have occurred from using a supplemental study guide, additional homework assignments, or any other extra form of work.

## Organization of the Study

Chapter I is an introductory chapter that states the problem and hypothesizes a result, provides a justification for this study, specifies assumptions made and definitions of key terms, and finally, cites the inherent limitations that are a part of this study.

Chapter II reviews the related literature on the topic of computer-assisted instruction in economics education.

The purpose of this chapter is to allow the reader to better understand the problem in terms of historical framework and current research trends.

Chapter III outlines the research methodology and procedure used. Included in this chapter is a description of the selection of the control and experimental groups, the use of computer-assisted instruction, selection and use of the research instrument, collection of other data, and the procedures of treating data.

Chapter IV describes the analysis of the data. Included is an analysis of the primary and secondary data obtained by presenting statistical results and interpreting these results.

Chapter V summarizes the results, draws specific conclusions, and delineates implications of the study.

CHAPTER II

LITERATURE REVIEW

Introduction

Several studies have been ventured in recent years on
the use of computer-assisted instruction in economics
education. They include studies using computer programs as
a partial substitute for lectures[1] and as a complete
substitute for lectures;[2] using computer-assisted
instruction as an appendage to the traditional course
lecture and discussion, both on a strictly voluntary basis[3]
and as a required component of the course;[4] and using
computers as a substitute for discussion groups with
teaching assistants.[5]

CAI as a Substitute for Lectures

Wentworth and Lewis collected data from two two-year

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[1]Steven C. Gold and Thomas F. Pray, "Criticisms of the
Use of Computerized Simulations in Economics: A Rebuttal,"
a paper presented at the Annual Meeting of the Eastern
Economic Association, 16 March 1984: 7.

[2]Ibid., 8.

[3]Ibid.

[4]Frank W. Millerd and Alastair R. Robertson, "Computer
Simulations as an Integral Part of Intermediate
Macroeconomics," The Journal of Economic Education 18
(Summer 1987): 274.

[5]William I. Davisson and Frank J. Bonello, Computer-
Assisted Instruction in Economic Education: A Case Study
(Notre Dame, Ind.: University of Notre Dame Press, 1976):
11.

colleges in Minnesota during the fall quarter of 1971.[6]
One hundred forty-nine students participated in the study in
which students were divided into control and experimental
classes. The experimental class played a computer game, The
Market Place, as a substitute for eight conventional
lectures. Test instruments used were the pre- and post-
TUCE. Wentworth and Lewis controlled for student
differences in their backgrounds using a multiple regression
model. The control class performed significantly better
than the experimental class on post-TUCE scores relative to
pre-TUCE scores.

In the Fall of 1970 at St. Olaf College, Emery and
Enger studied the effects of CAI on test scores when used as
a complete substitute for lectures on fiscal policy.[7]
Eighty-six students, divided into two sections,
participated. One section, designated as the control group,
received instruction through lectures on fiscal policy. The
second section, the experimental group, received no lectures
on fiscal policy. Instead, experimentals played the FISCAL
POLICY simulation and submitted answers to questions along
with the computer printouts.

Emery and Enger used pre- and post-TUCE scores on
fifteen multiple-choice questions, five in each category
of recognition and understanding, simple application, and

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[6]Gold and Pray, 7.

[7]Ibid., 8.

complex application.[8] Results, after controlling for student differences in background through regression analysis, showed no differences on recognition and understanding.  Experimentals, though, scored better on both simple and complex applications.

Lawrence A. Daellenbach performed an analysis similar to Emery and Enger's.[9] He divided students into four sections, two experimentals and two controls during the fall semester of 1974-75.  Control section number one met on Monday, Wednesday, and Friday at one o'clock for fifty minutes while experimental section number one met on Monday and Wednesday at two o'clock for fifty minutes.  Friday was left open for the experimental group to use CAI if the students wished.  Control section number two met on Tuesday and Thursday at two o'clock for seventy-five minutes, while the experimental section number two met on Tuesday and Thursday at three-thirty for fifty minutes.  This experimental group also received fifty minutes of released time for CAI work.

Daellenbach controlled for differences in student attributes other than the experimental treatment by using the least squares multiple regression model. Students in the

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[8]Ibid.

[9]Lawrence A. Daellenbach, Richard E. Schoenberger, and William E. Wehrs, "Has Computer Assisted Instruction (CAI) Been A Financial Failure?  Studies in Economic Education, No. 3," Wisconsin University:  La Crossee Center for Economic Education (October, 1976):  6.

experimental group were allowed to use the computer to the intensity of their choice.[10] Each week, experimentals had a menu of various tutorial lessons, games, and simulations from which to choose. Students were allowed to choose freely among the menu items. During the semester, fourteen tutorial lessons, five games, and one simulation were made available to the experimentals.

Controls and experimentals received the same exams, with test questions chosen from a test bank and some additional questions added by each instructor on an individual basis. Each instructor taught one control and one experimental section. Grades were based on accumulated points. Ten bonus points could be earned by each student. Controls earned bonus points by working outside assignments and experimentals by working CAI materials.

Daellenbach considered two components of achievement in analyzing effectiveness of CAI: affective and cognitive. In terms of cognitive achievement, each student took a pre- and post-TUCE. Affective achievement was measured by an attitude questionnaire, administered both at the beginning and end of the semester. In the regression model, characteristics such as general cognitive ability, prior economic knowledge, maturity, motivation, effort, sex, major, instructor characteristics, classroom environment, and instructional approach were considered.

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[10]Ibid.,8.

Costs of the CAI program included compensation, supplies and services, equipment paid for under the operating budget, and department level administrative costs. Daellenbach used results of affective and cognitive tests and cost considerations to calculate an education efficiency ratio (EER)[11]:

$$EER = \frac{educational\ output}{cost}$$

In the areas of simple application and recognition and understanding, CAI was found to be equally as efficient as teacher-assisted instruction, when fifty minutes of released time were allowed each week. In the affective area, CAI failed to achieve an education efficiency ratio greater than teacher-assisted instruction in all situations examined.[12]

### CAI as an Appendage to Lecture/Discussion Course

Gerald V. Post used CAI at Iowa State University during the spring of 1982 as a supplement to the traditional lecture course.[13] In a combined macro- and microeconomics principles course of approximately one hundred twenty students, each was assigned to one of three groups: a control group that was exposed only to lectures, a second group that heard lectures and was assigned take-home

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[11]Ibid.,33.

[12]Ibid.,37.

[13]Gerald V. Post, "Microcomputers in Teaching Economics," The Journal of Economic Education 16 (Fall 1985): 309.

assignments, and a third group that heard lectures and worked through simulations on two Apple II microcomputers.

Results of the study showed that the groups who worked on the computer assignments and the take-home assignments both had better scores on tests than did the control group. The computer group showed no significant differences on test scores from the take-home assignment group. Post concluded that there were several advantages of using CAI materials in teaching economics[14]:

1. CAI increases the amount of individual attention each student receives by allowing the computer to interact with the student.

2. Using computers to maintain gradebooks and to supplement lectures allows the instructor to spend more time with students.

3. CAI provides an opportunity to show the student the link between theory and practice.

4. Lessons can be written to be self-contained, where no modifications or computer knowledge is necessary, and where the lessons are transportable between institutions.

5. Computers with graphics capabilities can now be purchased at a low price.

6. CAI can help to standardize the material covered in different sections and can provide immediate feedback to the student.

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[14]Ibid., 310.

In a study at Illinois State University during the fall semester of 1975, Chismar, Hiebert, and McCanney used CAI as an optional appendage to the traditional lecture and discussion course.[15] They studied approximately three hundred-eighty students in a macroeconomics principles class, where students were divided into two groups, CAI users and non-CAI users.

The CAI users participated by working three different types of programs: reviews, simulations, and demonstrations. These programs were developed by Davisson and Bonello at the University of Notre Dame. The CAI programs were strictly optional for the CAI users.

The testing instrument used by Chismar, Hiebert, and McCanney was the TUCE, used both as a pre-test and as a post-test. Regression analysis was performed to control for differences in students.

The results showed that CAI users performed slightly better on TUCE scores than did non-CAI users. After controlling for GPAs in the regression model, CAI users performed slightly worse than non-CAI users. The instructors believe CAI users may have substituted the CAI programs for class attendance; therefore, they performed worse on TUCE scores than did the non-CAI users.

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[15]Gold and Pray, 8.

## CAI as a Substitute for Discussion

One of the most comprehensive studies of the use of computer-assisted instruction in economics education was done by William I. Davisson and Frank J. Bonello. Their book, Computer-Assisted Instruction in Economic Education: A Case Study, cites two weaknesses in the literature on the evaluation of CAI[16]:

1. CAI evaluations usually focus exclusively on the cognitive effects and ignore attitudinal effects and educational costs.

2. Attitudinal achievement is hard to measure because educators lack both the instruments and the methodology to assess its impact.

Davisson and Bonello feel that in order to completely assess CAI, the study must look at three areas: cognitive achievement, student attitudes, and educational costs. They chose to study a two-course sequence of Principles of Economics at the University of Notre Dame. The courses, which earn three credits each, are designed to meet three times a week for fifty minutes each time. Two of the meetings are lectures from the instructor with approximately three hundred students in each section. The third meeting is a discussion course administered by a graduate teaching assistant with approximately twenty students in each of

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[16]Davisson and Bonello, 1.

these sections. The purposes of the discussion course are to give the student the opportunity to ask questions about the material, to promote discussion, and to stimulate interest in economics by utilizing teaching strategies that are not appropriate for a large lecture situation.

Economics, the ninth edition, by Paul A. Samuelson, was chosen as the text for both the macro- and microeconomics courses. Course grades were determined solely from three exam scores--two one-hour exams and a two-hour final examination. These exams were composed primarily of objective, multiple-choice questions.

Students were randomly assigned to control and experimental groups. The students in the control group met for fifty minutes per week in their regularly scheduled discussion classes. The multiple-choice questions used in the CAI review routines were made available to the controls in their discussion group. They were given the opportunity to work through these questions and ask for help from the teaching assistant on any they had problems with.

The experimentals used a CAI system composed of three programs[17]:

1. Review routines that consisted of multiple-choice questions arranged by chapter. Students were provided with positive reinforcement for correct answers and explanations for incorrect answers, with the opportunity to try again

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[17]Ibid., 6.

until the correct answer was achieved. Upon completion of the review routine, the student could print out the complete routine to use as a study guide.

2. Demonstration routines, composed of demonstrations and calculations. Demonstrations were used to explain a concept and then demonstrate that concept either numerically or graphically. Students could use their own data in the demonstration. Calculations were used to lessen the time necessary to solve assigned problems. Given a model or formula, students supply data to obtain a desired output, with the calculation being performed by the computer.

3. Game simulations, which apply concepts learned to solve problems in a "real world" of data provided by the computer[18].

Davisson and Bonello used two different approaches toward the experimentals. The first approach, used in the first semester, was to force the experimentals to use the CAI programs. Students met at certain designated times to work on CAI programs with their teaching assistant. The second approach, used exclusively in the second semester, was to allow experimentals to work on CAI programs whenever and to whatever extent they chose.

Cognitive achievement was measured by using the TUCE and internally generated exams. The TUCE, Part 1, Form A was used as both a pretest and as a posttest. Two

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[18]Ibid., 9.

internally generated exams consisting of multiple-choice questions were administered during the semester. The final exam contained a TUCE portion and an internally generated portion.

These instructors used a regression equation to control for student differences other than CAI use. Variables considered included both the mathematics and verbal scores of the Scholastic Aptitude Test, cumulative grade point averages, TUCE pretest score, weekly estimates of lecture attendance, discussion class attendance for the controls and time spent with CAI programs for the experimentals, time spent studying, happiness with the instructor and textbook, and finally, happiness with the discussions for the control group and the CAI programs for the experimentals.

For Davisson and Bonello, CAI generated mixed results[19]. CAI programs presented an acceptable alternative to the discussion classes. Cognitive achievement appeared adequate for the CAI system. Considering time spent studying, CAI had a favorable outcome. Experimentals received the same level of cognitive achievement as the controls in less time. The instructors conclude that CAI is not superior to discussion classes but is an acceptable alternative.

Several shortcomings of the study were acknowledged. First, the data collected could be improved upon to increase

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[19]Ibid.,36.

$R^2$ by considering other variables. Also, the relationship between the variables should be explored to determine if multicolliniarity is a problem.

In considering student attitudes, the instructors administered a survey, the University Course Evaluation Form. CAI was not shown to have any significant impact on attitudes toward economics.

CAI students did point out several advantages they saw in using CAI[20]. First, CAI students thought the active involvement of CAI was superior to involvement generated in the discussion class. Second, CAI was a good study guide to use as a review for the multiple-choice questions on the examinations. Finally, CAI students felt like the computer was a "private tutor" that could be used at their convenience.

## Summary and Conclusions

No research was found in the literature review on the use of computer packages supplied by the textbook authors in Principles of Macroeconomics. This author feels that a computer package that is supplied to the instructor at no cost and one that is easy to use would be more likely to be used in an introductory course than one that must be developed by the instructor. This author hopes this research will benefit introductory level economics

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[20]Ibid., 116.

instructors who are trying to decide whether to utilize computer-assisted instruction as an appendage to their course.

Generally, results of studies of the evaluation of CAI in economics education have been mixed, but several conclusions can be reached.

1.    The computer is useful in economics to present traditional material in a new and interesting way.

2.    CAI is effective only when used as an appendage to the traditional lecture and discussion course and not as a substitute for the lecture.

3.    CAI is effective in transforming the student from a passive learner to an active participant.

4.    CAI can be successful in increasing the amount of individual attention each student gets, either from the computer or from the instructor.

5.    CAI can be used to link theory learned in the classroom with practice by using "real world" situations.

6.    Computers provide self-paced learning with immediate feedback.

7.    It takes less time to learn when using computer-based materials.

# CHAPTER III

## RESEARCH METHODOLOGY AND PROCEDURE

### Selection of Control and Experimental Groups

This study was based on data collected during the fall semester of 1990 at Cumberland University. Forty-one students in two sections of Economics 241--Principles of Macroeconomics--participated. Section one, consisting of twenty-four students, met at nine o'clock on Monday, Wednesday, and Friday for fifty-five minutes each and section two, consisting of seventeen students, met at ten o'clock on Monday, Wednesday, and Friday, also for fifty-five minutes each class period. Section two was arbitrarily chosen as the experimental group, with section one designated as the control group.

Participating students were told on the first day of class about the study and explained about their responsibilities as members of either the control or experimental groups. Other than the use of computer-assisted instructional materials by the experimental group, the two sections received the same syllabus and learning objectives, lectures, and class assignments. Both sections were taught by the writer. A copy of the course syllabus for Principles of Macroeconomics is provided in Appendix A.

## Use of CAI

Students in both sections were told about the use of the CAI materials. Section one students understood that they were not allowed to use the CAI materials. They would receive three fifty-five minute lectures per week and class assignments. Section two students would receive the same three fifty-five minute lectures per week and class assignments. In addition, the experimental group would be required to work assignments on the computer. The average score on the extra assignments would count as an exam grade in the computation of their final course grade.

The CAI materials used, Concept Master, were made available by their publisher, McGraw-Hill as a part of the economics instruction package adopted by the writer. The textbook used was Economics, the eleventh edition, by Campbell R. McConnell and Stanley L. Brue. A study guide was made available to students in both sections by placing a copy on one-hour reserve in the campus library. The objective of Concept Master was to "utilize the strengths of the textbook and to concentrate on areas of analysis and techniques involving graphical functions that students often find troublesome".[1] There was no cost involved in either receiving or administering these materials.

Concept Master consists of three parts: graphics-based

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[1]Campbell R. McConnell and Stanley L. Brue, Concept Master (New York: McGraw-Hill, 1990).

tutorials, examinations, and simulations. At the beginning of the semester, students in the experimental group were given a thirty-minute overview and demonstration of the way the tutorial works. Because the tutorial is menu driven and because most students have some exposure to computers by the time they reach a sophomore level course, the instructor felt this short introduction was adequate. The instructor was available for additional guidance on an individual basis if requested.

Two types of CAI materials were used: graphics-based tutorials and examinations. Each graphics-based tutorial took approximately one hour to complete and required the student to move from simple to complex situations. The tutorials emphasized areas that lent themselves well to visual or graphical representation.[2] Six of these were assigned during the semester on the subjects of construction and reading of graphs, production possibilities curves, demand and supply, aggregate demand and aggregate supply, Keynes' theory of employment, and fiscal policy. Student performance evaluations and assignments were to be printed and turned in as a homework assignment. Appendix B contains a typical computer assignment.

The second component of CAI was examinations. Each textbook chapter examination contained twenty multiple-choice questions. Each exam consisted of ten of the twenty

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[2]Ibid.

questions, chosen randomly by the computer. The exam section could be worked as many times as a student chose. It was suggested by the instructor that students work each chapter exam at least three times. This would increase the probability that a student would be exposed to each of the twenty questions at least once. Students were to submit as a homework assignment one exam from each chapter with a minimum score of eighty percent correct. Appendix C contains a more detailed description of Concept Master.

### Selection and Use of the Research Instrument

Two research instruments were used by this study to measure student cognitive achievement in macroeconomics: the revised version of the Test of Understanding in College Economics (TUCE), prepared by the Committee for a College-Level Test of Economic Understanding of the Joint Council on Economic Education and four internally generated exams. Reviewing the literature on research in economics education suggests that the TUCE is the most widely used research instrument. It has two primary objectives: "(1) to serve as a measuring instrument for controlled experiments in the teaching of introductory economics at the college level, and (2) to enable instructors of particular introductory courses to compare the performance of their students with that of students in other colleges and universities".[3]    The

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[3]Joint Council on Economic Education, Revised Test of Understanding in College Economics, 1981.

revised TUCE has thirty multiple-choice questions, divided
into three cognitive categories: recognizing and
understanding basic terms, concepts, and principles,
explicit application of basic terms, concepts, and
principles, and implicit application of basic terms,
concepts, and principles.

Students in both sections took the same internally
generated exams and each student took the Macro Form B of
the TUCE exam as both a pretest in the first week of classes
and as a posttest during the final exam period. National
norming data show that no statistically significant
difference occurs in posttest results based on the form of
the pretest.[4] In consideration of the costs involved in
administering the TUCE, the writer chose to use the Macro
Form B as both a pretest and posttest. The TUCE scores did
not become a part of a student's final course grade. The
purpose of the pretest was to determine students' basic
understanding of macroeconomics. The posttest served two
functions. First, the posttest score, in conjunction with
the pretest score, were used to calculate the percentage
improvement in test score from the beginning to the end of
the semester. The following formula was used:

$$\% \text{ improvement} = \frac{\text{Post-TUCE minus Pre-TUCE}}{\text{Average of Post and Pre-TUCE}}$$

Second, questions from each of the three areas of the TUCE--

_____

[4]Ibid.

recognition and understanding, explicit application, and implicit application--were used to determine the effect of the experimental treatment on post-TUCE scores in each area.

Each internally generated exam consisted of approximately fifty multiple-choice questions. The questions used were derived from a variety of sources: test banks, study guides, and instructor-designed materials. No attempt was made to ask any of the same questions on the exams as those in the CAI materials, but based on the limited database from which questions were drawn, some of the CAI examination questions may have appeared on an internally generated exam.

## Collection of Other Data

Considering that factors other than the use of CAI materials may affect student learning in macroeconomics, secondary data were collected from students participating in the study. This data includes ACT score, college GPA, and sex of students. Appendix D shows a copy of the questionnaire administered to the students and used to collect the demographic data.

## Procedures of Treating Data

The Ordinary Least Squares Regression model, a commonly used analytical procedure in economic education, was used to determine the relationship between the independent and dependent variables. The t-statistic was calculated and

tested at the .05 and .01 levels of significance.

The alternative hypothesis states that there is a significant positive relationship between students' cognitive achievement in Principles of Macroeconomics and their use of CAI.

The following equation was used to test the alternative hypothesis:

Regression Equation[5]:

$$Y = B0 + B1X1 + B2X2 + B3X3 + B4X4 + E$$

where:

Y = the dependent variable, the variable to be modeled, student cognitive achievement in Principles of Macroeconomics

Xi, where i = 1-4, independent variable, variable used as a predictor of Y

Bi, where i = 0-4, the parameter to be estimated, reflects the impact of X on Y, holding all other variables constant.

X1 = college GPA

X2 = ACT score

X3 = sex of student, where 1 = female, 0 = male

X4 = group, where 1 = experimental, 0 = control

E = epsilon = random error component, assumed to be normally distributed, with a mean of zero, constant

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[5]William Mendenhall and Terry Sincich, A Second Course in Business Statistics:  Regression Analysis (San Francisco: Dellen Publishing Company, 1986).

variance, zero covariance, and it is uncorrelated with the explanatory variables.

Some relationships are expected to exist between the independent variables and the dependent variable. College GPA, ACT score, and being in the experimental treatment group are all expected to have a positive impact on student achievement in macroeconomics. In addition, based upon a review of the literature, males are expected to exhibit superior performance in macroeconomics to females.

CHAPTER IV

ANALYSIS OF DATA

The data in this study were processed using Minitab and
analyzed in two major categories:  the effect of CAI as
measured by internally generated exam scores and as measured
by TUCE exam scores. Regression analysis was applied to each
of these categories in several different ways.  Some of the
observations were deleted from the regression model due to
missing data, such as an ACT score or failure to participate
in the pretest or posttest.  This chapter will examine the
relationship between four independent variables and the
dependent variables.

## Findings

Alternative Hypothesis:  There is a significant
positive relationship between students' cognitive
achievement in Principles of Macroeconomics and their use of
CAI.

The multiple regression model uses four independent
variables as possible determinants of student learning in
macroeconomics.  The experimental treatment, labeled GROUP
in the regression equation, measures the extent to which
being in the experimental group that used CAI contributed
toward students' cognitive achievement as measured by their
average exam score.  As can be seen in the regression
equation in Table 1, the relationship between the use of CAI

TABLE 1

REGRESSION EQUATION FOR PRINCIPLES OF MACROECONOMICS
(Average Exam Score on College GPA,
ACT, Sex of Student, and Group)

---

$Y = 33.515 + 11.687$ COLLEGE GPA $+ .6222$ ACT $- 4.944$ SEX
            $(5.24)**$          $(1.35)$        $(-1.92)*$

    $- .389$ GROUP
       $(-.17)$


$s=6.501$          $R^2=.676$          $F=14.60**$          $n=33$

*significant at .05 level
**significant at .01 level

---

and cognitive achievement as measured by average exam score
was a negative one as shown by the coefficient of -.389.
The values in parentheses are the "t" values. The "t" value
for GROUP was not significant at either the .05 or the .01
level of significance.

Three other independent variables were included in the
model, primarily to control for differences in student
learning other than the experimental treatment. These other
variables include college GPA, ACT score, and sex of
student. These independent variables were explained in
detail in Chapter three, but several additional points may
be made here. College GPA and ACT score were both
positively related to average exam score, as shown by their
positive coefficient, but only the contribution of college
GPA was statistically significant at both the .05 and .01

levels of significance. The "t" value for college GPA was 5.24. In addition, the large coefficient of college GPA, 11.687, indicates that college GPA can be used as a good predictor of average exam score in Principles of Macroeconomics. There was a negative relationship between being a female student of macroeconomics and average exam score. The economic literature tends to support this finding. Female students tend to come into an economics course with less general knowledge of economics and show less improvement in cognitive abilities during the course than do males. $R^2$ for this model was .676 and the "F" score of 14.60 was significant at both the .05 and .01 level of significance. This model therefore appears to be useful in predicting average exam scores in a Principles of Macroeconomics course.

TABLE 2

REGRESSION EQUATION FOR PRINCIPLES OF MACROECONOMICS
(Percentage Improvement from Pretest to Posttest
on College GPA, ACT, Sex of Student, and Group)

---

Y = 34.2 + 14.606 COLLEGE GPA - 3.193 ACT - 8.33 SEX
            (1.49)            (-1.54)        (-.70)

    - 2.2 GROUP
        (-.21)


s=28.32        $R^2$=.121        F=.90        n=33

*significant at .05 level
**significant at .01 level

---

When multiple regression analysis is used with students' cognitive achievement as measured by their percentage improvement from pretest scores to posttest scores as the dependent variable and the same four independent variables as in Table 1, there is no significant positive relationship between cognitive achievement as measured by percentage improvement in TUCE score and the use of CAI. In fact, this equation shows a negative relationship. Students in the experimental group improved less from beginning of the course to the end as measured by TUCE than the control group. The "t" value of -.21 though is insignificant at both .05 and .01 levels.

A few other independent variables warrant mention. College GPA was positively related to percentage improvement in TUCE scores but the "t" score was insignificant. The ACT score was negatively related to percentage improvement but was insignificant at the .05 and .01 levels. This result was unexpected given this set of data. Other data might have provided different results. Females improved less from pretest to posttest than did their male counterparts. $R^2$ for this model was .121 and the "F" value was .90 and insignificant. This model therefore should not be used as a predictor of student cognitive achievement in Principles of Macroeconomics. As discussed in Chapter I, a limitation of using the TUCE score without incorporating that score into the students' final grade is the possibility that the

students would not take the exam seriously.  The writer
feels that many students in this experiment did not take the
exam, particularly the posttest, seriously.  Incorporating
the TUCE exam score or a portion of it into the final course
grade might have improved this model's usefulness as a
predictor of student cognitive achievement.

TABLE 3

REGRESSION EQUATION FOR PRINCIPLES OF MACROECONOMICS
(Percentage Correct on Demand and Supply Questions
on College GPA, ACT, Sex of Student, and Group)

$$Y = 9.28 + 17.749 \text{ COLLEGE GPA} + .317 \text{ ACT} + .309 \text{ SEX}$$
$$(3.24)** \qquad (.28) \qquad (.05)$$

$$- .80 \text{ GROUP}$$
$$(-.14)$$

s=15.95        $R^2$=..383     F=4.35**        n=33

*significant at .05 level
**significant at .01 level

The internally generated exams focused on a wide
variety of subjects, from demand and supply to fiscal policy
to monetary policy.  In order to focus more clearly on
specific topics covered in the graphics-based tutorials and
computer-assisted examinations, the writer chose to measure
the dependent variable by using the percentage correct on
internally generated questions on demand and supply
analysis, one of the topics covered extensively in the

computer-assisted materials. Independent variables remained unchanged from regression equations one and two.

The model proved to be useful in determining cognitive achievement as measured by percentage correct on internally generated questions on demand and supply analysis. This was signified by the F-value of 4.35 which was significant at both the .05 and .01 levels. Students in the experimental group performed slightly worse on demand and supply questions than did the control group, as shown by the negative GROUP coefficient of -.80, but this relationship was not significant at either the .05 or .01 levels. The "t" statistic for GROUP was -.14.

Other variables proved to be more significant. College GPA was positively related to the dependent variable. The coefficient of COLLEGE GPA was large at 17.749, and the "t" value proved to be significant at both the .05 and .01 levels.

TUCE exam questions can be broken into three categories: recognition and understanding, explicit application, and implicit application. The writer chose five questions from each category on the posttest and calculated the percentage correct for both the control and experimental groups. Multiple regression analysis was used to determine the effect of the use of CAI on each category of questions, holding the same three independent variables as in the previous equations constant.

TABLE 4

REGRESSION EQUATION FOR PRINCIPLES OF MACROECONOMICS
(Percentage Correct on Recognition and Understanding
Questions on College GPA, ACT,
Sex of Student, and Group)

$$Y = -54.6 + 6.866 \text{ COLLEGE GPA} + 3.435 \text{ ACT} - .87 \text{ SEX}$$
$$(.81) \qquad\qquad (1.92)* \qquad (-.09)$$

$$+ 20.023 \text{ GROUP}$$
$$(2.19)*$$

$s = 24.40 \qquad R^2 = .303 \qquad F = 2.83* \qquad n = 33$

*significant at .05 level
** significant at .01 level

Table 4 shows the results of measuring cognitive achievement by using the percentage correct on recognition and understanding questions. There was a positive relationship between the use of CAI and the dependent variable, and this relationship was significant as shown by the "t" statistic of 2.19. ACT score was also significantly and positively related to the dependent variable.

Using percentage correct on explicit application questions on the posttest as a measure of cognitive achievement, there was no significant relationship between use of CAI and the dependent variable. The ACT score was significant, with a "t" statistic of -2.12. This negative relationship was unexpected and may be explained by the possibility that many students did not take the posttest

TABLE 5

REGRESSION EQUATION FOR PRINCIPLES OF MACROECONOMICS
(Percentage Correct on Explicit Application Questions
on College GPA, ACT, Sex of Student, and Group)

$$Y = 73.13 + 4.022 \text{ COLLEGE GPA} - 2.850 \text{ ACT} - 14.8 \text{ SEX}$$
$$(.63) \qquad\qquad (-2.12)* \qquad (-1.92)*$$

$$- 4.649 \text{ GROUP}$$
$$(-.68)$$

$$s = 18.28 \qquad R^2 = .244 \qquad F = 2.10 \qquad n = 33$$

seriously. Those that had a high grade point average knew
that their score would not affect their final course grade.
On the other hand, those with a low average may have put
forth extra effort, hoping that their score might influence
the instructor in calculating their final course average.
Females performed worse on explicit applications questions
than did males as shown by the negative coefficient of 14.8.
Overall, this model is not useful. $R^2$ is only .244 and the
F value is insignificant at both the .05 and .01 levels with
a value of 2.10.

As shown in Table 6, developing a regression model
measuring cognitive achievement by using percentage correct
on implicit application questions of the posttest and the
same four independent variables as used in the previous
regression equations of this study was not useful in
determining students' cognitive achievement in Principles of
Macroeconomics. The $R^2$ for this model was only .178 and F

TABLE 6

REGRESSION EQUATION FOR PRINCIPLES OF MACROECONOMICS
(Percentage Correct on Implicit Application Questions
on College GPA, ACT, Sex of Student, and Group)

---

$$Y = -21.4 + 12.272 \text{ COLLEGE GPA} + .903 \text{ ACT} + 5.95 \text{ SEX}$$
$$(1.63) \qquad (.57) \qquad (.65)$$

$$+ 2.98 \text{ GROUP}$$
$$(.37)$$

$s = 21.66 \qquad R^2 = .178 \qquad F = 1.41 \qquad n = 33$

*significant at .05 level
**significant at .01 level

---

was insignificant at both the .05 and .01 level, with a

value of 1.41. The students in the experimental group

performed better on these five implicit application

questions than did students in the control group, as

signified by the positive coefficient of 2.98, but the "t"

value was insignificant.

## Summary of Findings

The multiple regression model was useful in predicting

students' cognitive achievement in Principles of

Macroeconomics when internally generated examinations were

used as a measure of cognitive achievement, the dependent

variable. Tables 1 and 3 show that the model predicting

achievement using average exam score as the measure was

useful with an $R^2$ of .676 and an F value of 14.60 and the

model predicting cognitive achievement by using percentage

correct on demand and supply questions was useful as well with an $R^2$ of .383 and an F value of 4.35. In neither case, though, did there exist a significant positive relationship between the use of CAI and students' cognitive achievement in macroeconomics.

The multiple regression models developed using the TUCE exam scores as measures of students' achievement in Principles of Macroeconomics generally were not useful. $R^2$ ranged from a high of .303 when considering percentage correct on recognition and understanding questions on the TUCE exam to a low of .121 when considering percentage improvement from pretest to posttest. The only situation in which the experimental group performed significantly better than the control group occurred when measuring students' cognitive achievement by their percentage correct on the recognition and understanding questions of the TUCE exam.

College GPA was the only independent variable that was consistently positively related to students' cognitive achievement in a Principles of Macroeconomics course. The "t" statistic for college GPA was significant at both the .05 and .01 levels of significance when using average exam score as a measure of cognitive achievement. When using percentage correct on internally generated demand and supply questions as a measure of cognitive achievement, college GPA was significant at the .05 level.

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

The purpose of this study was to determine the effectiveness of using computer-assisted instruction as a supplement to the basic lecture and discussion course. This chapter summarizes the findings of the study and attempts to draw conclusions and identify implications of these findings.

## Summary of Findings

This study was conducted during the fall semester of 1990 at Cumberland University and included two sections of Principles of Macroeconomics. One section served as the control group and the other section served as the experimental group. The experimental group used two forms of computer-assisted instruction, graphics-based tutorials and computer chapter examinations. These materials accompanied the adopted textbook, Economics, the eleventh edition, by Campbell R. McConnell and Stanley L. Brue.

The null hypothesis proposed for this study was that after completing a Principles of Macroeconomics course, no statistically significant differences will be found between student learning of macroeconomics by a group of students using supplementary computer-assisted instructional materials and a group not using the computer materials. Secondary considerations included college grade point

averages, score on the ACT, and sex of student as possible determinants of student achievement in Principles of Macroeconomics. Analysis of the data supports acceptance of the null hypothesis.

Two research instruments were used: the percentage of improvement from the beginning to the end of the course based on improvement from a pretest to a posttest Revised Test of Understanding in College Economics and the average scores of four internally generated exams. Secondary data were collected using a student questionnaire.

The Ordinary Least Squares Regression model was used to determine the relationship between the independent and dependent variables.

The major findings were:

1. There was generally no significant positive relationship between students' achievement in Principles of Macroeconomics and the use of CAI when measured by average exam scores nor when measured by percentage improvement on the TUCE exam.

2. College GPA was the only independent variable that was consistently significant as a determinant of students' cognitive achievement in Principles of Macroeconomics.

3. Students who used computer-assisted instruction performed significantly better on the recognition and understanding questions on the postcourse TUCE than did students who had not used the computer materials.

## Conclusions

1.  It was concluded that the use of computer-assisted instruction in a Principle of Macroeconomics course did not contribute to student achievement or understanding of macroeconomics.

2.  Of the four independent variables tested, only college GPA consistently contributed to student achievement in macroeconomics.

3.  Of the research instruments used, average exam scores were more useful in building a regression model than was the TUCE exam.  A contributing factor toward this conclusion was that the TUCE score was not considered in determining the students' final course grade whereas the exam grades were used in determining the final course grade.

## Implications

Several implications of this study may be useful to others considering research on teaching college level macroeconomics.

1.  Any research instrument used to measure cognitive achievement should be included as a component of the students' final course grade.

2.  Additional research could be conducted on the independent variables in the regression model other than the experimental treatment to determine what effect, if any, macroeconomics.

3. Additional research could be conducted using the computer-assisted materials as a voluntary learning aid.

4. This study could be replicated in a more advanced economics course using the graphics capabilities of the computer to determine if computer-assisted instruction benefits the advanced economics student.

APPENDICES

APPENDIX A

Economics 241 Course Syllabus

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COURSE SYLLABUS

I. COURSE DESIGNATION

   A. Number and Title: ECON 241 – Principles of Macroeconomics
   B. Credit: 3 hours
   C. Text: McConnell, Campbell R. and Stanley L. Brue, Economics, 11th edition, McGraw Hill, New York, 1990.
   D. Instructor: Mrs. Mary Lewis Haley
   E. Office Number: 2nd floor, Business faculty
   F. Office Hours: By appointment.

II. CONTRIBUTIONS OF THE COURSE TO SPECIAL COMPETENCIES SOUGHT

See individual chapter goals attached.

III. TOPICS COVERED

   A. An Introduction to American Capitalism
   B. National Income, Employment, and Fiscal Policy
   C. Money, Banking, and Monetary Policy

IV. ACTIVITIES, PROJECTS, AND ASSIGNMENTS

   A. Textbook assignments
      1. readings
      2. questions and exercises
      3. graphics-based tutorials and examinations
   B. Class participation
   C. Exams

V. EVALUATION PROCESS

   A. Grade Determination
      1. Major Exams (4)         80%
      2. Homework and participation   10%
      3. Computer-assisted instruction   10%

   B. Grading Scale
      90 - 100      A
      80 - 89       B
      70 - 79       C
      60 - 69       D
      below 60     F

INSTRUCTIONAL OBJECTIVES - CHAPTER 1 - THE NATURE AND METHOD OF ECONOMICS

1. Define economics and state some important reasons for studying economics. Differentiate between micro- and macroeconomics.
2. Explain what an economic principles is and how they are derived.
3. Explain what is meant by a generalization and an abstraction.
4. Explain the important of ceteris paribus.
5. List eight economic goals and give examples of conflicting and complementary goals.
6. Explain and give examples of the fallacy of composition and post hoc fallacy.
7. Explain and illustrate a direct relationship between two variables and define and identify a positive sloping curve. Explain and illustrate an inverse relationship between two variables and define and identify a negative slope.
8. Identify independent and dependent variables.


INSTRUCTIONAL OBJECTIVES - CHAPTER 2 - AN INTRODUCTION TO THE ECONOMIZING PROBLEM

1. Understand economic concepts including scarcity, opportunity cost, and trade-offs and how they affect consumers, business, and government.
2. Identify types of economic resources and type of income associated with various factors.
3. Construct a production possibilities curve when given appropriate data. Illustrate economic growth, underemployment of resources, and increasing costs using a production possibilities curve.
4. Give two major differences between pure capitalism and a command economy.


INSTRUCTIONAL OBJECTIVES - CHAPTER 3 - PURE CAPITALISM AND THE CIRCULAR FLOW

1. List and explain six important characteristics of capitalism.
2. List three other characteristics of modern economies.
3. Define and explain resource and product markets.
4. Draw and label a simple circular flow diagram.

INSTRUCTIONAL OBJECTIVES - CHAPTER 4 - THE MECHANICS OF
INDIVIDUAL PRICES:  DEMAND AND SUPPLY

1. Differentiate between demand and quantity demanded;
   and supply and quantity supplied.
2. State the Law of Demand and Law of Supple and graph
   demand and supply curves when given demand and supply
   schedules.
3. List the major determinants of demand and supply.
4. Explain and illustrate graphically the concept of
   equilibrium price and quantity.
5. Explain the effects of changes in demand and supply
   on equilibrium price and quantity.
6. Explain the effects of a price change for one good on
   the demand for its substitutes or complements.
7. Give an example of the rationing function of prices.
8. Explain briefly how concepts of supply and demand apply
   to resource markets.
9. Describe foreign exchange markets using supply and
   demand analysis.


INSTRUCTIONAL OBJECTIVES - CHAPTER 5 - THE PRICE SYSTEM AND
THE FIVE FUNDAMENTAL QUESTIONS

1. Explain how a competitive price system determines the
   answers to each of the five fundamental questions.
2. Explain the concepts of normal profit, economic cost,
   and economic profit, and explain that economic profit
   results in expanding industries and losses cause
   declining industries.
3. Identify the least-cost combination of resources when
   given technological data and the prices of resources.
4. Explain what is meant by the guiding function of prices.
5. State the major points in the case for and the case
   against the price system.


INSTRUCTIONAL OBJECTIVES - CHAPTER 6 - THE ECONOMIC
FUNCTIONS OF GOVERNMENT

1. Explain why the American economy is mixed rather
   than pure capitalism and list five economic functions
   of the government in the U.S.
2. Explain two ways that the government controls
   monopolies.
3. List three policies which redistribute income.
4. Explain what is meant by a "market failure" and give an
   example of a spillover cost and a spillover benefit.
5. Explain appropriate government action to promote
   spillover benefits and limit spillover costs.

6. Explain the terms "public good" and "exclusion principle".
7. Outline the stabilization function of government.


INSTRUCTIONAL OBJECTIVES - CHAPTER 7 - THE FACTS OF AMERICAN CAPITALISM:  THE PRIVATE SECTORS

1. Define, explain, and give relative importance of the five shares in the functional distribution of income.
2. Define and explain the personal distribution of income, and state the relative shares going to the top 20% compared to the bottom 20%.
3. State the three major categories of household spending or income disposition and relative shares of each.
4. Explain the terms durable goods, nondurable goods, and services.
5. Explain the difference between a plant, firm, and industry.
6. State the advantages and disadvantages of the three legal forms of business in comparative terms.
7. Explain the concept of limited liability.
8. State three facts which describe big business in the U.S.
9. State two major benefits of international trade and four examples of the economic impact of global trade and finance.


INSTRUCTIONAL OBJECTIVES - CHAPTER 8 - THE FACTS OF AMERICAN CAPITALISM:  THE PUBLIC SECTOR

1. List five causes of historical growth in government size.
2. Differentiate between government purchases and transfer payments.
3. For federal and state government, describe two major revenue sources and the two major categories of spending; for local governments describe the one major source of revenue and category of spending.
4. Define and explain the difference between marginal and average tax rates.
5. Define and state the importance of intergovernmental transfers.
6. Explain the difference between the ability-to-pay principle and benefits-received principle of taxation.
7. Define regressive, proportional and progressive tax rates and be able to recognize and give examples of each.

8.  State the probable incidence of personal income,
    corporate income, sales and excise, and property taxes.
9.  Explain why a general sales tax is considered
    regressive.
10. State two tax proposals to reduce the federal deficit.


INSTRUCTIONAL OBJECTIVES - CHAPTER 9 - MEASURING OUTPUT,
NATIONAL INCOME, AND THE PRICE LEVEL

1.  State the purposes of national income accounting.
2.  Compute GNP using the expenditures approach and the
    income approach.
3.  Differentiate between gross and net investment and
    explain why changes in inventories are investments.
4.  Discuss the relationship between net investment and
    economic growth.
5.  Compute NNP, NI, PI, and DI when given relevant data.
6.  Describe the system represented by the circular flow
    in this chapter given a copy of the diagram.
7.  Calculate a GNP price index using simple hypothetical
    data and find real GNP by adjusting money GNP using
    price indices.
8.  List seven reasons why GNP is not an index of social
    welfare.


INSTRUCTIONAL OBJECTIVES - CHAPTER 10 - MACROECONOMIC
INSTABILITY:  UNEMPLOYMENT AND INFLATION

1.  Explain what is meant by a business cycle and describe
    its four phases.
2.  Identify two types of noncyclical fluctuations in
    business activity.
3.  Identify the immediate determinant or cause of changes
    in levels of output and employment.
4.  Explain why the cyclical impact affects capital and
    consumer durable goods industries more than consumer
    nondurables.
5.  State causes of frictional, cyclical, and structural
    unemployment.
6.  Define the full employment or natural rate of
    unemployment.
7.  Describe how unemployment is measured by the Bureau of
    Labor Statistics and evaluate the strengths and
    weaknesses of these statistics.
8.  Identify the economic costs of unemployment and three
    groups which bear unusually heavy unemployment burdens.
9.  Define inflation and list two types of inflation.
10. Describe the predicted outcome of increased total demand
    on employment and inflation in ranges 1, 2, and 3 when
    presented with the diagram.

11. List three groups that are hurt and two groups that may benefit from unanticipated inflation.
12. Present three possible effects of inflation on output and employment.


INSTRUCTIONAL OBJECTIVES - CHAPTER 11 - MACROECONOMIC ANALYSIS:  AGGREGATE DEMAND AND AGGREGATE SUPPLY

1. Define aggregate demand and aggregate supply.
2. Give three reasons why the aggregate demand curve slopes downward and illustrate, label, and explain the three ranges of the aggregate supply curve.
3. Explain how a market economy moves to equilibrium price and output level.
4. Predict effects of increases in aggregate demand when the economy is in the Keynesian range, the intermediate range, and the classical range.
5. Explain the ratchet effect of a decrease in aggregate demand.
6. State four basic non-price-level causes of changes in aggregate demand and three basic non-price-level causes of changes in aggregate supply.
7. Predict the effects of increases and decreases in aggregate supply on real national output and the price level.


INSTRUCTIONAL OBJECTIVES - CHAPTER 12 - CLASSICAL AND KEYNESIAN THEORIES OF EMPLOYMENT

1. List three simplifying assumptions for the model in this chapter.
2. Explain the classical economists' view that all saving would be borrowed and spent for capital goods and their theory that price-wage flexibility would eliminate a recession and unemployment.
3. List two reasons why price-wage flexibility may not guarantee full employment and three reasons why the rate of interest may not guarantee equality of saving and investment.
4. Identify what determines the level of output and employment in Keynesian theory.
5. Explain how consumption and saving are related to disposable income.
6. Compute APC, APS, MPC, and MPS when given appropriate data and explain what happens to APC and APS as income increases.
7. List five nonincome determinants of consumption and saving and explain how a change in these determinants will affect consumption and saving schedules.

8.  List the two basic determinants of investment and explain what determines if a firm will invest or not.
9.  Compute the investment demand schedule given appropriate data and explain why investment spending and the rate of interest are inversely related.
10. List five noninterest determinants of investment spending and describe how these determinants will affect the investment demand schedule.


INSTRUCTIONAL OBJECTIVES - CHAPTER 13 - EQUILIBRIUM NATIONAL OUTPUT IN THE KEYNESIAN MODEL

1.  Find the equilibrium NNP by using either the aggregate expenditures-national output approach or the leakages-injections approach when given the necessary data
2.  Explain why the economy will ten to produce its equilibrium NNP rather than some smaller or larger NNP.
3.  Distinguish between planned investment and actual investment and explain how saving and actual investment are equal when saving and planned investment are not.
4.  Determine the economy's new equilibrium NNP when consumption, saving, or investment schedules change.
5.  Find the value of the multiplier when given data and two facts on which the multiplier effect is based.
6.  Explain the paradox of thrift.
7.  Distinguish between equilibrium NNP and full-employment non-inflationary level of NNP.
8.  Find recessionary or inflationary gaps when given data.
9.  Contrast the Keynesian expenditures-output and the aggregate demand-aggregate supply models in terms of variability of price-level and states of the economy (ranges along the aggregate-supply curve).
10. Identify the major determinants of a nation's exports and its imports and define aggregate expenditures in an open economy including the concept of net exports.
11. Find equilibrium NNP in an open economy when given data.
12. Describe the economic impacts of negative net exports and positive net exports and give three examples of how circumstances abroad can affect U.S. NNP.
13. Relate the aggregate expenditures and AD-AS models.


INSTRUCTIONAL OBJECTIVES - CHAPTER 14 - FISCAL POLICY

1.  Find equilibrium NNP in an economy with government purchases and net taxes when given the relevant data.
2.  Determine the effect on the equilibrium NNP when government purchases or net taxes change.
3.  Explain why the balanced-budget multiplier equals one.

4.  Differentiate between expansionary and contractionary
    fiscal policy and recognize the conditions for
    recommending one of these fiscal policies.
5.  Describe how to handle a budget deficit or a surplus.
6.  Distinguish between discretionary and nondiscretionary
    fiscal policy.
7.  Give two examples of how built-in stabilizers help
    eliminate recession or inflation.
8.  List three timing problems and three political problems
    that limit the effective fiscal policy.
9.  Explain and recognize graphically how crowding out and
    inflation can reduce the effectiveness of fiscal policy.


INSTRUCTIONAL OBJECTIVES - CHAPTER 15 - MONEY AND BANKING

1.  Explain the three functions of money and define the
    money supply, M1 and near-monies, M2, and M3.
2.  Explain why money in the U.S. economy is debt and who
    holds these debts in paper and checkable deposit form.
3.  State three reasons why currency and checkable deposits
    are money and why they have value.
4.  Describe the relationship between the value of money and
    the price level.
5.  Identify two types of demand for money and the main
    determinant of each.
6.  Describe the relationship between the determinants of
    money demand and each type of money demand.
7.  Explain what is meant by stabilizing the value of money
    and enumerate two policies government uses to do this.
8.  Explain what determines the equilibrium rate of interest
    and predict how changes in nominal GNP and the money
    supply will affect the equilibrium rate of interest.
9.  Describe the relationship between bond prices and
    interest rates.
10. Describe the structure of the U.S. banking system.
11. Explain why Federal Reserve Banks are central, quasi-
    public, and banker's banks.
12. Describe six functions of the Federal Reserve System and
    point out which role is the most important.


INSTRUCTIONAL OBJECTIVES - CHAPTER 16 - HOW BANKS CREATE
MONEY

1.  Recount the story of how fractional reserves began.
2.  Explain the effects of a currency deposit in a checking
    account on the composition and size of the money supply.
3.  Compute a bank's required and excess reserves.
4.  Explain why a commercial bank is required to maintain a
    reserve and why it is not sufficient to cover deposits.

5. Describe what happens to the money supply when a commercial bank makes a loan or buys securities and when a loan is repaid or a bank sells its securities.
6. Explain what happens to a commercial bank's reserves and demand deposits after it has made a loan.
7. Describe how a check drawn on one commercial bank and deposited in another will affect the reserves and excess reserves in each bank after the check clears.
8. Describe what would happen to a single bank's reserves if it made loans that exceeded its excess reserves.
9. Explain how it is possible for the banking system to create an amount of money which is a multiple of its excess reserves when no single bank ever creates money greater than its excess reserves.
10. Compute the size of the monetary multiplier and the money-creating potential of the banking system.

INSTRUCTIONAL OBJECTIVES - CHAPTER 17 - THE FEDERAL RESERVE BANKS AND MONETARY POLICY

1. List the principal assets and liabilities of the Federal Reserve Banks.
2. Explain how each of the three quantitative controls may be used by the Fed to expand and to contract the money supply and identify which is used most often.
3. Prescribe three monetary policies the Fed could use to reduce unemployment and three policies it could use to reduce inflationary pressures in the economy.
4. Explain the Keynesian cause-effect explanation of the link between monetary policy and changes in equilibrium NNP.
5. Illustrate using money supply and demand graphs how a change in the money supply will affect the interest rate.
6. Show the effects of interest rate changes on investment spending.
7. Explain a leakages-injections graph showing the effects of planned investment on the equilibrium NNP.
8. State how the steepness of the demand-for-money and the investment-demand curves affect the impact of a change in the money supply on equilibrium NNP.
9. Use an aggregate-demand aggregate-supply graph to show how changes in monetary policy affect the economy.
10. List four shortcomings and three strengths of monetary policy and explain the net export effect of an expansionary and a contractionary monetary policy.
11. Summarize the Keynesian theory of employment and the policies that may promote a full-employment noninflationary level of NNP.
12. Describe the problem of coordinating monetary and fiscal policy in Keynesian theory.

APPENDIX B

Typical Computer Assignment

COMPUTER ASSIGNMENT #1
9:00 SECTION
ECONOMICS 241 - PRINCIPLES OF MACROECONOMICS


Using graphics-based tutorials:

1.  How to Construct and Read a Graph
    a.  Complete the graph for the relationship between
        hours of study and grade on economics exam after
        the curve has been drawn on the screen.  Print this
        using the command PRINT SCREEN (in the upper right
        hand corner on your keyboard).
    b.  Print screen showing the graph of the relationship
        between the number of years of education and
        monthly incomes.
    c.  Print screen showing the graph of the relationship
        between hours of leisure and weekly income.

2.  Production Possibilities Curve
    a.  Using the second table in the tutorial, can 800
        widgets and 1,500 gadgets be produced?
    b.  If we produce 360 widgets and 400 gadgets, are we
        maximizing production?
    c.  Print screen showing the production possibilities
        curve plotted on a graph with widgets on the
        horizontal axis and gadgets on the vertical axis.
    d.  Given the four production possibilities curves on
        the screen, which graph shows the effect of an
        increase in land, labor, and capital, with no
        change in technology?
    e.  Print screen showing graph of goods for the present
        and goods for the future.

3.  Demand and Supply
    a.  Print screen showing graph of the relationship
        between price and quantity demanded.  This is the
        first graph shown on this tutorial.
    b.  If population increases, the demand curve would
        shift to the _____.
    c.  Print screen showing graph of the relationship
        between price and quantity supplied.
    d.  What happens to the price if a surplus exists?

4.  Work through the tests for chapters 1 through 5 at
    least three times.  Print out your performance
    evaluation each time.  You should have at least one
    grade of at least 80% correct before turning this part
    in.

**APPENDIX C**

Description of <u>Concept Master</u>

<u>Concept Master</u>

INTRODUCTION

<u>The Concept Master</u> is an interactive instructional software package containing three major elements:

    (1)  Graphics Based Tutorials
    (2)  Examinations
    (3)  Simulations

The objective of <u>The Concept Master</u> is to utilize the strengths of the textbook and to concentrate on areas of analysis and techniques involving graphical functions that students often find troublesome.

The Graphics Based Tutorials emphasize topics which lend themselves to visual or graphical representation, supported by appropriate explanation. Included in the Tutorials are such subjects as how to read a graph, basic supply and demand analysis, market models, and comparative advantage.

The Examinations component of the program includes a substantial bank of new multiple choice questions from which students can generate tests to monitor their own performance. Questions for every chapter in the textbook are included and are keyed to the text. Tests are randomly generated and can be made up of questions from one or more chapters. The student receives a performance report at the end of the exam that includes an overall grade, a grade by chapter, and page references for any questions missed.

The Simulations feature realistic situations covering both micro and macro subjects. They are designed to emphasize selected concepts in a lively manner and to maintain student interest.

<u>Components of the Program</u>

GRAPHICS BASED TUTORIALS

The Graphics Based Tutorials cover specific issues discussed in the text and make profuse use of graphs to explain and illustrate concepts under review. As part of the review, students are asked to answer a series of questions and receive a hint either upon request or if they initially answer a question incorrectly.

If students respond correctly, they receive on-screen acknowledgement. If students answer incorrectly twice, the right answer appears on the screen and remains there for 10 seconds, permitting time for the student to examine it. If less time is sufficient, hitting the RETURN key will bring up the next screen.

The program keeps track of right and wrong answers and provides students with a score at the end of the tutorial. Concept Master does not keep a permanent record of student scores.

Several tutorials require students to be familiar with material from more than one chapter in the text. At the beginning of each tutorial, the introduction specifies the material that should have been covered before the tutorial is attempted. A list of tutorial titles, the chapter(s) in the textbook that the tutorial covers, and the total number of questions contained in each tutorial can be found in the section of this manual that describes the three versions of the program.

EXAMINATIONS

The Concept Master examination program contains a data base of 20 multiple choice questions for each chapter in the text. Each question includes a page reference to the text from which the question is drawn. A single examination can have up to 11 chapters and 88 questions at one time. Because tests are randomly generated, several versions of a test can be generated and students are unlikely to have the sam questions if they take a retest on the same material.

After each question is answered, the correct answer is highlighted and, if the student's response is wrong, a test page reference is displayed. At the end of the test, an on-screen evaluation of student performance is presented which shows the percent correct by chapter as well as the overall percent correct. Page references to questions missed are presented on screen and may be printed out if the student wishes.

APPENDIX D

Student Demographic Questionnaire

## STUDENT QUESTIONNAIRE

Please answer the following questions as completely as possible.

1. How old are you? _____

2. What is your college Grade Point Average? _____

3. What was your score on the ACT test? _____

4. What was your high school Grade Point Average? _____

5. Are you majoring in business? _____

6. Did you have economics in high school? _____

7. What is your classification in college?

    a. Freshman \_\_\_\_\_
    b. Sophomore \_\_\_\_\_
    c. Junior \_\_\_\_\_
    d. Senior \_\_\_\_\_

APPENDIX E

Review Letter from Research Ethics Committee
for Human Subjects

TO:        Ms. Mary Lewis Haley
           Economics

FROM:      Peter Heller PH
           Chair, MTSU Research Ethics Committee

RE:        Review:  Use of Human Subjects

Date:      April 15, 1991

    The purpose of this memo is to inform you that the MTSU
Research Ethics Committee has favorably evaluated your
research proposal entitled, "Effect of . . . Instruction . .
. Experimental Course Design" in terms of its ethical
utilization of human subjects.  Best of luck on the
successful completion of your project.

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