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EFFECTIVE USE OF MICROCOMPUTERS FOR ELEMENTARY SOCIAL STUDIES

A Thesis

Presented to the
Department of Elementary Education
and the
Faculty of the Graduate College
University of Nebraska

In Partial Fulfillment
of the Requirements for the Degree
Masters of Arts
University of Nebraska at Omaha

by

Steven Richard Hanks

December 1984

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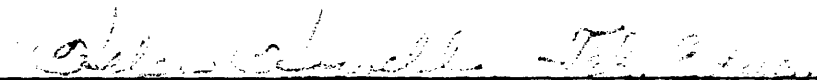


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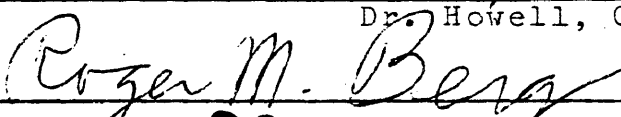
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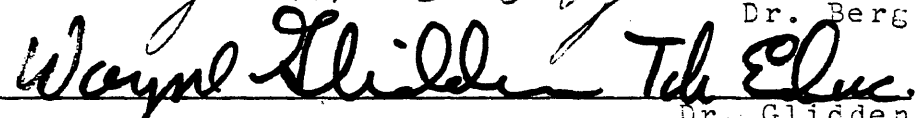
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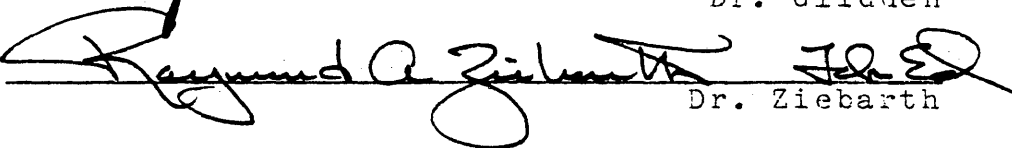
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EFFECTIVE USE OF MICROCOMPUTERS FOR ELEMENTARY SOCIAL STUDIES

CHAPTER I

INTRODUCTION

The use of computers in the classroom is still a very new development in education. In fact, computers themselves have been around only for about thirty-five years. The incredible growth in the technology of computers is almost impossible to fathom. Modern computers are not only faster and "smarter," they are smaller and cheaper. Shane (1982) pointed out that if a Rolls Royce had become as cost efficient as computers and had its price reduced accordingly, it would cost only three dollars.

Background

Computers first came into being in the fifties. They were constructed with vacuum tubes and were extremely large. Universities and businesses had to convert entire

buildings to house these ponderous computing devices. An emphasis in advanced technology due to the space race quickly changed this. Since size and weight are very important in space travel, scientists have spent a great deal of time and energy in designing more efficient ways of doing things. One end result has been the silicon chip. The silicon chip is smaller than a fingernail, yet it replaces hundreds of large and cumbersome vacuum tubes. Due to the conversion to silicon chips, computers that would have filled gymnasiums have been reduced in size and price and are now small enough to fit on a desk top. Although government and big business were the first to take advantage of the new technology, its impact on the consumer market soon followed. When manufacturers began making the table top or microcomputer, machines that had cost in the tens of thousands of dollars became affordable to both individuals and small groups.

Statement of the Problem

Educators now have available to them a wide array of microcomputers and software. Questions have arisen as to proper utilization of microcomputers in the classroom. Microcomputer uses include record keeping, skill

development through drill, tutorials, problem solving, games, creative writing, and simulations. In the past, educators used non-computer simulation games with entire classes. These simulations provided students with opportunities to use their knowledge and abilities in real-life situations and to develop decision making skills. Problems with simulations arose often in the areas of; 1.) presentation - due to differences in teaching styles and learning styles of students, and 2.) the response of individual students to group dynamics. In contrast, computer simulations provide consistent presentations and allow each student the opportunity to participate actively without group pressures. Microcomputers also enable each student to work at his/her own pace allowing for learning style differences.

Statement of the Purpose

The purpose of this study was to attempt to answer the following question. Is the achievement of fifth and sixth graders in learning factual information in economics enhanced by the use of microcomputers? Three secondary purposes were also explored: 1) Does the use of simulations with materials in economics affect achievement

levels of fifth and sixth graders? 2) Does the use of the microcomputer in the teaching of economics affect the growth of high achievers more or less than low achievers? High achievers are defined as those students who score higher than the 90th percentile on the California Achievement Test and low achievers are students who score lower than the 50th percentile on the same test. 3.) Does the use of microcomputers in the teaching of economics cause differences in achievement levels between males and females?

Delineation of the Research Study

This study will compare the achievement levels of three groups of fifth and sixth graders with different learning experiences in economics. One group used three computer simulations, "Sell Apples," "Sell Plants," and "Sell Bikes," designed by the Minnesota Educational Computer Consortium. The second group followed the regular school district curriculum using the ETV program "Trade-Offs." The last group was a control group and received no instruction in economics. Lesson objectives were the same for the ETV and Computer groups.

The group working with the computers did the following:

1. Took the Pretest (BET Form A)

2. Did all three simulations
3. Took the Post Test (BET Form B)

The group following the regular school curriculum did the following:

1. Took the Pretest (BET Form A)
2. Did three "Trade-Offs" lessons
3. Took the Post Test (BET Form B)

The control group did the following:

1. Took the Pretest (BET Form A)
2. Waited three days to negate any learning gained during the Pretest
3. Took the Post Test (BET Form B)

Comparisons made of achievement levels on the Basic Economics Test at the beginning and at the end of the learning unit compared initial knowledge with learned knowledge to test the hypotheses.

Statement of Hypothesis

The following hypotheses were formed:

1. There is no significant difference between the mean achievement growth on the Basic Economics Test from

Form A (Pretest) to Form B (Post Test) of the Control group and the other two research groups (the ETV and Computer groups).

2. There is no significant difference between the mean achievement growth on the Basic Economics Test from Form A (Pretest) to Form B (Post Test) of students using simulations (the Computer group) and those using "Trade-Offs" (the ETV group).

3. There is no significant difference on the Basic Economic Test from Form A (Pretest) to Form B (Post Test) between the mean achievement level of students using microcomputers that score in the 90th percentile or higher on the California Achievement Test and students using microcomputers that score less than the 50th percentile on the California Achievement Test.

4. There is no significant difference on the Basic Economics Test from Form A (Pretest) to Form B (Post Test) between the mean achievement level of males and females using microcomputers.

Criteria for the Hypothesis

The criteria for these hypotheses were based on research in related articles and district policies. The school district designated in the study used the 90th

percentile on the California Achievement Test as a minimum guide for testing students for gifted programs. Although this does not imply that all students who score above the 90th percentile were in fact gifted, this served as a reference point. In contrast, the school district used the 50th percentile on the California Achievement Test as a maximum score for inclusion of students in the remedial reading program. Again, this was not meant to label students, but rather was used as a reference point. The comparison of males and females was included because research indicated gender biases in the study of economics (Chizmar and Halinski, 1981) and also in computers (Shane, 1982).

Definition of Terms Used

Achievement Levels--percentile ranks as obtained from the CAT and from the BET as described in the respective manuals for examiners.

Apple--the microcomputer made by the Apple Corporation.

BET--Basic Economics Test.

CAT--California Achievement Test.

CAI--Computer-assisted instruction.

CBI--Computer-based instruction.

CMI--Computer-managed instruction.

Simulation--type of computer program in which the computer-user must make a series of decisions which have an effect on the outcome of the program.

High Achievers--as defined by the school district involved in the study, students who score higher than the 90th percentile on the California Achievement Test.

Low Achievers--as defined by the school district involved in the study, students who score lower than the 50th percentile on the California Achievement Test.

MECC--Minnesota Educational Computer Consortium.

Software--programs recorded on disc or cassette for computer use.

Scope and Limitations of the Study

This study was limited to one economics unit for fifth and sixth graders and encompassed six to ten days. It was confined to three schools within a single school district. There were only three simulations used and three "Trade-Offs" tapes used. The population was relatively homogeneous in terms of culture (see Table I in Chapter III) and therefore any conclusions derived are narrow in scope. The computer materials were relatively new and untested. Also, the teachers using the computer materials were inexperienced in the use of microcomputers. The BET was designed with "Trade-Offs" as one method of

teaching. This could indicate a bias on the BET for the group using "Trade-Offs." The BET manual includes tables with norms for this teaching technique which were used in the study.

Organization of the Study

Chapter II is a survey of related literature in the areas of microcomputers and economics. A detailed description of how the study was planned and conducted is found in Chapter III. Chapter IV describes and interprets the analysis of the collected data. The summary of the data and the conclusions reached form the content of Chapter V. This is followed by the Bibliography and Appendix A. The Bibliography is the standard listing of selected reference materials. Appendix A is a series of tables with all data collected and listed by each research group (ETV, Computer and Control) and each sub-group (for example, males in ETV).

CHAPTER II

REVIEW OF RELATED LITERATURE

Publishers have discovered that computers are a very popular and profitable subject. From Time to Educational Technology, cover stories and entire issues have been devoted to this subject. Before initiating this study, library research was conducted in the area of related literature. Periodic guides produced a multitude of articles on computers. The topics ranged from buying guides to software reviews. Because of the emphasis of this study, the research base was confined to the following categories:

1. Microcomputers in the classroom.
2. Computer simulations and Software.
3. Economic education.
4. Related studies.

Microcomputers in the classroom include information articles that cover the general area of this study. The category, computer simulation and software is more specific and covers the materials that were utilized in this. Economic education is the curriculum area tested

in this study. Related studies are any research studies that are connected with computers.

Microcomputers in the Classroom

There were scores of books and articles on the subject of microcomputers in the classroom. Therefore, it was important to take a broad overview of the subject to note any specific trends that may have affected this study.

Time magazine did a cover story on microcomputers (Golden, 1982) which brought out some astute points. The interviewed students from New Jersey, New York and Minnesota demonstrated three characteristics: lack of fear of the new technology, no preconceived notions, and a great deal of excitement. The Golden article also dealt with the growth of computers in the country and how the growth affected some schools. It further described some computer "camps" where parents send their children for a week to become immersed thoroughly in computer knowledge. This article pointed to the tremendous growth of microcomputers and the need for schools to be involved in their proper usage.

While the Time article was concerned primarily with the present status of microcomputers, it was important to investigate predictions about the future by some of the experts. Shane (1982) predicted that by the year 2000, the U.S. will have to retrain 50% of its workers in the use of computers. Schools will be expected to take an active role with this training.

Laurel Dickerson and William Pritchard (1981) looked into a future classroom in which computers will play a primary role. They called for planning by educators to support this scenario. They further reported the findings of a questionnaire which stated that educators fully expected computers to be an intergal part of the curriculum. It was reported that 60% of Florida school districts have computers but less than 40% of these districts provided or supported formal training for teachers. The article contended that planning is needed, but no procedural suggestions were offered.

Ronald Saltinski (1981) contended that there are two areas of computer usage, statistical analysis and simulation. Saltinski believed that sociological and psychological studies could be made less tedious by the

utilization of the microcomputer. As to simulation, Saltinski cited the example of a program that simulated the operation of a nuclear power plant; an experience that could not be duplicated in a classroom in a way other than with a computer. Having to make decisions forces the student to learn a certain amount of information. These contentions seemed valid, but, they were not substantiated by any data.

It should be noted that most of the information relating to the study topic was found in journals and through an ERIC search. Only two books were discovered which were pertinent and parts of them were already antiquated. This provides an example of the speed of obsolescence in the computer field. Both books used a great number of generalities when discussing the strong and weak points of computers, indicating that research needs to be conducted in order to test these generalities.

Computer Simulations and Software

Investigating this strand of the research base produced interesting results. A great deal of information

has been written about computer simulation. Apparently, authors such as Ahl (1980) and Klassen (1982) feel that simulation is an excellent way to use the microcomputer. In fact, no negative articles surfaced at all. This was most interesting since there are no concrete results to substantiate the assertions made. The authors were touting simulations based upon intuition rather than research.

Despite the lack of concrete substantiation, seemingly valid generalizations were made. Klassen, Boocock (1968), and Ahl agreed that simulations force the student to learn a certain amount of knowledge in order to use the simulation successfully. They also stated that the student must use higher levels of thinking in order to be successful with the simulation. Using the Taxonomy devised by Bloom as a model of intellectual development, it appeared that students using simulations would be thinking on the levels of application, analysis, and synthesis rather than just knowledge and comprehension.

Goles (1983) also supported the idea that computer simulation can promote higher levels of thinking. This report analyzed and reviewed programs for possible

educational use. Cohen discussed various educational software for Social Studies. The only programs mentioned for elementary economics were the Minnesota Educational Computer Consortium (MECC) programs which were used in this study. The abundance of articles by authors such as Cohen (1982) and Troutner (1982) describing different types of software such as the MECC programs served to point out the need for concrete evidence to support the assertions that computer simulations are educationally sound.

Economics Education

While investigating this strand of the research base, one theme seemed to permeate the literature. It was a desire on the part of teachers for more training and materials. The national survey by Clark and Barron (1981) delineated this point. The report stated that the teaching of economics has spread across the country; however, eighty-one percent of the teachers surveyed felt the need for more materials and over half wanted some training.

To meet this need, Joanne Troutner (1982) produced a week-long lesson plan on consumer education utilizing "Trade-Offs" and a computer simulation that was unnamed but, sounds remarkably similar to "Sell Bikes." Troutner has integrated into her lessons, two aspects of this study which were used by different groups. Although no testing was done to prove effectiveness, it was interesting to note that educators are investigating the materials used in this study.

"Trade-Offs", the teaching tool, also was carefully studied by Walstad (1980). These educational television programs were shown to have a positive impact on student achievement levels in economics. Additional teacher training was also shown to have a definite effect on test results. The study by Walstad was very competent and indicated careful research to substantiate his findings.

Despite finding information concerning materials being used for this study, a lack of research in computers and economics was apparent. The only study located that was even remotely related concerned computer managed instruction. Marlin and Niss (1982) detailed a study utilizing individualized instruction managed by a microcomputer. The study was significant in showing that gifted and below average students had higher success with

this program than the gifted and below average students who received lectures.

Related Studies

An enormous amount of literature has been written about computers in education. To publish such material new magazines have been created as Creative Computing, Popular Computing, Computers in the Classroom, and Computers and Education. Other journals such as Educational Technology and Mathematics Teacher also have focused their attention in this area. Despite the seeming wealth of articles, few well-researched studies in the area of microcomputers were found. This could be due to the newness of the subject matter and the difficulty in obtaining reasonable samples. An ERIC search produced only two research studies. This fact alone seemed to point up the need for further research.

Gershman and Sakamoto (1981) completed a case study on a CAI project in a Canadian secondary school. Described were the different course features, the evaluation used, and the statistics gathered. Since it was a case study, no control group was used and therefore

it was difficult to evaluate the results. However, an attitude survey was given with results which showed a very positive attitude about CAI.

In a study of a drill and practise type of CAI and mathematics by Burns and Bozeman (1981), results demonstrated that students using computers scored higher than those using traditional methods. The sample population was not described which limited generalizations of the results. Despite this drawback, the study seemed to support the idea that CAI does help mathematics achievement.

The third study was an excellent example of a good research. Carmen and Kosberg (1982) reported that emotionally-handicapped children could learn mathematics concepts faster with the computer, but failed to prove that they would be able to maintain the accelerated rate. It was not clear whether this was a problem with software or with the usage of microcomputers. This study was important because it showed the computer used by people other than the gifted or talented.

An ERIC search produced two studies of importance to the topic of this study. A study by Boocock (1968) on simulation games and learning reinforced the assertion

that simulations are educationally viable. Another study on computer simulation in high schools by Marian Visich, Jr. (1982) found that simulations make a significant contribution to learning.

The last article was also the most interesting. G. Bracey in the Nov./Dec. 1982 issue of Electronic Learning wrote about research being done by James Kulik at the University of Michigan. The article made a very positive endorsement of computers in the classroom. Many studies were cited that pointed out the positive aspects of CAI and CBI. The author also indicated that research showed that students learn more and faster with computers, but that researchers cannot conclude why. Based on a poll of researchers, Bracey found that most research in the area of microcomputers in the classroom delved into the area of "why" computers might be more effective rather than providing evidence as to the actual effectiveness of CAI. It is unfortunate that the author did not include any details concerning any specifics of the research. Bracey concluded that there are a number of questions still open about using computer simulations in the classroom.

CHAPTER III

METHODOLOGY

This study was conducted in a suburban school district near Omaha, Nebraska during the spring of 1983. Because of school district policy, pseudonyms were used for the names of the actual schools used in the research.

Population

The population for this study was taken entirely from one school district. This school district is unlike other districts in the area in that it is still growing. There were new schools opened in 1981 and 1982. The schools used in this study were relatively large and housed suburban children of above average abilities (see Tables 1 and 2).

TABLE 1

Descriptions of Participating Schools			
Figures Indicate Number of Students			
	Nepaug Control	Pleasant Valley ETV	Bakerville Computer
School Population	575	575	669
Total Sixth Grade	37	67	91
Total Fifth Grade	80	93	89
Chapter I Reading	0	40	47
Chapter I Math	0	35	48
Minority Percentage	0	0	0
Students by CAT Score			
91-99	12	24	27
50-90	22	111	56
1-49	5	20	23
Students in Study	39	155	106

TABLE 2

Comparisons of California Achievement Test Scores
 Figures are the Mean for Participating Students

	Nepaug Control	Pleasant Valley ETV	Bakerville Computer
Total Test	75.28	70.08	70.79
Ref. Skills	77.71	72.14	71.07
TNP	69.66	64.62	64.74
Students in Study	39	155	106

In all three schools, the same curriculum was followed. There was flexibility in this curriculum so students could study things at different times of the year. The teachers involved in the study were very cooperative in scheduling so that all activities were completed in all schools within a two month period of time.

The three schools shared some basic similarities in meeting the needs of the enrolled students. All were departmentalized for science and social studies and ability grouped for mathematics reading and language. The texts used were the same in all buildings. No students used in this study were bussed. This fact reinforced the idea that these were "neighborhood" schools.

Physically, there were some differences in these buildings. Nepaug was the only two-story elementary building in the district and was an open plan building. Bakerville was also an open plan building but it was on one floor. Pleasant Valley was quite different in that it was built with self-contained classrooms and the building had a more "traditional" look.

In the spring of 1982, Bakerville Elementary School obtained its first Apple computer. Several staff members

took classes in computer literacy and in BASIC. Programs were borrowed and tried and others purchased. Despite this enthusiasm, there were no guidelines available as to the most effective use of the computer. Therefore, with permission of the school district administration, this study came about in the spring of 1983.

During the school day, students in all three schools had the following subjects or classes:

1. Mathematics
2. Reading
3. Language
4. Science
5. Social Studies
6. Gym or Music

Economics was taught in the social studies period which was usually in the afternoon.

Methods

Control Group

The control group at the Nepaug School was composed of 39 fifth and sixth graders. The students were selected

at random by their teachers. The students at Nepaug School (hereafter referred to as the Control group) took the Basic Economics Test Form A during the first week of March. This was conducted on two Apple computers. The BET test was not rewritten, but just put into computer format and corrected and graded by the computer. The students then used the computers for other activities not related to the study for three days. At this point, the classes took the BET Form B again on the Apple computers. There was no instruction in economics before or during this period of time.

Experimental Group 1

Pleasant Valley served as the first experimental group. The group (in this study referred to as the ETV group) was composed of 155 fifth and sixth graders. This constituted all students in these grades. The ETV group took the BET Form A during the third week in April. The BET test booklet was used and the tests were hand graded. The classroom teachers then proceeded with "Trade-Offs" lessons 13-14 for the sixth grade and lessons 10-12 for the fifth grade. The teachers did the suggested activities that were in the ETV manual and held discussions

as suggested. Following all three lessons, the BET Form B was administered to the fifth and sixth graders. The tests and lessons were carried out entirely in each individual classroom.

Experimental Group 2

All of the students at Bakerville Elementary (hereafter referred to as the Computer group) did not take the BET tests at the same time. Because of a limited number of Apple computers (five were used), the fifth grade completed the computer simulations during the last two weeks of April and the sixth during the first two weeks of May. Both groups followed the same sequence and were given the BET Form A on the Apple computer, the same test taken by the Control group.

After they completed the test, they were given packets of worksheets taken from the MECC manual (that coincided with the simulations used). The worksheets were color coded according to usage. Blue sheets were completed or read before any simulations could be started. The red sheets were completed during the simulations and the yellow worksheets were done at any time.

After the worksheet packets were introduced and explained, the simulations were presented. Each

simulation was gone over with an entire class on a large screen television by each teacher. Although each student had an instruction sheet prepared by MECC, this explanation was deemed necessary by the teachers involved. After all explanations were given, the students began work on their packets and the simulations.

The students were allowed twenty minutes on the computer at a time while doing the simulations. Most students worked in pairs. While awaiting a turn at the keyboard, the students worked on their MECC worksheets and on other dittos that were not related to the economics unit. When all of the students had several experiences with all of the simulations, the BET Form B was administered on the computers. This entire unit was completed by each group in a two week time period.

Materials

Control Group

The students at Nepaug Elementary school used Apple computers and the BET Form A and B adapted for the

computer. Since this was the Control Group, no economic lessons were taught before or during this study.

Experimental Group 1

The ETV group used two sets of materials. The standard BET test booklet was used for the Pretest and Post Test although a ditto was made for the answer sheet. There were enough test booklets so that every child had one. The "Trade-Offs" lessons were on video tapes. Teachers utilized them at their discretion. Each grade level had three half-hour programs to watch. The programs consisted of short dramatizations of a specific economic principle. This was followed by group discussion. Each teacher had an ETV guide to assist them with this discussion.

Experimental Group 2

The Computer group worked with Apple computers. First, they used the BET that was adapted for the computer. Then, they used the simulations.

There were three MECC simulations used, "Sell Apples," "Sell Plants" and "Sell Bikes." "Sell Apples" was a very user-friendly program. The computer guided the student through some decisions he or she had to make in the sale of some apples. "Sell Plants" was very similar

in that it was also user-friendly. They both stressed ideas about advertising and its effect on sales as well as selecting the best price for the product. "Sell Bikes" was a much more complex program and less user-friendly. Without directions or an instruction sheet, it was too difficult to use this program. However, this program as well as the others included instructional guides and worksheets from MECC.

Tests

The Basic Economics Test (BET) was used in this study as it was the only nationally normed test located in the area of economics. A nationally normed test contributed substantiality to this study. The test itself is composed of 38 multiple choice questions and has two forms. The questions cover the cognitive categories of knowledge, understanding and application. Form A was given as the Pretest and Form B was the Post Test.

Summary of the Chapter

The following statements summarize this chapter. The population used in this study was from a suburban district

outside a mid-western American city. The study was conducted in three schools using computer simulations in one experimental group and educational television programs in the other experimental group. The control group students received no instructions in economics, they completed the pretest and the post test only. The pretest and post test used were the BET Form A and B.

CHAPTER IV

STATISTICAL ANALYSIS OF THE DATA

This chapter presents and interprets the information generated by this study. The results of the pretests and post tests were submitted to statistical analysis in order to test the hypotheses.

Pretest

The pretest was the BET Form A. The scores were well above the national average according to the percentile scores. The averages were 68 for the control group, 77 for the ETV group and 68 for the computer group. These figures came from the BET manual using the raw scores obtained in the pretest. There were no difficulties in conducting the test. The raw scores and percentiles are shown in Tables 3 and 4.

Post Test

The post test was the BET Form B. The scores on this test showed a drop in percentile scores from the pretest. The averages were 61 for the control group, 68 for the ETV group and 44 for the computer group. These results seem

TABLE 3

Comparison of the Mean For BET Raw Scores by School			
	Nepaug Control	Pleasant Valley ETV	Bakerville Computer
Pretest	20.05	22.08	20.21
Post Test	19.87	23.36	18.96
Difference	-.13	.35	-1.26
Significance level	.14	1.19	1.26
Level needed for Significance	1.671	1.658	1.671
Number of Students	39	155	106

TABLE 4

Comparison of the Mean For Percentile Scores of the BET
By School.

	Nepaug Control	Pleasant Valley ETV	Bakerville Computer
Pretest	68	77	68
Post Test	61	63	44

substantial, however when the raw scores were analyzed there was no statistical significance in the difference from the pretest to the post test. Tables 3 and 4 show these percentile scores as well as the raw scores.

Statistical Tests

There were several statistical tests utilized in this study. The measure of central tendency was the mean. The measure of variability was the standard deviation obtained through the whole score method. The level of significance was obtained through the t-test with the degrees of freedom varying with each group and with $p < .05$. These particular statistical methods were used because of the size of the population and the items to be analyzed. Appendix A contains a complete listing of all statistics for each major group (i.e. all males and all females) and all sub-groups (i.e. males in the control group and males in the experimental group). The BET manual (Chizmar and Halinski, 1981) provided tables to convert the raw scores to percentiles. Percentile scores were used only in the first two sections of this chapter, raw scores were used unless otherwise noted. The reason raw scores were used instead of percentiles was that the pretest scores would have had to have been read in the BET manual on the column

marked "Without Instruction" for Form A. The Post Test would have had to have been read in the column marked "With Instruction" for Form B. The phrase "With Instruction" is vague and undefined. Therefore it was determined that raw scores would be used to measure growth.

Examination of the Hypotheses

Four hypotheses were presented in Chapter I and were examined individually for acceptance or rejection.

1. The first hypothesis stated that there is no significant difference between the mean achievement growth of the three research groups on the BET from pretest to post test. Based on the information obtained and illustrated in Table 3, this hypothesis is accepted as no group made any statistically significant growth.

2. The second hypothesis stated that there is no significant difference between the mean achievement growth of students using simulations and those using "Trade-Offs" on the BET from the pretest to the post test. Based on the data obtained and illustrated in Table 3, this

hypothesis is accepted as no group made any statistically significant growth.

3. The third hypothesis stated that there is no significant difference on the BET from the pretest to the post test between the mean achievement level of students using microcomputers that score higher than the 90th percentile on the CAT and students using microcomputers that score less than the 50th percentile on the CAT. Based on the information obtained and illustrated in Tables 5 and 6, this hypothesis is accepted as no group made any statistically significant growth.

4. The last hypothesis stated that there is no significant difference between the mean achievement level of males and females using microcomputers on the BET from the pretest to the post test. Based on data obtained and illustrated in Tables 7 and 8, this hypothesis is accepted as no group made any statistically significant growth.

Summary of Chapter

The results of the pretest and the post test were described and the statistical measures were delineated. Based on these results, all hypotheses as outlined in Chapter I were accepted. The data obtained indicated no statistically significant growth in any group comparison.

TABLE 5

Comparison of the mean for the BET Raw Score for those students that scored higher than the 90th percentile on the CAT

	Nepaug Control	Pleasant Valley ETV	Bakerville Computer
Pretest	22.5	25.7	24.62
Post Test	21.91	26.45	24.44
Difference	-.59	.75	-.19
Significance level	.4	.54	.16
Level needed for			
Significance	1.717	1.684	1.684
Number of Students	12	24	27

TABLE 6

Comparison of the Mean for the BET Raw Score for those students that scored lower than the 50th percentile on the CAT

	Nepaug Control	Pleasant Valley ETV	Bakerville Computer
Pretest	13.19	17.79	17.08
Post Test	12.8	16.75	16.91
Difference	-.4	-1.05	-.13
Significance level	.32	.8	.14
Level needed for			
Significance	1.86	1.697	1.684
Number of Students	5	20	23

TABLE 7

Comparison of the Mean for the BET Raw Score for Males

	Nepaug Control	Pleasant Valley ETV	Bakerville Computer
Pretest	20.52	22.79	20.62
Post Test	20.66	23.19	19.55
Difference	-.14	.4	-1.08
Significance level	.09	.35	.94
Level needed for			
Significance	1.634	1.658	1.671
Number of Students	21	71	54

TABLE 3

Comparison of the Mean for the BET Raw Score for Females

	Nepaug Control	Pleasant Valley ETV	Bakerville Computer
Pretest	19.5	21.48	19.78
Post Test	18.94	23.5	18.34
Difference	-.56	2.02	-1.45
Significance level	.4	2.01	1.18
Level needed for			
Significance	1.697	1.645	1.671
Number of Students	18	34	52

CHAPTER V

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary

Computers are becoming more and more an integral part of everyday life. Teachers are being given the opportunity to utilize this tool in their classroom. There are many kinds of software available to use with the computer, but what is most effective has not been determined. Reports that have appeared present many possibilities, but most reports are subjective and lack any statistical evidence.

The purpose of this study was to compare growth in achievement levels of students using computers with students using traditional methods of learning. Research in related literature seemed to indicate that simulation was the area to investigate. Further investigation pointed to using Economics as the subject area as there exists three computer simulations, a short economics unit already in the curriculum, and a nationally normed test.

The null hypotheses developed were the following:

1. There is no significant difference between the

Mean achievement growth of the three research groups on the BET from Form A to Form B.

2. There is no significant difference on the BET between the Mean achievement growth of students using simulations and those using "Trade-Offs."

3. There is no significant difference between on the BET the Mean achievement growth of students using microcomputers that score in the 90th Percentile or higher on the CAT and students using microcomputers that score less than the 50th Percentile on the CAT.

4. There is no significant difference on the BET between the Mean achievement level of males and females using microcomputers.

Materials were then purchased and two other schools were contacted. Permission was obtained from the administration and the teachers to conduct the study. At the two Experimental schools all fifth and sixth graders were involved. Teachers at the control school randomly selected students for participation.

The study formally began in the spring of 1983. The control group received no economics instruction, its students took the pretest then waited three days and took the post test. The first experimental group took the

pretest, watched the appropriate "Trade-Offs" programs, and took the post test. The second experimental group took the pretest, did the simulations and accompanying packets, and then took the post test.

Conclusions

Extreme care must be taken when interpreting the results of this research to avoid invalid generalizations. The conclusions presented in this study can be applied only to the population tested or one of similar economic, sociological, and intellectual make-up.

The results of the pretests and post tests confirmed the null hypotheses put forth in this study. Analysis of the data showed that there was no statistically significant growth of the mean from the pretest to the post test in the control group or the ETV group or the computer group. There was no statistical difference in growth in the mean from the pretest to the post test for males as compared to females. And finally, there was no statistical difference in growth for either high achievers (according to the CAT) or low achievers.

In Chapter I, four questions were posed in the Statement of the Purpose. The first question asked whether

the use of microcomputers would enhance the learning of factual information. According to the test results, the answer was no. However, since using more conventional methods also brought a negative answer, the results are inconclusive. The second question, does the use of simulation affect achievement levels, had the identical result as the first, inconclusive and for the same reasons. The third question asked if there was any difference in growth for high achievers versus low achievers. The answer was that there was no difference in achievement level in either group. The final question asked if there was any difference in achievement levels between males and females. There was no difference in growth for the groups using the computers however, the group using ETV was different. The only sub-group that had any statistically significant growth was the ETV female group (see Table 8). However, this was not part of any of the hypotheses.

Recommendations

Although there is no statistically significant growth by any of the groups, the following recommendations were made.

1. This project needs to be repeated with a different test. The BET is a competent device, but it is not sensitive enough for short term studies such as this. As

Table 9 indicates (in Appendix A), the mean of the study group was above the national norms in both the pretest and the post test. However, the growth was only .19 for the study group and 2.0 for the national norm.

2. It is difficult to determine the positive effect simulations have on achievement levels. A research study on computer simulations could be very useful.

3. Although it was not the focus of this study, it was found that the computer was extremely useful in managing instruction (CMI). The researcher corrected all 300 tests. The tests at Bakerville (computer group) and Nepaug (control group) were on computer and were compiled in minutes. Pleasant Valley's tests (ETV group) were on paper and took over eight hours to compile. This is a significant difference.

4. The statistics did not show that either ETV or the computer was the better method of teaching. Therefore it could be assumed that use of the computer could be as effective a method of teaching as more traditional methods. After the post test was given in all groups, the teachers were questioned informally about the attitude of the students regarding the lessons. The students at Pleasant Valley (ETV group) were indifferent toward the "Trade-Offs" program. However, at Bakerville (computer group), students were coming in (at their own request) at recesses and after school to do their lessons on the computer. Part of this enthusiasm can be attributed to the computer and the

Hawthorne Effect. However the extent of this enthusiasm seemed to indicate that this method is valid. Attitude inventories or questionnaires perhaps could provide more definite information.

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BIBLIOGRAPHY

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APPENDIX A

TABLE 9

Comparison of the Mean for All Groups and the National Norm		
	Study Group	National Norms
Pretest	21.15	17.76
Post Test	21.35	19.76
Difference	.19	2.0
Significance	.24	9.3
Number of Students	300	4,462

KEY FOR STATISTICAL INFORMATION

- A-Name of group
- B-These scores are the number of correct answers per category.
- C-Questions in knowledge category as determined in BET manual.
- D-Questions in Understanding category from BET.
- E-Questions in Application category from BET.
- F-New questions developed by researcher.
- G-Total of Knowledge, Understanding, Application and New questions.
- H-Total of just BET without New questions.
- I-Number of students in group.
- J-Mean of CAT Total score.
- K-Mean of Reference Skills score on CAT.
- L-Mean of Mental Age for group from CAT.
- M-Mean of Chronological Age for group from CAT.
- N-Mean of TNP score from CAT.
- O-Ratio comparing the Mean of the Pretest and the Mean of Mental age.
- P-Ratio comparing the Mean of the Pretest and the Mean of Total CAT.
- Q-Ratio comparing the Mean of the Pretest and the Mean of CAT Reference Skills.
- R-Ratio comparing the Mean of the Post Test and the Mean of Mental age.
- S-Ratio comparing the Mean of the Post Test and the Mean of Total CAT.
- T-Ratio comparing the Mean of the Post Test and the Mean of Reference Skills on the CAT.
- U-BET Raw Scores.
- V-Number of students scoring in the Pretest and the Post Test in this range.
- W-Same as U and V.
- X-The Standard Deviation computed by Whole score method.
- Y-Level of Significance as defined by the t-test where $p < .05$.
- Z-Statement of statistical Significance.

 STATISTICAL INFORMATION-AVERAGES FOR ALL STUDENTS

TYPES OF QUESTIONS	PRETEST	POST	DIF
KNOWLEDGE	2.78	2.63	-.15
UNDERSTANDING	13.05	12.62	-.43
APPLICATION	5.33	5.94	.61
NEW	2.71	1.88	-.33
TOTAL TEST	23.86	23.19	-.68
BET RAW SCORE	21.15	21.35	.19

 GROUP AVERAGES

# OF STUDENTS	CAT TOTAL	REF SKILLS ON CAT
300	71	72.49
MENTAL AGE 12.43	CHRON. AGE 11.08	TNP (FROM CAT) 65.32

 RATIOS COMPARING THE BET AND THE CAT

BET (PRE)/M.A.	BET (PRE)/CAT	BET (PRE)/REF
1.7	.29	.29
BET (POST)/M.A.	BET (POST)/CAT	BET (POST)/REF
1.71	.3	.29

 TEST SCORE RANGE - NUMBER OF STUDENTS (PRE POST)

SCORE	PRE	POST	SCORE	PRE	POST
34-36	2	4	16-18	45	38
31-33	7	13	13-15	29	30
28-30	21	30	10-12	9	16
25-27	43	49	7-9	3	5
22-24	73	48	4-6	0	1
19-24	68	66			

 STANDARD DEVIATION-PRETEST POST TEST

LEVEL OF SIGNIFICANCE IS

STATISTICALLY

STATISTICAL INFORMATION-AVERAGES FOR ALL STUDENTS					
TYPES OF QUESTIONS	PRETEST	POST	DIF		
KNOWLEDGE	2.78	2.63	-.15		
UNDERSTANDING	13.05	12.62	-.43		
APPLICATION	5.33	5.94	.61		
NEW	2.71	1.88	-.83		
TOTAL TEST	23.86	23.19	-.68		
BET RAW SCORE	21.15	21.35	.19		
GROUP AVERAGES					
# OF STUDENTS	CAT TOTAL	REF SKILLS ON CAT			
300	71	72.49			
MENTAL AGE	CHRON. AGE	TNP (FROM CAT)			
12.43	11.08	65.32			
RATIOS COMPARING THE BET AND THE CAT					
BET (PRE)/M.A.	BET (PRE)/CAT	BET (PRE)/REF			
1.7	.29	.29			
BET (POST)/M.A.	BET (POST)/CAT	BET (POST)/REF			
1.71	.3	.29			
TEST SCORE RANGE - NUMBER OF STUDENTS (PRE POST)					
SCORE	PRE	POST	SCORE	PRE	POST
34-36	2	4	16-13	45	38
31-33	7	13	13-15	29	30
28-30	21	30	10-12	9	15
25-27	43	49	7-9	3	5
22-24	73	48	4-6	0	1
19-24	68	66			
STANDARD DEVIATION-PRETEST 4.95 POST TEST 6.56					
LEVEL OF SIGNIFICANCE IS .237164343					
STATISTICALLY NOT SIGNIFICANT					

 STATISTICAL INFORMATION-AVERAGES FOR SCHOOLS

NEPAUG

TYPES OF QUESTIONS	PRETEST	POST	DIF
KNOWLEDGE	2.53	2.12	-.42
UNDERSTANDING	12.82	11.94	-.88
APPLICATION	4.71	5.79	1.07
NEW	2.97	1.33	-1.65
TOTAL TEST	23	21.2	-1.8
BET RAW SCORE	20.05	19.87	-.18

GROUP AVERAGES

# OF STUDENTS 39	CAT TOTAL 75.28	REF SKILLS ON CAT 77.71
MENTAL AGE 12.76	CHRON. AGE 11.03	TNP (FROM CAT) 69.66

RATIOS COMPARING THE BET AND THE CAT

BET (PRE)/M.A. 1.57	BET (PRE)/CAT .26	BET (PRE)/REF .25
BET (POST)/M.A. 1.55	BET (POST)/CAT .26	BET (POST)/REF .25

TEST SCORE RANGE - NUMBER OF STUDENTS (PRE POST)

SCORE	PRE	POST	SCORE	PRE	POST
34-36	0	0	16-18	6	6
31-33	1	1	13-15	9	3
28-30	2	1	10-12	1	4
25-27	5	6	7-9	0	1
22-24	9	3	4-6	0	0
19-24	6	14			

STANDARD DEVIATION-PRETEST 5.11 POST TEST 5.27
 LEVEL OF SIGNIFICANCE IS .139219768
 STATISTICALLY NOT SIGNIFICANT

 STATISTICAL INFORMATION-AVERAGES FOR SCHOOLS

 PLEASANT VALLEY

TYPES OF QUESTIONS	PRETEST	POST	DIF
KNOWLEDGE	2.93	2.9	-.04
UNDERSTANDING	13.36	13.8	.43
APPLICATION	5.79	6.48	.69
NEW	2.57	1.73	-.84
TOTAL TEST	24.65	25.01	.35
BET RAW SCORE	22.08	23.36	1.27

 GROUP AVERAGES

# OF STUDENTS	CAT TOTAL	REF SKILLS ON CAT
155	70.08	72.14
MENTAL AGE	CHRON. AGE	TNP (FROM CAT)
12.32	11.06	64.62

 RATIOS COMPARING THE BET AND THE CAT

BET (PRE)/M.A.	BET (PRE)/CAT	BET (PRE)/REF
1.79	.31	.3
BET (POST)/M.A.	BET (POST)/CAT	BET (POST)/REF
1.89	.33	.32

 TEST SCORE RANGE - NUMBER OF STUDENTS (PRE POST)

SCORE	PRE	POST	SCORE	PRE	POST
34-36	2	4	16-18	19	14
31-33	5	10	13-15	8	8
28-30	12	23	10-12	6	3
25-27	24	37	7-9	0	3
22-24	45	27	4-6	0	0
19-24	34	26			

 STANDARD DEVIATION-PRETEST 4.81 POST TEST 9.48
 LEVEL OF SIGNIFICANCE IS 1.19234051
 STATISTICALLY NOT SIGNIFICANT

 STATISTICAL INFORMATION-AVERAGES FOR SCHOOLS

 BAKERVILLE

TYPES OF QUESTIONS	PRETEST	POST	DIF
KNOWLEDGE	2.64	2.44	-.2
UNDERSTANDING	12.67	11.15	-1.53
APPLICATION	4.89	5.21	.32
NEW	2.82	2.3	-.52
TOTAL TEST	23.03	21.27	-1.77
BET RAW SCORE	20.21	18.96	-1.26

 GROUP AVERAGES

# OF STUDENTS	CAT TOTAL	REF SKILLS ON CAT
106	70.79	71.07
MENTAL AGE	CHRON. AGE	TNP (FROM CAT)
12.48	11.13	64.74

 RATIOS COMPARING THE BET AND THE CAT

BET (PRE)/M.A.	BET (PRE)/CAT	BET (PRE)/REF
1.61	.28	.28
BET (POST)/M.A.	BET (POST)/CAT	BET (POST)/REF
1.51	.26	.26

 TEST SCORE RANGE - NUMBER OF STUDENTS (PRE POST)

SCORE	PRE	POST	SCORE	PRE	POST
34-36	0	0	16-18	20	18
31-33	1	2	13-15	12	19
28-30	7	6	10-12	2	9
25-27	14	6	7-9	3	1
22-24	19	18	4-6	0	1
19-24	28	26			

 STANDARD DEVIATION-PRETEST 4.82 POST TEST 5.4
 LEVEL OF SIGNIFICANCE IS 1.25935101
 STATISTICALLY NOT SIGNIFICANT

STATISTICAL INFORMATION-AVERAGES OF STUDENTS SCORING
HIGHER THAN THE 90TH PERCENTILE ON THE CAT

NEPAUG

TYPES OF QUESTIONS	PRETEST	POST	DIF
KNOWLEDGE	2.66	2.25	-.42
UNDERSTANDING	13.83	13.16	-.67
APPLICATION	6.08	6.5	.41
NEW	3.08	1.66	-1.42
TOTAL TEST	25.66	23.58	-2.09
BET RAW SCORE	22.5	21.91	-.59

GROUP AVERAGES

# OF STUDENTS	CAT TOTAL	REF SKILLS ON CAT
12	96.5	94.33
MENTAL AGE	CHRON. AGE	TNP (FROM CAT)
14.32	10.92	87.25

RATIOS COMPARING THE BET AND THE CAT

BET (PRE)/M.A.	BET (PRE)/CAT	BET (PRE)/REF
1.57	.23	.23
BET (POST)/M.A.	BET (POST)/CAT	BET (POST)/REF
1.52	.22	.23

TEST SCORE RANGE - NUMBER OF STUDENTS (PRE POST)

SCORE	PRE	POST	SCORE	PRE	POST
34-36	0	0	16-18	0	0
31-33	1	0	13-15	2	0
28-30	1	0	10-12	0	0
25-27	1	3	7-9	0	0
22-24	4	1	4-6	0	0
19-24	3	8			

STANDARD DEVIATION-PRETEST 4.92 POST TEST 2.53
LEVEL OF SIGNIFICANCE IS .397771782
STATISTICALLY NOT SIGNIFICANT

STATISTICAL INFORMATION-AVERAGES OF STUDENTS SCORING
HIGHER THAN THE 90TH PERCENTILE ON THE CAT

PLEASANT VALLEY

TYPES OF QUESTIONS	PRETEST	POST	DIF
KNOWLEDGE	3.37	3.12	-.25
UNDERSTANDING	15.29	15.45	.16
APPLICATION	7	7.75	.75
NEW	2.91	2.29	-.63
TOTAL TEST	28.58	28.62	-.04
BET RAW SCORE	25.7	26.45	.75

GROUP AVERAGES

# OF STUDENTS	CAT TOTAL	REF SKILLS ON CAT
24	93.08	89.25
MENTAL AGE	CHRON. AGE	TNP (FROM CAT)
14.14	10.91	85.58

RATIOS COMPARING THE BET AND THE CAT

BET (PRE)/M.A.	BET (PRE)/CAT	BET (PRE)/REF
1.81	.27	.28
BET (POST)/M.A.	BET (POST)/CAT	BET (POST)/REF
1.36	.28	.29

TEST SCORE RANGE - NUMBER OF STUDENTS (PRE POST)

SCORE	PRE	POST	SCORE	PRE	POST
34-36	0	1	16-18	1	1
31-33	3	3	13-15	0	0
28-30	4	8	10-12	0	0
25-27	7	7	7-9	0	1
22-24	8	1	4-6	0	0
19-24	1	2			

STANDARD DEVIATION-PRETEST 3.61 POST TEST 5.72
LEVEL OF SIGNIFICANCE IS .543467039
STATISTICALLY NOT SIGNIFICANT

STATISTICAL INFORMATION-AVERAGES OF STUDENTS SCORING
HIGHER THAN THE 90TH PERCENTILE ON THE CAT

BAKERVILLE

TYPES OF QUESTIONS	PRETEST	POST	DIF
KNOWLEDGE	3.18	3	-.19
UNDERSTANDING	15.25	14.4	-.86
APPLICATION	6.18	6.59	.4
NEW	3.25	2.96	-.3
TOTAL TEST	27.88	27.44	-.45
BET RAW SCORE	24.62	24.44	-.19

GROUP AVERAGES

# OF STUDENTS	CAT TOTAL	REF SKILLS ON CAT
27	95.07	87.7
MENTAL AGE	CHRON. AGE	TNP (FROM CAT)
14.56	11.32	84.62

RATIOS COMPARING THE BET AND THE CAT

BET (PRE)/M.A.	BET (PRE)/CAT	BET (PRE)/REF
1.69	.25	.28
BET (POST)/M.A.	BET (POST)/CAT	BET (POST)/REF
1.67	.25	.27

TEST SCORE RANGE - NUMBER OF STUDENTS (PRE POST)

SCORE	PRE	POST	SCORE	PRE	POST
34-36	0	0	16-18	1	1
31-33	1	2	13-15	0	0
28-30	6	4	10-12	0	0
25-27	8	5	7-9	0	0
22-24	5	7	4-6	0	0
19-24	6	8			

STANDARD DEVIATION-PRETEST 3.47 POST TEST 3.8
LEVEL OF SIGNIFICANCE IS .156559696
STATISTICALLY NOT SIGNIFICANT

STATISTICAL INFORMATION-AVERAGES OF STUDENTS SCORING
LOWER THAN THE 50TH PERCENTILE ON THE CAT

NEPAUG

TYPES OF QUESTIONS	PRETEST	POST	DIF
KNOWLEDGE	2	.8	-1.21
UNDERSTANDING	8.6	7.4	-1.2
APPLICATION	2.59	4.59	2
NEW	2.2	1.2	-1
TOTAL TEST	15	14	-1
BET RAW SCORE	13.19	12.8	-.4

GROUP AVERAGES

# OF STUDENTS	CAT TOTAL	REF SKILLS ON CAT
5	29.2	39.79
MENTAL AGE	CHRON. AGE	TNP (FROM CAT)
10.03	11.19	35

RATIOS COMPARING THE BET AND THE CAT

BET (PRE)/M.A.	BET (PRE)/CAT	BET (PRE)/REF
1.31	.45	.33
BET (POST)/M.A.	BET (POST)/CAT	BET (POST)/REF
1.27	.43	.32

TEST SCORE RANGE - NUMBER OF STUDENTS (PRE POST)

SCORE	PRE	POST	SCORE	PRE	POST
34-36	0	0	16-18	0	1
31-33	0	0	13-15	5	1
28-30	0	0	10-12	0	2
25-27	0	0	7-9	0	1
22-24	0	0	4-6	0	0
19-24	0	0			

STANDARD DEVIATION-PRETEST .39 POST TEST 3.05
LEVEL OF SIGNIFICANCE IS .322495212
STATISTICALLY NOT SIGNIFICANT

STATISTICAL INFORMATION-AVERAGES OF STUDENTS SCORING
LOWER THAN THE 50TH PERCENTILE ON THE CAT

PLEASANT VALLEY

TYPES OF QUESTIONS	PRETEST	POST	DIF
KNOWLEDGE	2	2	0
UNDERSTANDING	11.5	10.44	-1.06
APPLICATION	4.4	4.3	-.1
NEW	2	1.29	-.71
TOTAL TEST	19.79	18.04	-1.76
BET RAW SCORE	17.79	16.75	-1.05

GROUP AVERAGES

# OF STUDENTS	CAT TOTAL	REF SKILLS ON CAT
20	36.2	47.09
MENTAL AGE	CHRON. AGE	TNP (FROM CAT)
10.1	11.04	36.54

RATIOS COMPARING THE BET AND THE CAT

BET (PRE)/M.A.	BET (PRE)/CAT	BET (PRE)/REF
1.76	.49	.37
BET (POST)/M.A.	BET (POST)/CAT	BET (POST)/REF
1.65	.46	.35

TEST SCORE RANGE - NUMBER OF STUDENTS (PRE POST)

SCORE	PRE	POST	SCORE	PRE	POST
34-36	0	0	16-18	7	3
31-33	0	0	13-15	2	4
28-30	0	0	10-12	2	3
25-27	1	1	7-9	0	1
22-24	1	1	4-6	0	0
19-24	7	7			

STANDARD DEVIATION-PRETEST 3.42 POST TEST 4.19
LEVEL OF SIGNIFICANCE IS .804923243
STATISTICALLY NOT SIGNIFICANT

STATISTICAL INFORMATION-AVERAGES OF STUDENTS SCORING
LOWER THAN THE 50TH PERCENTILE ON THE CAT

BAKERVILLE

TYPES OF QUESTIONS	PRETEST	POST	DIF
KNOWLEDGE	2.21	2.25	.04
UNDERSTANDING	11.13	9.82	-1.31
APPLICATION	3.73	4.73	1
NEW	2.08	1.78	-.31
TOTAL TEST	19.17	18.6	-.57
BET RAW SCORE	17.08	16.91	-.18

GROUP AVERAGES

# OF STUDENTS	CAT TOTAL	REF SKILLS ON CAT
23	40.86	46.91
MENTAL AGE	CHRON. AGE	TNP (FROM CAT)
10.42	11.09	.41

RATIOS COMPARING THE BET AND THE CAT

BET (PRE)/M.A.	BET (PRE)/CAT	BET (PRE)/REF
1.63	.41	.36
BET (POST)/M.A.	BET (POST)/CAT	BET (POST)/REF
1.62	.41	.36

TEST SCORE RANGE - NUMBER OF STUDENTS (PRE POST)

SCORE	PRE	POST	SCORE	PRE	POST
34-36	0	0	16-18	7	5
31-33	0	0	13-15	3	7
28-30	0	0	10-12	1	2
25-27	0	0	7-9	2	0
22-24	3	3	4-6	0	0
19-21	7	6			

STANDARD DEVIATION-PRETEST 3.88 POST TEST 3.48
LEVEL OF SIGNIFICANCE IS .140386457
STATISTICALLY NOT SIGNIFICANT

 STATISTICAL INFORMATION-AVERAGES FOR ALL MALES

TYPES OF QUESTIONS	PRETEST	POST	DIF
KNOWLEDGE	2.83	2.56	-.28
UNDERSTANDING	13.43	12.65	-.78
APPLICATION	5.31	5.97	.65
NEW	2.85	1.91	-.95
TOTAL TEST	24.5	23.36	-1.14
BET RAW SCORE	21.66	21.48	-.18

 GROUP AVERAGES

# OF STUDENTS	CAT TOTAL	REF SKILLS ON CAT
146	70.3	72.82
MENTAL AGE	CHRON. AGE	TNP (FROM CAT)
12.8	11.13	67.65

 RATIOS COMPARING THE BET AND THE CAT

BET (PRE)/M.A.	BET (PRE)/CAT	BET (PRE)/REF
1.69	.3	.29
BET (POST)/M.A.	BET (POST)/CAT	BET (POST)/REF
1.67	.3	.29

 TEST SCORE RANGE - NUMBER OF STUDENTS (PRE POST)

SCORE	PRE	POST	SCORE	PRE	POST
34-36	2	4	16-18	18	18
31-33	5	10	13-15	13	16
28-30	12	11	10-12	3	10
25-27	20	23	7-9	1	2
22-24	33	23	4-6	0	0
19-24	39	29			

 STANDARD DEVIATION-PRETEST 6.28 POST TEST 6.28
 LEVEL OF SIGNIFICANCE IS .237241007
 STATISTICALLY NOT SIGNIFICANT

 STATISTICAL INFORMATION-AVERAGES FOR MALES

NEPAUG

TYPES OF QUESTIONS	PRETEST	POST	DIF
KNOWLEDGE	2.3	2.04	-.77
UNDERSTANDING	12.95	12.42	-.53
APPLICATION	4.76	6.19	1.42
NEW	3	1.33	-1.67
TOTAL TEST	23.42	22	-1.43
BET RAW SCORE	20.52	20.66	.14

GROUP AVERAGES

# OF STUDENTS 21	CAT TOTAL 74.23	REF SKILLS ON CAT 77.9
MENTAL AGE 13.07	CHRON. AGE 11.17	TNP (FROM CAT) 69.76

RATIOS COMPARING THE BET AND THE CAT

BET (PRE)/M.A. 1.56	BET (PRE)/CAT .27	BET (PRE)/REF .26
BET (POST)/M.A. 1.58	BET (POST)/CAT .27	BET (POST)/REF .26

TEST SCORE RANGE - NUMBER OF STUDENTS (PRE POST)

SCORE	PRE	POST	SCORE	PRE	POST
34-36	0	0	16-18	2	3
31-33	1	1	13-15	5	1
28-30	2	1	10-12	1	3
25-27	2	4	7-9	0	0
22-24	5	2	4-6	0	0
19-21	3	6			

STANDARD DEVIATION-PRETEST 5.87 POST TEST 5.86
 LEVEL OF SIGNIFICANCE IS .0892910191
 STATISTICALLY NOT SIGNIFICANT

 STATISTICAL INFORMATION-AVERAGES FOR MALES

 PLEASANT VALLEY

TYPES OF QUESTIONS	PRETEST	POST	DIF
KNOWLEDGE	2.92	2.87	-.06
UNDERSTANDING	13.84	13.64	-.2
APPLICATION	5.84	6.26	.42
NEW	2.6	1.59	-1.02
TOTAL TEST	25.38	24.71	-.67
BET RAW SCORE	22.78	23.19	.4

 GROUP AVERAGES

# OF STUDENTS	CAT TOTAL	REF SKILLS ON CAT
71	67.04	69.59
MENTAL AGE	CHRON. AGE	TNP (FROM CAT)
12.55	11.08	65.88

 RATIOS COMPARING THE BET AND THE CAT

BET (PRE)/M.A.	BET (PRE)/CAT	BET (PRE)/REF
1.81	.33	.32
BET (POST)/M.A.	BET (POST)/CAT	BET (POST)/REF
1.84	.34	.33

 TEST SCORE RANGE - NUMBER OF STUDENTS (PRE POST)

SCORE	PRE	POST	SCORE	PRE	POST
34-36	2	4	16-18	7	4
31-33	3	7	13-15	3	6
28-30	7	7	10-12	2	3
25-27	13	15	7-9	0	2
22-24	16	12	4-6	0	0
19-24	18	11			

 STANDARD DEVIATION-PRETEST 5.09 POST TEST 6.61
 LEVEL OF SIGNIFICANCE IS .346626134
 STATISTICALLY NOT SIGNIFICANT

 STATISTICAL INFORMATION-AVERAGES FOR MALES

 BAKERVILLE

TYPES OF QUESTIONS	PRETEST	POST	DIF
KNOWLEDGE	2.72	2.35	-.38
UNDERSTANDING	13.07	11.44	-1.63
APPLICATION	4.83	5.5	.66
NEW	3.12	2.55	-.58
TOTAL TEST	23.75	22.11	-1.65
BET RAW SCORE	20.62	19.55	-1.08

 GROUP AVERAGES

# OF STUDENTS 54	CAT TOTAL 73.05	REF SKILLS ON CAT 75.11
MENTAL AGE 13.01	CHRON. AGE 11.19	TNP (FROM CAT) 69.16

 RATIOS COMPARING THE BET AND THE CAT

BET (PRE)/M.A. 1.58	BET (PRE)/CAT .28	BET (PRE)/REF .27
BET (POST)/M.A. 1.5	BET (POST)/CAT .26	BET (POST)/REF .26

 TEST SCORE RANGE - NUMBER OF STUDENTS (PRE POST)

SCORE	PRE	POST	SCORE	PRE	POST
34-36	0	0	16-18	9	11
31-33	1	2	13-15	5	9
28-30	3	3	10-12	0	4
25-27	5	4	7-9	1	0
22-24	12	9	4-6	0	0
19-24	18	12			

 STANDARD DEVIATION-PRETEST 4.39 POST TEST 5.28
 LEVEL OF SIGNIFICANCE IS .936309515
 STATISTICALLY NOT SIGNIFICANT

 STATISTICAL INFORMATION-AVERAGES FOR ALL FEMALES

TYPES OF QUESTIONS	PRETEST	POST	DIF
KNOWLEDGE	2.71	2.7	-.02
UNDERSTANDING	12.61	12.51	-.11
APPLICATION	5.32	5.39	.56
NEW	2.56	1.35	-.72
TOTAL TEST	23.12	22.89	-.24
BET RAW SCORE	20.55	21.09	.54

 GROUP AVERAGES

# OF STUDENTS	CAT TOTAL	REF SKILLS ON CAT
155	71.22	71.71
MENTAL AGE	CHRON. AGE	TNP (FROM CAT)
12.01	10.97	62.7

 RATIOS COMPARING THE BET AND THE CAT

BET (PRE)/M.A.	BET (PRE)/CAT	BET (PRE)/REF
1.71	.28	.28
BET (POST)/M.A.	BET (POST)/CAT	BET (POST)/REF
1.75	.29	.29

 TEST SCORE RANGE - NUMBER OF STUDENTS (PRE POST)

SCORE	PRE	POST	SCORE	PRE	POST
34-36	0	0	16-18	27	20
31-33	2	3	13-15	16	14
28-30	9	19	10-12	6	6
25-27	23	26	7-9	2	3
22-24	40	25	4-6	0	1
19-24	29	37			

 STANDARD DEVIATION-PRETEST 5.73 POST TEST 5.73
 LEVEL OF SIGNIFICANCE IS .327429503
 STATISTICALLY NOT SIGNIFICANT

 STATISTICAL INFORMATION-AVERAGES FOR FEMALES

NEPAUG

TYPES OF QUESTIONS	PRETEST	POST	DIF
KNOWLEDGE	2.22	2.22	0
UNDERSTANDING	12.66	11.38	-1.28
APPLICATION	4.66	5.33	.66
NEW	2.94	1.33	-1.62
TOTAL TEST	22.5	20.27	-2.23
BET RAW SCORE	19.5	18.94	-.56

GROUP AVERAGES

# OF STUDENTS	CAT TOTAL	REF SKILLS ON CAT
18	76.5	77.5
MENTAL AGE	CHRON. AGE	TNP (FROM CAT)
12.39	10.36	69.55

RATIOS COMPARING THE BET AND THE CAT

BET (PRE)/M.A.	BET (PRE)/CAT	BET (PRE)/REF
1.57	.25	.25
BET (POST)/M.A.	BET (POST)/CAT	BET (POST)/REF
1.52	.24	.24

TEST SCORE RANGE - NUMBER OF STUDENTS (PRE POST)

SCORE	PRE	POST	SCORE	PRE	POST
34-36	0	0	16-18	4	3
31-33	0	0	13-15	4	2
28-30	0	0	10-12	0	1
25-27	3	2	7-9	0	1
22-24	4	1	4-6	0	0
19-24	3	3			

STANDARD DEVIATION-PRETEST 3.97 POST TEST 4.31
 LEVEL OF SIGNIFICANCE IS .397676981
 STATISTICALLY NOT SIGNIFICANT

 STATISTICAL INFORMATION-AVERAGES FOR FEMALES

 PLEASANT VALLEY

TYPES OF QUESTIONS	PRETEST	POST	DIF
KNOWLEDGE	2.94	2.92	-.02
UNDERSTANDING	12.96	13.92	.96
APPLICATION	5.75	6.66	.91
NEW	2.54	1.85	-.7
TOTAL TEST	24.04	25.26	1.21
BET RAW SCORE	21.48	23.5	2.01

 GROUP AVERAGES

# OF STUDENTS 84	CAT TOTAL 72.65	REF SKILLS ON CAT 74.3
MENTAL AGE 12.12	CHRON. AGE 11.04	TNP (FROM CAT) 63.55

 RATIOS COMPARING THE BET AND THE CAT

BET (PRE)/M.A. 1.77	BET (PRE)/CAT .29	BET (PRE)/REF .28
BET (POST)/M.A. 1.93	BET (POST)/CAT .32	BET (POST)/REF .31

 TEST SCORE RANGE - NUMBER OF STUDENTS (PRE POST)

SCORE	PRE	POST	SCORE	PRE	POST
34-36	0	0	16-18	12	10
31-33	2	3	13-15	5	2
28-30	5	16	10-12	4	0
25-27	11	22	7-9	0	1
22-24	29	15	4-6	0	0
19-24	16	15			

 STANDARD DEVIATION-PRETEST 4.43 POST TEST 4.68
 LEVEL OF SIGNIFICANCE IS 2.01247041
 STATISTICALLY NOT SIGNIFICANT

 STATISTICAL INFORMATION-AVERAGES FOR FEMALES

 BAKERVILLE

TYPES OF QUESTIONS	PRETEST	POST	DIF
KNOWLEDGE	2.55	2.53	-.02
UNDERSTANDING	12.26	10.84	-1.43
APPLICATION	4.96	4.92	-.04
NEW	2.5	2.03	-.47
TOTAL TEST	22.28	20.4	-1.89
BET RAW SCORE	19.78	18.34	-1.45

 GROUP AVERAGES

# OF STUDENTS 52	CAT TOTAL 68.44	REF SKILLS ON CAT 66.88
MENTAL AGE 11.92	CHRON. AGE 11.07	TNP (FROM CAT) 60.15

 RATIOS COMPARING THE BET AND THE CAT

BET (PRE)/M.A. 1.65	BET (PRE)/CAT .28	BET (PRE)/REF .29
BET (POST)/M.A. 1.53	BET (POST)/CAT .26	BET (POST)/REF .27

 TEST SCORE RANGE - NUMBER OF STUDENTS (PRE POST)

SCORE	PRE	POST	SCORE	PRE	POST
34-36	0	0	16-18	11	7
31-33	0	0	13-15	7	10
28-30	4	3	10-12	2	5
25-27	9	2	7-9	2	1
22-24	7	9	4-6	0	1
19-24	10	14			

 STANDARD DEVIATION-PRETEST 5.19 POST TEST 5.45
 LEVEL OF SIGNIFICANCE IS 1.18737511
 STATISTICALLY NOT SIGNIFICANT
