

SOUTHWEST TEXAS STATE UNIVERSITY

A STUDY OF MICROCOMPUTERS IN THE
ELEMENTARY AND MIDDLE SCHOOLS
OF BEAUMONT, TEXAS:
ITS USES, EFFECTS, AND BENEFITS.

A THESIS SUBMITTED
IN CANDIDACY FOR THE DEGREE OF
MASTER OF SCIENCE
DEPARTMENT OF COMPUTER SCIENCE

BY
TAMMY FONTENETTE CARTWRIGHT

SAN MARCOS, TEXAS

MAY 1991

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GLOSSARY

Chapter Programs -- federally funded programs used for remediation. In the Beaumont school district, the programs are used to assist with reading and mathematics.

computer-assisted instruction (CAI) -- a method of teaching that uses a computer to present instructional materials. Students interact with the computer in a learning situation that might involve drill and practice, tutorials, simulations, or the like (Clements 1985).

computer-assisted learning (CAL) -- used synonymously with CAI.

computer literacy -- knowledge of the technology, capabilities, applications (uses and abuses), limitations, and impact of computers. Often separated into two levels, computer awareness and hands on working knowledge (Clements 1985).

courseware -- instructional materials used in computer-assisted instruction. It refers to the computer software that presents the instruction on the computer as well as the teachers' manuals and other materials that might be needed by teacher or learner (Hofmeister 1984).

drill-and-practice -- a CAI program in which the student responds in a rather quick fashion to brief items or questions under a "flash card" format. The computer provides feedback as to the correctness of the student's answer and may adapt to the individual student by varying the number of items or the frequency of the stimuli as a function of the student's responses (Thomas 1981).

feedback -- the ability of the computer to provide the learner with immediate information on whether a response is correct or incorrect is one of the characteristics of CAI (Hofmeister 1984).

file server -- a computer system dedicated to handling nonlocal file references in a computer network. It can receive requests from hundreds of users.

hardware -- the physical equipment of a computer system, consisting of electrical, electronic, magnetic, and mechanical devices (Clements 1985).

network -- the connection of several computers to a central computer with disk storage, often a hard disk system with a large storage capability. It links computers together to allow them to share programs and other information (Clements 1985).

peripherals -- devices used for communicating with the CPU or storing data in the CPU (Pantiel and Petersen 1984).

simulations -- a representation of "real-life" physical conditions or situations through models (Clements 1985).

software -- computer programs that enable computers to process information and solve problems (Clements 1985).

Texas Assessment of Academic Skills (TAAS) -- standardized test used to determine the academic achievement of students. The test is administered to third, fifth, and seventh grade students.

tutorial -- a CAI program which provides the student with paragraph-like material, interspersed questions, response-sensitive branching, and the opportunity to test his or her understanding of a concept, subject or topic (Thomas 1981).

word processing -- provides an environment whereby the computer permits easy insertion and or deletion of text, correction of spelling, and reorganization of presentation without the necessity of completely rewriting the material (Thomas 1981).

CHAPTER 1

INTRODUCTION

As educators become increasingly aware of the capabilities of the microcomputer and become more precise in defining their courseware needs, they often become a major force in improving the quality and availability of courseware. This phenomenon is clearly present in the schools of Beaumont, Texas.

The city of Beaumont has a population of one hundred twenty thousand and is located eighty miles southeast of Houston. There are fourteen elementary schools (K-3), six intermediate schools (4-5), and six middle schools (6-8) in the Beaumont Independent School District (B. I. S. D.).

Since the Beaumont Independent School District is experiencing continual growth, the district is dedicated to using technology to help manage the instructional program and to increase the efficiency of computer-assisted instruction.

Purchases have been made and procedures have been developed to accomplish the objectives of the district's instructional program. The Beaumont Independent School District is integrating a range of computer hardware and courseware into the curriculum to assist the students in

learning the essential elements.

The computer curriculum is designed to equip the students with the necessary hands-on computer experience to interact with our increasingly computer literate society. According to Hansen (1990), computers are used to supplement the instructional process and the student's curriculum. They are integrated into the curricula as a tool to help students meet district objectives.

When using computers, students take an active part in their own learning. Computers also make it possible to use more current information than is available in textbooks, to develop writing skills, to simulate scientific experiments that would otherwise be too costly or too dangerous, to solve mathematics problems too time consuming to solve in any other way, and to use a multitude of other effective teaching applications (Hansen 1990).

Statement of the Problem

The progressive movement of incorporating micro-computers in the classroom has made a large impact on many school districts. For many years our society has been faced with the challenge of increasing our students' awareness of computers and their knowledge of applications delivered by computers. Thus, many schools have implemented an increasing amount of computer hardware and courseware into the schools. However, few districts have realized the

full range of uses, effects, and benefits that computer-assisted instruction can have on students. Therefore, in order to help computer courseware and hardware vendors, administrators, teachers, and students, it is necessary to study the parameters with respect to courseware for varying grade levels for a model district.

The Purpose of the Study

The purpose of this study is to investigate and analyze the role of computer-assisted instruction with regard to microcomputers, courseware, facilities, and teacher training in the Beaumont Independent School District in order to help hardware and courseware vendors, administrators, educators, and students of elementary and middle schools to better understand the roles and capabilities of microcomputers in the classroom.

Through an examination of the Beaumont Independent School District computer curriculum, related studies, and related articles, I intend to answer several questions about computer-assisted instruction in the Beaumont Independent School District: 1) What hardware, courseware, and training exist in each elementary and middle school? 2) What effects have the microcomputer curriculum in the subject areas of reading, writing, vocabulary, mathematics, science, social studies, computer literacy, and personal development had on the academic and social growth of the

students? 3) What benefits has the computer curriculum offered the students? 4) What are the recommendations and needs of the students and teachers? 5) What benefits will occur through implementing the recommendations and satisfying the needs?

Organization of the Study

Summaries of the number of microcomputers, arrangement of microcomputers, and applications of primary focus are given for the elementary, intermediate, and middle schools. The following report of the investigation is divided into three main categories of educational groups: elementary (K-3), intermediate (4-5), and middle (6-8). Since the related literature, observations, and interviews of teachers and students emphasize the uses, effects, and benefits of various categories of courseware in the elementary, intermediate, and middle schools with regard to each of the applications, these discussions have been placed in sections appropriate to their emphasis.

Delimitations of the Study

For the purpose of this investigation, the following delimitation is made: This study is limited to the computer curriculum of the Beaumont Independent School District focusing on the most recent implementation of the operating requirements of the Texas Education Agency. Bergin (1988) explains:

The Master Plan for Vocational Education was approved by the State Board of Education on January 11, 1987. The intent of the plan was to align the vocational curriculum more closely with the general curriculum. As a part of this plan, computer use and keyboarding at the elementary level was addressed to provide districts a much needed direction and means of support. The plan states that keyboarding and other computing competencies shall be offered K-6 beginning in 1988. The State Board envisions this technological foundation as an integral part of the overall curriculum.

CHAPTER 2

INSTRUCTIONAL EQUIPMENT AND COURSEWARE

The Computer Services Department, created in January 1989, is composed of a Data Processing Division and Instructional Computer Technology Division. The Instructional Computer Technology Division coordinates, plans, and implements the district's usage of instructional computer hardware, courseware, and training.

The Beaumont Independent School District utilizes an IBM AS/400 mid-range computer system for administrative functions. All elementary and secondary schools access the AS/400 via telephone communications. There are 164 remote devices and 50 local devices with over 200 users.

Apple and IBM microcomputers are available at each school for instructional use. The district uses Minnesota Education Computer Consortium (MECC) software extensively in Grades 2 through 5 (Hansen 1990).

Elementary schools (K-3)

Each elementary school has up to two computer curriculum coordinators, up to three computer laboratories, and computers in a few classrooms. Hansen (1990) assessed the current number of computers in the elementary and middle

schools with special emphasis on computer/student ratio (see Table 1, pg. 12). There are a total of 7,013 students and 476 computers in the elementary schools giving an average computer/student ratio of 1:15. Of these computers, 29 are used for special education (see Table 2, pg. 13), 74 are used for Chapter Programs (see Table 3, pg. 14), and 28 are used for the library (see Table 4, pg. 15).

Computer laboratories are arranged in a variety of ways depending on student need, availability of adequate space, access to hardware, and funding. However, all of the K-3 schools have implemented the Writing to Read Program in at least one of the computer laboratories. Writing to Read was implemented in the elementary schools during the 1986-1987 school year. Writing to Read is a computer-based instructional system designed to develop the writing and reading skills of kindergarten and first grade students. The program is organized like a computer laboratory. The classroom teacher accompanies her students to the center daily where her students spend forty-five minutes to an hour working. In this center, students use a variety of equipment and language arts materials organized as learning stations. First grade students review Writing to Read during the first six weeks of school in most elementary schools. Afterwards, kindergarten students are introduced to Writing to Read for the remainder of the school year.

The program is favorably received by educators for

many reasons. According to Martin (1984), the Writing to Read System is designed to utilize the capabilities of a personal computer with a digitized voice attachment which enables the computer to "talk". This creates a computer-based instructional program that provides consistent, sequenced, self-paced, interactive, multi-sensory instruction. As students combine sounds and letters to form words, they realize that letters stand for sounds and that words are composed of these sounds. Martin (1984) further suggests that Writing to Read builds on students' natural language development. It provides a logical, sequential, and consistent format that allows students to turn their language into print they can read. The Writing to Read System centers on guiding students to convert their speech to writing. As students learn how to write what they can say, they also learn to read their own writing. They understand that these two different processes are related to each other. The Writing to Read System helps students write and read at their highest level of speaking ability (Martin 1984).

Since there are usually two computer coordinators on each elementary campus, one coordinator supervises the Writing to Read Center while the other supervises the computer-assisted instruction laboratory. According to Pantiel and Petersen (1984), a computer laboratory allows a large number of students to use the computer at one time.

In addition, Pantiel and Petersen (1984) suggest that the laboratory coordinator can focus attention on developing a high level of computer expertise, affording the rest of the staff an in-house computer expert to field questions, assist less highly trained persons in sound decision making, and make sure that users care for the equipment properly.

In many schools, volunteers assist the computer curriculum coordinator in supervising the computer-assisted instruction laboratory. Volunteers are encouraged to participate in the computer-assisted instruction. There is a noticeable difference in the effect volunteers have on the students in the computer laboratory. The most noticeable is that the students are able to get greater individualized assistance because the student to assistant ratio is greatly improved.

While the Writing to Read Center is used to tutor kindergarten and first grade students in reading and writing, the computer-assisted instruction laboratory is used to instruct many kindergarten through third grade students in spelling, addition, subtraction, and multiplication as well as in reading and writing.

On the average, most students use the computer-assisted instruction laboratory once a week for forty-five minutes to an hour.

Intermediate schools (4-5)

In the Beaumont Independent School District there are six intermediate schools which instruct 3,446 fourth and fifth grade students. Hansen (1990) found that there are 291 microcomputers in the intermediate schools giving an average computer/student ratio of 1:12 (see Table 1, pg. 12). Of these computers, 15 are used for special education (see Table 2, pg. 13), 38 are used for Chapter Programs (see Table 3, pg. 14), and 16 are used for the library (see Table 4, pg. 15).

Most intermediate schools use at least one of their laboratories for computer-assisted instruction for teaching language arts, mathematics, science, social studies, keyboarding, and word processing. Schools which have more than one computer laboratory use the additional laboratory to reinforce mathematics and reading.

In Homer Elementary School, a Wasatch distributed network is implemented. Each teacher has three microcomputers and one printer in her classroom. These microcomputers are capable of accessing an array of courseware in various academic fields through file servers.

Middle schools (6-8)

In the Beaumont school district there are six middle schools which instruct 4,775 students. Table 1 (pg. 12) illustrates that with 408 microcomputers in the middle

schools, there is an average computer/student ratio of 1:12 (Hansen, 1990). Of these 408 microcomputers, 16 are used for special education (see Table 2, pg. 13), 14 are used for the library (see Table 4, pg. 15), and 21 are used for vocational training (see Table 5, pg. 16).

Of the twelve laboratories in the middle schools, none are networked. One laboratory on each campus is used to teach computer literacy to eighth grade students for one semester. The students learn about word processing, data base management, spreadsheets, programming, keyboarding, robotics, electronic news gathering, terminology, and telecommunications.

In the other computer laboratory, teachers reserve the computer-assisted instruction laboratory once a week for an hour. This laboratory is utilized by teachers for enrichment and reinforcement of skills in language arts, mathematics, science, and social studies.

TABLE 1
TOTAL NUMBER OF MICROCOMPUTERS
USED FOR INSTRUCTION
1990

=====						
Campus	Number of Students	Computers IBM Apple Other			Total	Computer/Student Ratio
K-3						
Amelia	735	13	28		41	1:18
Bingman	333	7	26		33	1:10
Blanchette	536	7	18	3	28	1:19
Caldwood	458	7	15		22	1:21
Curtis	377	7	22		29	1:13
Dunbar	390	8	27		35	1:11
Fehl	297	18	19		37	1: 8
Field	331	7	28		35	1: 9
Fletcher	487	9	27		36	1:14
Guess	812	15	25		40	1:20
Lucas	662	15	17		32	1:21
Martin	621	7	23		30	1:21
Pietzsch	537	15	29		44	1:12
Regina	437	7	27		34	1:13
Sub Total	7,013	142	331	3	476	1:15
4-5						
French	390	1	28		29	1:13
Homer	789	111	2		113	1: 7
MacArthur	452	1	47		48	1: 9
Odgen	455	1	29		30	1:15
Price	521	1	31		32	1:16
Vincent	839	1	38		39	1:22
Sub Total	3,446	116	175		291	1:12
6-8						
Austin	1,032	22	49		71	1:15
Bowie	498	22	32		54	1: 9
Crockett	569	32	39		71	1: 8
Marshall	895	22	31		53	1:17
Odom	1,196	33	69		102	1:12
South Park	585	23	34		57	1:10
Sub Total	4,775	154	254		408	1:12
Total	15,234	412	760	3	1,175	1:13

TABLE 2
MICROCOMPUTERS USED FOR SPECIAL EDUCATION
1990

=====				
Campus	IBM	Computers Apple	Other	Total
K-3				
Amelia		2		2
Bingman		1		1
Blanchette		1		1
Caldwood		2		2
Curtis		1		1
Dunbar		3		3
Fehl		1		1
Field		1		1
Fletcher		1		1
Guess		7		7
Lucas		2		2
Martin		3		3
Pietzsch		1		1
Regina		3		3
Sub Total		29		29
4-5				
French		3		3
Homer		1		1
MacArthur		3		3
Odgen		1		1
Price		2		2
Vincent		5		5
Sub Total		15		15
6-8				
Austin		2		2
Bowie		3		3
Crockett		2		2
Marshall		3		3
Odom		2		2
South Park		4		4
Sub Total		16		16
Total		60		60

TABLE 3
MICROCOMPUTERS USED FOR CHAPTER PROGRAMS
1990

=====				
Campus	IBM	Computers Apple	Other	Total
K-3				
Amelia				
Bingman		2		2
Blanchette		4	3 Atari	7
Caldwood				
Curtis				
Dunbar		12		12
Fehl	11	1		12
Field		14		14
Fletcher	1	13		14
Guess				
Lucas				
Martin		4		4
Pietzsch		3		3
Regina		6		6
Sub Total	12	59	3	74
4-5				
French		9		9
Homer				
MacArthur		17		17
Odgen		7		7
Price		5		5
Vincent				
Sub Total		38		38
Total	12	97	3	112

TABLE 4
MICROCOMPUTERS USED FOR LIBRARY
1990

=====				
Campus	IBM	Computers Apple	Other	Total
K-3				
Amelia	1	1		2
Bingman	1	1		2
Blanchette	1	1		2
Caldwood	1	1		2
Curtis	1	1		2
Dunbar	1	1		2
Fehl	1	1		2
Field	1	1		2
Fletcher	1	1		2
Guess	1	1		2
Lucas	1	1		2
Martin	1	1		2
Pietzsch	1	1		2
Regina	1	1		2
Sub Total	14	14		28
4-5				
French	1	1		2
Homer	1	1		2
MacArthur	1	1		2
Odgen	1	5		6
Price	1	1		2
Vincent	1	1		2
Sub Total	6	10		16
6-8				
Austin	1	1		2
Bowie	1	1		2
Crockett	1	1		2
Marshall	1	1		2
Odom	1	2		3
South Park	2	1		3
Sub Total	7	7		14
Total	27	31		58

TABLE 5
MICROCOMPUTERS USED FOR VOCATIONAL TRAINING
1990

=====				
Campus	IBM	Computers Apple	Other	Total
6-8				
Austin		3		3
Bowie		3		3
Crockett		3		3
Marshall		4		4
Odom		4		4
South Park		4		4
Sub Total		21		21
Total		21		21

CHAPTER 3

MICROCOMPUTERS IN THE ELEMENTARY SCHOOLS (K-3)

Uses

The district uses Minnesota Education Computer Consortium (MECC) software extensively in elementary schools. A limited license is purchased annually to reproduce this instructional software for the district's use. Instructional software published by other vendors are also available for computer-assisted learning.

Computers are used to teach elementary students three fundamental applications: reading, writing, and mathematics. Since these applications are novel to the students, tutorial programs are used extensively. Tutorial programs are very useful because they introduce new concepts, explain, characterize, ask questions, accept and evaluate responses, diagnose difficulties, provide feedback and reinforcements, monitor performances, and select appropriate placement into subsequent lessons. (Burke 1986; Pantiel and Petersen 1984; Thomas 1981).

Computers are used extensively in the Writing to Read Center to instruct kindergarten and first grade students in reading and writing. Each kindergarten and first grade

teacher brings her class to the Writing to Read Center where observations show the children learn how to use the computer which acts as a guide or a tutor.

To teach reading, computers provide students with opportunities to listen carefully to instructions and information, discriminate among sounds for each letter of the alphabet, understand the directions of conventional print, acquire a basic sight vocabulary, and use phonics: initial, medial, final consonants, long vowels, short vowels, and initial blends.

The computers in the Writing to Read Center are also used to tutor the students in writing by providing the students with opportunities to recognize the nature of sound-symbol correspondence, to write stories and brief descriptions, to recognize that the function of first-draft writing is to capture ideas, to add information omitted in a first draft to subsequent drafts, to recognize that rewriting and editing are done with a particular purpose, to use basic conventions of capitalization and punctuation, to use a variety of prewriting activities as sources for later writing, and to use a systematic method to spell words independently.

In mathematics, the computer-assisted instruction laboratory is used to introduce students to concepts and skills associated with the understanding of numbers and the place-value system. To accomplish this, computers and the

courseware "Conquering Whole Numbers" and "Conquering Decimals" published by MECC are used. "Money! Money!" published by Hartley is used to teach students about counting, comparing, adding, subtracting, and making change. Computers and a variety of mathematics courseware are used to develop skills in identifying tens and ones to show place value; identifying measurement units of money, time, length, weight, and temperature; estimating whole numbers; dividing whole numbers; and multiplying whole numbers.

Effects

Through observation, it is clear that the students are confident and enthusiastic about reading and writing. The students interact one on one with the computer at their own pace. Lathrop and Goodson (1986) suggest that micro-computers using tutorial programs offer students an avenue for independent and active exploration.

Benefits

This tutorial method of teaching is very effective in offering the students the opportunity to develop their ability to express their ideas and manipulate the English language.

Through the use of computers, students learn to read using word attack skills to decode written language, and to apply reading skills to a variety of practical situations. They also develop their vocabulary and comprehension skills

to gain meaning from written material.

Elementary students also learn the basic operations on numbers such as addition, subtraction, multiplication and division; properties of numbers; and uses of numbers.

CHAPTER 4

MICROCOMPUTERS IN THE INTERMEDIATE SCHOOLS (4-5)

By the time the students of the Beaumont Independent School District have reached the intermediate level, they have already been introduced to the fundamental applications of reading, writing, and mathematics. Observations show that in addition to using the computer for introducing students to new applications, the computer is also used for reinforcing previously learned skills through drill and practice programs. Ricciardi (1982) writes:

Using the microcomputer for drill and practice fosters results even greater perhaps than proficiency at basic facts and operations.

It promotes positive self-image, confidence, satisfaction of achievement, perseverance, and provides immediate reinforcement and reward, all in a non-threatening learning environment. These are the real benefits to the student and perhaps the most important.

The interaction that takes place between computer and student is educationally exciting and fosters much needed motivation for ordinarily humdrum memorizing and practice.

It has been my pleasure to observe this exchange take place daily in my remedial math classes. The students are no longer threatened by classroom competitiveness. They enjoy charting their progress and competing for awards for their individual and group achievements.

Yes, drill and practice truly does have a place in microcomputer education--a place of honor.

Uses

In mathematics and reading laboratories, computers are utilized to reinforce mathematics and reading skills using drill and practice programs.

In the computer-assisted instruction laboratory teachers use the laboratory to enhance instruction in social studies, mathematics, science, writing, reading, and keyboarding.

The district uses Minnesota Education Computer Consortium software extensively in the intermediate schools. After previewing various courseware, teachers recommend that a license be purchased to reproduce the courseware for an entire class depending on how beneficial the courseware is for computer instruction. Instructional software published by other vendors is also available for computer-assisted learning.

According to Howie (1989), MECC publishes a "composing information series" that consists of four programs: "MECC Writer" is a the word processor; "MECC Editor" reviews student writing and encourages revision; "MECC Speller" identifies misspelled and confusing words; and "MECC Write Start" is a prewriting motivator.

The related courseware used for prewriting and postwriting by the Beaumont Independent School District includes "Editor," "Speller," and "Write Start." Howie (1989) suggests that "Write Start" offers word processing

activities that encourage students to think, to share ideas, and to communicate information. "Editor" introduces outlining as a way to check for main ideas and supporting details in each paragraph. "Speller" reinforces the writing process in its emphasis on revision.

As for reading, Ms. Marion Pekar, computer curriculum coordinator at MacArthur Elementary School, reported that a variety of courseware is used to reinforce skills in identifying antonyms for target words with an editing option; identifying context clues for word identification; and understanding words in context, including modifying phrases or clauses. Additional courseware is available for students to develop skills in identifying an implied main idea; recalling facts and details that support the main idea, arranging events in sequential order; and using graphic sources for information such as tables and lists, charts and graphs, and maps.

Various courseware is used to reinforce the writing skills of students by allowing students to apply conventions of punctuation and capitalization, use correct possessive forms of nouns and possessive forms of pronouns, and learn to complete sentences.

According to Ms. Gail Terracina, the computer curriculum coordinator at Vincent Elementary School, a variety of MECC courseware is used for drill and practice as well as for higher level problem solving in mathematics.

"Speedway Math" and "Number Munchers" published by MECC are used to reinforce students' mathematics skills in performing basic operations on numbers. "Fraction Munchers" and "Conquering Fractions" are used to reinforce students' mathematics skills in recognizing equivalent fractions and performing basic operations on fractions. "Coordinate Math" is used to teach students map coordinates, graph coordinates, and interpretation and construction of charts and graphs. "Market Place," a simulation program, is used to teach students about selling, buying, and earning money through the simulation of a business.

Courseware published by Sunburst is used for higher level thinking. "The Kings Rule" allows students to form hypotheses, recognize numerical patterns, and test logic skills. "Puzzle Tanks" allows students to practice mathematics and logic skills by filling a tank from a number of smaller tanks.

To teach social studies, computers are used to identify significant individuals and their contributions to Texas history; distinguish among city, county, state, and nation; locate major geographical features of Texas on maps; describe economic activities in regions of the United States; identify significant American leaders and their contributions to American history; and describe major historical events in the development of the United States.

The Beaumont Independent School District uses "Jenny's Journey," "Oh Deer!," and "Oregon Trail," simulation courseware published by MECC, to teach some social studies concepts. "Jenny's Journey" is used to assist students in reading maps. "Oh Deer!" simulates the five-year management of a large herd of deer in a suburban community.

According to Howie (1989), "Oregon Trail" is a variable-assignment simulation in which students encounter continuing situations that include numerous variables which take on different values. The feedback continuously identifies the outcomes of students' choices of values to help them in making future decisions. Its instructional process teaches students to discover the set of values identified as optimal for the variables. Students must decide on the equipment, destination, occupation, and route during their trip. Using "Oregon Trail," students improve their understanding of the hardships the pioneers faced. They grow in problem-solving ability as they make decisions and adjust their thinking in order to survive the perils.

According to Cannings and Brown (1986), simulation courseware offers many advantages and uses to students. It is usually much less expensive than a real laboratory. It allows the quick exploration of many possibilities and the systematic variation of many relevant parameters. It allows active exploration without danger or harm to

students. Finally, it allows students to focus their attention on centrally important issues without being distracted by the details of real experiments.

To teach keyboarding as mandated by the Master Plan for Vocational Education, the Beaumont Independent School District uses computers with the integration of the courseware "MECC Keyboarding Primer" and "MECC Keyboarding Master."

To teach science, the district uses instructional simulations by MECC. "Genetics" assists students in determining gene characteristics and in identifying blood types in a simulated hospital laboratory. "Discovery Lab" is used to design experiments in order to determine the characteristics of imaginary mystery organisms. "Miner's Cave" is used to teach students about simple machines such as wheel and axle, lever, pulley, and ramp.

Effects

When game format drill and practice programs are used, students interact and compete with one another to complete mathematics assignments. The students' attention span and motivation are improved. Ms. Terracina suggests that the students are more willing to perform more mathematics problems using the computer than if they were using paper and pencil.

In the reading and writing laboratory, students

receive reinforcement in comprehension, determining main ideas, improving vocabulary, and perfecting spelling. Teachers verified that there is improvement in the amount of material students are learning in the computer laboratory compared to what is mastered in the classroom alone.

Kepner (1986) suggests that students using a word processor are more willing to put ideas on paper initially and to expand on them later. The continual development of ideas through editing is an ability that teachers report they stress to students. According to Howie (1989), a word processor allows students to experience writing as a dynamic, esthetically satisfying process. Not only does a word processor allow students to record and publish what they know; it also facilitates discovery of their ideas and sharpens their thinking in a way that paper and pencil cannot (Howie 1989).

Benefits

The use of computers benefits students in reading by offering an effective means of developing vocabulary and comprehension skills.

Computers and MECC software benefit students in writing by offering an alternative method for selecting topics and generating material to write about. Students also develop skills in writing effectively for a variety of purposes.

Mathematical courseware allow students to spontaneously develop answers mentally rather than on their fingers or on paper. The use of mathematical drill and practice courseware allows the students to improve measurement concepts and skills using metric units. Computers offer an alternative way of delivering information to students. Students are given an alternative way of learning the representation of numbers on a line and pairs of numbers on a coordinate plane.

Keyboarding allows students to master a skill which will be useful in most careers. Keyboarding skills allow students to utilize word processing packages to prepare future school assignments. Intermediate school libraries in the Beaumont Independent School District provide computers which students may use to complete school assignments. According to Kepner (1986), an important factor in making the decision to teach keyboarding in the elementary school is that students must have access to computers whenever writing assignments are made. This holds true for the rest of their school career. Too many districts that have initiated keyboarding instruction at a given grade level or in a certain course deny students who have learned keyboarding permission to use the computers because students who have not learned keyboarding have priority.

CHAPTER 5

MICROCOMPUTERS IN THE MIDDLE SCHOOLS (6-8)

The Texas Board of Education mandates that computer literacy be taught in the seventh or eighth grade for one semester. Texas requires that students learn computer-related terminology and use, history and development of computers, use of the computer as a tool, communicating instructions to the computer, and problems and issues of computer use in the society.

The district's middle school teachers also use computer laboratories to enhance academic applications such as mathematics, science, and social studies.

Uses

The students are provided opportunities to identify computer terms, classify types of computers, understand the uses and limitations of computers, and list advantages and disadvantages of using specific types of computers for various applications.

When learning to use the computer as a tool, the students load software from an external storage medium (floppy diskettes), use software packages in a variety of applications (word processing, spreadsheets, data base

manipulation and information retrieval), determine which software is most appropriate for various applications, and learn editing procedures in the context of data entry.

In order to use the computer as a word processor, middle school students select from a variety of word processing packages: "Bank Street Writer" developed by Scholastic; "Apple Works" developed by Apple Computer, Incorporated; and "Processing Words" developed by MECC.

Students learn to program the computer using BASIC programming language. Students use and develop flow-charts, develop problem-solving skills, write programs, interpret and correct program errors, and predict output of given programs.

To identify problems and issues of computer use in society, students identify computer-related careers; identify the importance of ethics in accessing and manipulating automated information; and identify the issues and potential solutions pertaining to computer-related law, copyright, and privacy.

Ms. Doris Cyrus, computer literacy teacher and computer curriculum coordinator at Marshall Middle School, reported that mathematics teachers take their students to the computer laboratory to enhance their mathematics skills using MECC courseware such as "Estimation" and "Number Systems." Courseware published by IBM such as "Math Concepts" and "Math Practice" is also utilized.

For science, courseware published by Prentice-Hall such as "Plate Tectonics," "Weather Stations," and "Continental Drift" is used to teach earth science.

Courseware such as "Computers In Government" and "Polls and Politics" published by MECC is used to instruct students in social studies.

Effects

Although students must share computers, observations show that students interact with enthusiasm and confidence. Students are motivated to complete computer assignments. Students discuss the objectives of the assignment, the procedure necessary to complete the objectives, and the creative alternatives that could be pursued. Students who work around computers tend to talk to each other more than they do in the classroom and to talk about what is to be learned rather than about out-of-classroom matters (Cannings and Brown 1986).

Because students of varied backgrounds are given an opportunity to work closely with each other, students are more apt to develop their opinions of others based on personal experience rather than stereotypes.

Teachers reported that students who use a word processing product to complete writing assignments are more willing to review and correct spelling and grammatical errors than if they had completed the assignment using paper

and pencil.

Benefits

The use of the computer and the printer provides students with immediate feedback on their work. Taylor (1980) suggests that the best feedback is that which comes immediately after the event. This method serves as a means of practicing the skills needed for the future office worker. Using the computer, the student can think, plan, compose, revise, and print documents with ease. The computer becomes a powerful tool integrated into the thinking process of the student.

Students are given an opportunity to work with other students of varying backgrounds in a problem solving environment.

At Marshall Middle School, students are given an opportunity to work with technical equipment such as audio recorders and video recorders for school projects. Following video taping and audio taping school events the students incorporate the recorded material into computer assignments such as writing about the recorded material and illustrating the recorded material using word processors and graphics tools to create a multimedia environment. Clements (1985) suggests that courses are too verbal, too restricted to teaching people to repeat material. While repeating material is a successful mode with some students, it is a

barrier to others. Many faculty members have difficulty recognizing this problem because they are highly verbal. Many students, however, require more visual aids or sensory aids in the learning process, aids that often are not stressed in the learning materials used in many classrooms.

The students learn how to use tools necessary for future employment opportunities. Tools such as word processors offer students an alternative means of preparing future school writing assignments.

CHAPTER 6

RECOMMENDATIONS

Recommendations

The need for additional teacher training, equity in delivering computer-assisted instruction, hardware, computer facilities, and courseware are the most common recommendations made by Beaumont Independent School District teachers.

The district has no formal system for delivering training and support. However, there are occasional in-house workshops in which teachers may volunteer to participate. Mr. Rusty Bertrand, computer literacy teacher at Bowie Middle School, said that he has not participated in the in-house workshops because he does not have enough time in the semester to cover any additional subjects. According to Cannings and Brown (1986), when implementing the computer curriculum, a school district must recognize that teachers will need to reorganize and restructure their educational materials and modes of presentation. Staff development is the most important part of any beginning or continuing computer education program. One can acquire as much hardware and software as the budget will allow. But if teachers do not know how to use the equipment or integrate

it into their everyday classwork, the equipment will remain in cartons or on the shelves in the storeroom (Cannings and Brown 1986).

Pantiel and Petersen (1984) suggest that principals should consider establishing cooperative programs with other school systems. This could include anything from creating a newsletter that highlights the uses of computers in their schools and sharing publications with other schools to making arrangements for teachers to observe computer programs in other districts.

In interviews, many computer curriculum coordinators revealed that most of their computer information is derived from hands-on experience and from networking with their peers. A limited number of teachers feel that they receive adequate training relating to incorporating computers into their teaching fields. For many schools, the computer-assisted instruction laboratory sits unused for hours. Observations further show that students in schools which require teachers to utilize the computer-assisted instruction laboratory at least once a week receive more computer instruction than do students in schools which do not mandate the use of the laboratory.

Schools which do not mandate the use of computers in teachers' lesson plans show a lower usage of the laboratory. Not only does this demonstrate poor utilization of funds, but it also raises the question of equity of

computer accessibility for students in the Beaumont Independent School District.

Observations and interviews further reveal that schools in lower socio-economic levels utilize the computer-assisted instruction laboratory more for remediation in mathematics and reading for students who have scored low on the Texas Academic Assessment Skills test, whereas schools in higher socio-economic levels utilize the computer-assisted instruction laboratory for enrichment and reinforcement of a larger range of applications. Cannings and Brown (1986) suggest that children in economically deprived areas frequently utilize computers, when available, only in drill and practice mode, while those students in more affluent communities tend to be exposed to computers in a wider diversity of approaches--programming, simulation, and development of higher level skills. Although computer-assisted instruction is offered dependent upon the needs of the majority of the students on the campus, there is a clear need to equalize access to computers as well as to the modes of computer instruction for students who may not fall into the majority.

Several teachers offered recommendations beyond improving the laboratory facilities. Ms. Cyrus expressed a need for a larger laboratory. Currently, the computers are arranged in such a way that they provide inadequate work space. Larger computer literacy classrooms are divided so

that the computers occupy one half of the class, and desks for student writing assignments occupy the other half.

Another common need of the intermediate and middle school teachers is to have at least one computer for each student in a class. Currently, students must share computers on assignments which should be done independently. Many teachers expressed the need to replace the monitors on the Apple computers which were installed eight years ago when the Texas Education Agency mandated computer literacy in the curriculum with monitors which offer vision-sensitive screens. Several teachers expressed concerns about what effect the outdated monitors are having on the students' vision. In addition, outdated monitors can release stray radiation. Another concern was that many of the keyboards do not have traditional touch typing capability.

Inefficient hardware implementation is also a prevalent problem throughout the Beaumont Independent School District. Although there have been a few schools to pilot networks, most of the district's schools are not networked. Consequently, teachers have to distribute floppy diskettes to each student. This is not only a time consuming chore, but it also portrays the more common practices of the "real world's" use of hard disks inaccurately. For these reasons, several teachers recommended that whenever possible, network systems should be the standard computer installation in the district.

In regards to laboratory facilities, teachers recommended a range of general repairs and replacement of equipment. Ms. Fay Clark, computer literacy teacher at Odom Middle School, expressed the need to have the computers rewired in such a way that computer cords run along the floor underneath by a cover.

As for courseware, the need expressed most often is to develop a procedure which will assist all teachers in determining what courseware is useful in enriching their teaching area. In schools which have an abundance of courseware and software, teachers complained that the equipment was inadequately managed. Some teachers suggested that a laboratory assistant is needed to help manage the computer-assisted instruction laboratory and to inform teachers about applicable courseware.

Benefits of Implementing Recommendations

Effective utilization of technology does not occur without appropriate staff development. Many Beaumont Independent School District teachers do not understand how to exploit technology as a teaching tool. Successful incorporation of educational technology can not occur without appropriate teacher education. Thus, I recommend that a comprehensive plan be developed to provide on-going training for teachers.

The benefits of properly training teachers will be

improved student efficiency and productivity, as well as the overall effectiveness of the district's computer network. Several teachers stated that their morale and confidence to integrate computer technology into their lesson plans will improve if they were provided prompt technical support. On-going teacher training will provide teachers an opportunity to increase their competence in adapting computer technology as a tool, thus providing students and teachers the means for investigating subjects in greater depth. Furthermore, through the teachers' increased ability to integrate technology-based instruction, students will have an increased opportunity to master the skills necessary to progress successfully through the curriculum.

According to Cannings and Brown (1986), providing equitable computer instruction throughout the district will also decrease the gap of computer knowledge held by one group of students versus another. Failure to close the equity gap may ultimately create a technological caste system within the nation's schools that we can ill afford (Cannings and Brown 1986).

Whenever possible, networks should be standard installations in the district to minimize the current hardware inadequacies. Instructional networks make learning easier and more efficient. File servers can maintain all necessary courseware and software which students access from a menu of options. Teachers do not have to spend time

distributing program disks. Students can work on the appropriate courseware for the subject matter they need to study. Networking can bring resources such as data bases and word processing directly to the student. In addition, networks save money by cutting down on the need for peripherals. For example, one printer can serve an entire network. In cases when the network would be inoperable, the software and courseware currently on floppy diskettes could be used while the network is being repaired. Other cost savings result from decreased need for blank diskettes and the cost of damaged or erased diskettes.

Summary

The Beaumont Independent School District has made purchases and developed procedures to address the reality that students who are unable to cope effectively in a technological society are in increasing danger of becoming unemployable in society.

With the implementation of a variety of computer hardware and courseware, teachers are encouraged to include computer instruction regularly into their lesson plans. Computer laboratories are implemented with the focus on allowing teachers to bring their students to the laboratory to teach subjects ranging from reading and writing to mathematics and science. Computer-assisted learning is well received by teachers, parents, administrators, and students.

On the elementary level, computers are used primarily to tutor reading and writing using the Writing to Read Program. The manner in which the computer-assisted instruction laboratory is utilized is dependent upon the needs of the students on the campus.

In the intermediate schools, computers are used for reading, writing, mathematics, science, social studies, and keyboarding. In schools which have a larger percentage of students who scored low on the Texas Academic Assessment Skills test, the laboratory is used to reinforce mathematics and reading. On other campuses, teachers utilize the computer-assisted instruction laboratory to integrate computer-assisted instruction as a tool, and for enrichment in their teaching field.

In the middle schools, computer literacy is taught in the eighth grade for one semester. A variety of applications mandated by the Texas Board of Education are taught in this class: word processing, spread sheets, data base, keyboarding, robotics, electronic news gathering, ethics, terminology, telecommunications, and programming. As in the intermediate schools, the manner in which the computer-assisted instruction laboratory is used at each campus is dependent upon the needs of those students.

The use of computers has increased students' motivation and interest in learning more about a range of academic fields. Computers have provided a means for

students to interact and solve computer problems together in a socially acceptable manner.

Although there have been steps to improve the computer curriculum of the Beaumont Independent School District, teachers maintain that problems still exist in the areas of teacher training, equity in delivering computer-assisted instruction, hardware, computer facilities and courseware.

Conclusions

Having examined computer use in the Beaumont Independent School District and the research reported in related literature, we can begin to get answers to the questions asked in the introduction of this paper as well as questions other districts may raise while integrating computer-based instruction in its schools. Listed below are conclusions other school districts may find informative based on the observations and interviews of Beaumont Independent School District personnel and research of literature pertaining to computer-assisted instruction.

When integrating computer-assisted instruction into the district, teachers and administrators need to be aware of the vast differences in the types of courseware and hardware which are available. It is equally important to keep in mind the grade level for which the equipment will be purchased. Research shows that different types of instruction can have various effects on and benefits for

students.

In order to implement computer facilities both equitably and effectively, teachers and administrators must investigate and analyze the needs of the students of each campus throughout the district.

All school districts will not reach the same level of computer-assisted instruction at the same time. This development will be gradual. Educators who are motivated to learn to use the computer and other technologies effectively may reach the information age faster than those who are not. Educators must be informed of the importance of using the computer as a tool to help students in the problem-solving and thinking process, not just as a replacement for learning factual material.

APPENDIX

INTERVIEW QUESTIONS FOR TEACHERS IN THE B. I. S. D

Campus: _____

Date: _____

Interviewee: _____

1. Do students use a computer in your classroom?
2. Do you take your students to a lab?
3. How often do the students use the computer?
4. What grade(s) do you teach?
5. What subject(s) do you teach?
6. What courseware do you use to reinforce your subject(s)?
7. How would you classify the courseware you use:
Tutorial, Drill & Practice, Tool, Game, Simulation?
8. Which courseware if any, has offered academic and or personal growth improvement for the students?
9. How much training have you received?
10. How are you trained?
11. Do you need additional training?
12. What suggestions would you recommend to improve the efficiency of computer-assisted instruction for this school or your students?
13. What recommendations/needs do you have that would make your daily instruction more effective?
14. If your recommendations were implemented, what benefits would be realized by students, your school, or the district?
15. Are there any other comments you would like to make?

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SOFTWARE MENTIONED

<u>Title</u>	<u>Publisher</u>
<u>Keyboarding</u>	
MECC Keyboarding Primer	MECC
MECC Keyboarding Master	MECC
<u>Language Arts</u>	
Apple Works	Apple Computer, Inc.
Bank Street Writer	Scholastic
MECC Editor	MECC
MECC Speller	MECC
MECC Writer Start	MECC
MECC Writer	MECC
Processing Words	MECC
<u>Mathematics</u>	
Conquering Decimals	MECC
Conquering Fractions	MECC
Conquering Whole Numbers	MECC
Estimation	MECC
Fraction Munchers	MECC
Kings Rule, The	Sunburst
Market Place	MECC
Math Concepts	IBM
Math Practice	IBM
Money! Money!	Hartley
Number Munchers	MECC
Number Systems	MECC
Puzzle Tanks	Sunburst
Speedway Math	MECC

Science

Continental Drift	Prentice-Hall
Discovery Lab	MECC
Genetics	MECC
Plate Tectonics	Prentice-Hall
Miner's Cave	MECC
Weather Stations	Prentice-Hall

Social Studies

Computers In Government	MECC
Jenny's Journey	MECC
Oh Deer!	MECC
Oregon Trail	MECC
Polls & Politics	MECC