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ABSTRACT
        A rationale for computers in education in the Andover
(Massachusetts) public schools, a curricular scope and sequence, a
computer acquisitions plan, and a staff development summary are
presented. The report is a result of an 18-month study of computers
in education; pilot programs in the schools; and input from
specialists in business, education, and industry. The rationale
suggests that students must be provided opportunities to use properly
simple computer equipment, retrieve information from data banks,
learn programming languages, appreciate the impact of computers on
society, design information systems, use computers as a
decision-making tool, and learn via computer aided instruction. The
scope and sequence focuses on the educational use of computers from
five viewpoints: as a teaching tool, technological device, social
force, personal tool, and career tool. Recommendations are that
elementary schools have one microcomputer per 15 teachers and
secondary schools, one per department; the number of student
computers is determined on the basis of 30 minutes per student
weekly. Staff development will include an introduction to the
microcomputer, introduction to programming, instructional software
evaluation, and instructional software implementation. Appendices
include a history of the program (1981-1983) and proposals for
1983-1984, a log of student use of existing computers, a history of
hardware acquisitions, and phase 1 of the Andover Educational
Computing Program. (KC)

ANDOVER PUBLIC SCHOOLS
ANDOVER, MASSACHUSETTS

Educational Computing
in the
Andover Public Schools

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January 1983

Report of

The Computer Curriculum Committee

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INTRODUCTION

This is a report of the Andover Computer Curriculum Committee on educational computing in the Andover Public Schools. The findings and recommendations are based on the district's eighteen month study of computers in education, pilot programs in our schools, and input from specialists in business, education, and industry.

The report includes a rationale for educational computing, a curricular scope and sequence, a recommended computer acquisition plan, and staff development summary. The appendix includes the two year history of educational computing to date and describes programs, student use, and equipment acquisition.

Upon school committee approval, a specific implementation plan with a specific hardware proposal within specified costs will be prepared.

Rationale

Ten years ago the computer was considered a frill in education. Today, the computer is involved in most areas of modern life. The computer was used primarily as a sorting device, a machine designed to eliminate repetitive tasks and store quantities of information. Today, the computer is a vital tool used for decision making in large and small businesses. The home computer is rapidly becoming commonplace.

One of the long range goals of the public schools is to produce students who can participate intelligently as citizens in a computer-oriented society. Citizens should be prepared to function in the society by possessing a collection of skills, knowledge, concepts, and values designed to facilitate life in this technological era.

The Andover Public Schools must provide programs and services that enable students to develop those skills, knowledge, concepts, and values. Andover students must be involved in a formal study of computers and their uses in order that they might demonstrate a knowledge of this tool by learning how computers are changing our society; how computers work; and what computers do; and what they can do to make computers work for them.

Students in the Andover Public Schools must be provided opportunities to:
- Use properly simple computer equipment
- Retrieve information from data banks
- Learn programming languages
- Appreciate and understand how computers have impacted various aspects of society
- Experience a wide variety of simulations related to existing curriculum areas
- Design logical unique information systems
- Use computers as a decision-making tool
- Learn via computer aided instruction

The development of these opportunities should apply the theories of child growth and development as related to literacy in English. Such opportunities would enable students to develop the ability to read and write or as Luermann stated in Creative Computing

(Nov. 1981), "write for the computer and read what other people have written for the computer."

Students who can successfully demonstrate these skills, knowledge, concepts, and values and apply them would be computer literate and thus able to function comfortably as productive citizens in a computer-oriented society.

Educational Computing Program

OVERVIEW

Because the computer is a multi-purpose tool, we need to look at its educational use from more than one viewpoint. Teachers can use computers as tools for teaching many different subjects, in many different ways. Students should learn how to use computers in the many ways adults of the future will use them. In planning how the computer should be integrated into the curriculum, we have tried to reflect the following views of the computer:

As a Teaching Tool:
   The computer may assist the teacher in teaching all
   subjects, not simply computer science. It offers:
      Drill and practice
      Tutoring
      Simulations and microworlds
      Data and word processing resources
      Information retrieval and storage

As a Technological Device:
   Students need the basic ability to operate the
   computer as a black-box device with simple controls.

As a Social Force:
   Students need to explore how the computer fits into
   their world, past, present, and future. They need
   to consider the social and ethical issues surrounding
   how computers are used, and will be used.

As a Personal Tool:
   Students need to learn some of the many ways in which

computers can help them achieve their own personal goals, now and in the future. In particular, people can use the computer to help them to:

    Learn and explore ideas

    Write

    Draw shapes, compose and produce music

    Retrieve and store information

    Communicate

    Process and display data

    Make models and decisions

    Operate and/or control devices such as autcmobiles, home heating and cooling systems, and household appliances.

As a Career Tool:

Some students need to develop proficiency in using the computer as preparation for computer-related careers. Current areas include:

    Writing

    Accounting and finance

    Programming

    Science and engineering

    Commercial art

    Law

    Medicine

    Fine Arts

    History

    Manufacturing

    Human Services

    Music

    Theology

SCOPE AND SEQUENCE

I. As a Teaching Tool
   A. Use as a learning aid
      1. As a tutor
      2. For drill and practice

Basic skills remediation (below grade level objectives)

Drill and practice (at grade level objectives)

Problem solving (above grade-level objectives)

B. For simulations - interdisciplinary units

1. Real world models to simulate situations when real world examples are historic, or too dangerous, expensive, or time consuming

2. Software which demands:

a. inference
b. interpolation
c. extrapolation
d. evaluation

C. Student will be able to use the word processor

1. Writing through technology

a. editing, revising, proof-reading written materials
b. creative writing
c. reports
d. auto hyphenation and justifications
e. auto spelling correction

2. Developing news items with all students

3. Developing new skills for students with special needs

a. language deficient
b. motor deficient

II. As a Technological Device

A. Student will be able to locate on keyboard:

1. letters, numbers, symbols

2. return key, space bar, control key, shift key

B. Student will be able to access the computer

1. Turn on and off computer properly

2. LOGON and LOGOFF (when applicable)

3. Utilize peripheral input/output devices:

disk drives
printers
cassette recorder
light pen

C. Student will be able to use system commands and interact with the computer. (Specific language and specific machine.)

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```
(A)   CATALOG or DIR
(A)   RUN
(B)   SAVE
(B)   READ
(B)   LOCK
(B)   UNLOCK
(B)   DELETE or KILL or ERASE
```

2. Immediate Commands

```
(B)   STOP              CP/M
(B)   CTRL G and C      CDOS
(B)   LIST              MP/M
```

D. Students will be able to edit:

1. Erase

2. Alter a program or data

3. Use a preprogrammed module

E. Students will be able to demonstrate a knowledge of computer system components.

   1. Identify the components

     a. Hardware
     b. Software

   2. Understand functions of the components

     a. Hardware
     b. Software

III. As a Social Force

A. Student will be able to list and understand the impact of computers in daily life; e.g., at home, work, or school; in the marketplace; and at leisure.

B. Student will be able to understand the capabilities and limitations of computers.

   1. Capabilities

     a. enhances creativity
     b. increases speed, accuracy, reliability, and consistency of what is being run

       b.1   performs repetitive tasks
       b.2   performs editing tasks

     c. stores, processes, and retrieves large amounts of data quickly

   2. Limitations

     a. dependence upon human input
     b. finite storage capacity
     c. speed

C. Students will project future computer applications and the potential impact that they may have on their lives.

   1. Career choices

      a. new jobs
      b. elimination of present jobs
      c. necessity for flexibility regarding career changes throughout life

   2. Robotics

      a. automated control
      b. numeric control machines
      c. automatic mobile devices or R_2D_2

   3. Artificial intelligence

   4. New devices incorporating computer intelligence

D. Student will explore historical development of computational devices and how they relate to modern computers.

   1. Counting

      a. fingers, pebbles, notches
      b. abacus
      c. Napier's bones

   2. Mechanical

      a. Mannheim
      b. Pascal
      c. Leibniz
      d. Jacquard
      e. Babbage/Lovelace
      f. Hollerith

   3. Electronic generations categorized by speed, size, and storage

      a. relays
      b. vacuum tubes
      c. transistor
      d. integrated circuit
      e. succeeding generations

E. Students will be aware of ethical implications of computer use and abuse:

   1. Privacy - security

      a. types of records or lists
      b. computer deciphering techniques to protect data bases

   2. Computer Crime

      a. rights of software ownership (copyright laws)
      b. unauthorized access to data banks

         1. illegal transfer of money
         2. illegal transfer and illegal use of information

           c. corporate crime

           d. public corruption

    3. Potential for dehumanization of society

IV. As a Personal Tool

    A. Use as a laboratory in which to develop critical thinking skills

        1. By data analysis

           a. situational problem-solving

           b. student initiated projects

           c. class projects

> student government elections
> real elections
> poll gathering - surveys
> school store - cost analyses and inventory
> individual grades
> budget allowance
> athletics - individual and team statistics
> energy studies

        2. For problem solving/calculations

           a. concrete

           b. abstract - creative reasoning

        3. Creating software to be used by other students

           a. games

           b. simulation

           c. supplemental courseware

        4. Other

           a. writing/graphics

           b. communications

           c. data storage/retrieval

           d. data processing

           e. decision making/models

    B. Programming Activities

        1. Logo

             Fundamental Logo Graphics Commands

             FD   BK   LT   RT   plus input

             DRAW

             PC $\left.\begin{array}{l}\\ \\ \end{array}\right\}$ with number 0 - 5 for colors
             BG

             PU, PD

             HT, ST

Home

Draw - Immediate Mode
Length, Angles, Shapes

Repeat Instructions

Edit Mode
Writing simple procedures
Debugging - editing command
Sub procedures
Procedures with input
Simple recursion
Recursion with varying input
Conditional and stop rules

Logo Text (Numbers - words - lists)
Print statement
Numbers Computation
Words & Lists
Request command - Interactive programming
"Make" statement - Variable
Conditional if ... then

Logo Saving Procedures
Floppy disk
Save
Read
Catalog
Erase
Printers - Hard copy

    2. BASIC

V. As a Career Tool

  A. Word Processing skills

    1. Secretarial

    2. Report Writing

    3. Journalism

    4. Editing

    5. Contracts

    6. Specifications

  B. Experiences in Programming Languages

    1. Advanced Basic

    2. PASCAL

    3. Other languages

  C. Business Applications

    1. Accounting

    2. Finance

        3.   Inventory Control

        4.   Forecasting

        5.   CAD/CAM

D. Technical Applications

        1.   Drafting

        2.   Mechanics

        3.   Art

        4.   Music

RECOMMEMDED COMPUTER ACQUISITION PROGRAM

1983 - 1986

School (students) Computer as:	South (450)	Sanborn (450)	Bancroft (600)	West (900)	Junior High Doherty (650)	West (750)	Andover High School (1300)	TOTALS
Technological Device 1	1	1	1	1½	1	1		6½
Teaching Personal Career Tool For Teachers: 2 For Students: 3	½ (2) ½ (2) +17	½ (2) ½ (2) +17	½ (3½) ½ (3½) +22½	½ (5) ½ (5) +33½	½ (14) ½ (14) +19	½ (14) ½ (14) +23	½ (14) ½ (14) +45	27¼ 204¼
Total need	20	20	27	40	34	38	59	238
Available	2	2	3	4	9	9	8	37
Rec. purchase	18	18	24	36	25	29	51	201

1. Assumes 40 minutes/year/student

2. Elementary: 1 micro/15 teachers   Secondary: 1 micro/"department"

3. Assumes 30 minutes/student/week

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SPECIFIC PLAN: 1983-1986

Over the next three years, we recommend pursuing a limited number of specific goals within the broad outline set forth above. As the following paragraphs describe, reaching each of these instructional goals requires the acquisition of a certain number of microcomputer systems for each school. The attached chart summarizes this hardware acquisition proposal.

One goal does not have immediate hardware acquisition implications: the exploration of the Computer as a Social Force. We assume that the basic familiarity with the computer needed to discuss this issue will be accomplished in the context of the remaining goals. In addition, we have re-ordered the goals for purposes of discussion, to reflect differences in the ways we have estimated hardware requirements.

1. COMPUTER AS TECHNOLOGICAL DEVICE

We consider it a high priority for every child in the Andover Schools to have the ability to operate a microcomputer as a simple device. Specifically, each child should be able to insert a disk, turn on the computer, catalog the disk, run a program, and interact with the program using single-key commands. We estimate this level of skill to require 40 minutes of computer time per year, per student. This would correspond to a total requirement of six and one-half microcomputers system-wide (as detailed on the summary sheet). In this calculation, as in all that follow, we have assumed that microcomputers can be effectively used 50% of the time, corresponding to 450 hours of computer time per microcomputer per year.

2. COMPUTER AS TEACHING, PERSONAL, AND CAREER TOOL

We also feel that every child in the Andover Schools should have at least a minimal experience with the use of the computer as a teaching, personal, and career tool. The nature of that experience should naturally reflect individual needs of the children, teacher preferences, and level of schooling. For example, we believe the emphasis at the

elementary level should be on interaction with teaching programs, with simple programming (Logo), and with word-processing. At the secondary level, this emphasis would gradually shift toward more powerful personal applications and especially career-oriented and college-preparatory uses of the computer.

We estimate that, to accomplish a minimal level of experience, each student should be able to work with a micro-computer for an average of 30 minutes each week. (This does not mean that each student will spend this amount of time each week. Over several years, however, each student should have this much access.) This will require a total of roughly 204 microcomputers system-wide.

In addition, however, effective instructional use of the computer requires knowledgeable and prepared teachers. Therefore, provision for inservice training, preparation activities, and software review must also be included here. Assuming half-time staff use, one microcomputer for every fifteen elementary teachers, and one microcomputer for most departments at the secondary level, should give teachers the access they need. (For these purposes, we have considered. as departmental units the following: Language Arts, Foreign Language, Mathematics, Music, Fine Arts, Social Studies, Industrial Arts, Physical Education/Health, Business Education, Special Needs, Media, Home Economics, and Guidance.) These machines would be used for instruction the remaining half time, as reflected in the summary figures.

RECOMMEDATION

Although the level of microcomputer use proposed here is a minimal one, the cost is nevertheless fairly high. Assuming that one microcomputer system costs approximately $2000, the total acquisition budget over three years would be over $400,000. Servicing and training costs would be drawn from existing accounts for these purposes. However, these costs need to be viewed in perspective. A yearly acquisition budget of $133,000 represents an allocation of less than $27 per student per year over the three-year period, and of course the costs should be amortized over a longer period. In view of the importance of computer-related experience for children in this community, these costs are hardly excessive.

STAFF DEVELOPMENT

Over 40 per cent of our professional staff will have success-fully completed courses in educational computing and/or programming by the end of this school year. A language arts based software course is currently in full operation; a business education compu-ter application course is about to begin. Three inservice courses in LOGO and BASIC will be offered beginning in March.

In addition by the end of this school year all staff will have had the following experiences:

1. Introduction to the microcomputer: controlling the hardware, that is, turning it on and off, inserting discs, responding to commands, etc.

2. Introduction to programming: overview of either LOGO or BASIC that helps teachers understand how programs are written and how they might, with further training, control software.

3. Instructional software evaluation: focus on the software that is available on the grade level or in the department with which teachers are working.

4. Instructional software implementation: nuts and bolts using the computers in the classroom either with small groups of students or with the class as a whole.

Costs for the above activities are drawn from regular school system inservice and professional improvement funds and Massachusetts Department of Education Commonwealth Inservice Institute grants. Further staff development with similar funding is assumed during the coming school year.

APPENDIX

History of Program

OVERVIEW OF ELEMENTARY PROGRAM

School	1981-1982	1982-1983	1983-1984 (Proposed)
West Elementary	Computer literacy program for 215 sixth grade students & introduction to BASIC & LOGO as well as to tutorials, text-editing, games, and simulations on the computer.	Extension of program to selected fourth grade students and sixth grade students.	Introduce all students to computer as a tool. Introduce programming with LOGO in grades 3-6. Field test Project Quill writing software.
Bancroft	Computer literacy program through LOGO for 243 children in Lofts 1, 2, and 3 and for 6th grade students who have completed IMS.	Extension of program to the fourth graders who were in the third grade program and to students in the 4th, 5th, and 6th grades.	Introduce all students to computer as a tool. Introduce programming with LOGO in grades 3-6. Field test Project Quill writing software.
Sanborn	Program to teach 83 6th grade students how to write simple programs in BASIC -- thus developing logical analysis skills.	Extension of the program to 5th and 6th grade students. Implementation for primary grades as well	Introduce all students to computer as a tool. Introduce programming with LOGO in grades 3-6.
South	No equipment	Program to be implemented at grades 4 and 5.	Introduce all students to computer as a tool. Introduce programming with LOGO in grades 3-6.

OVERVIEW OF SECONDARY PROGRAM

School	1981-1982	1982-1983	1983-1984 (Proposed)
AHS	**Math Department** PDP with 5 terminals, 2 dec-writers, 1 printer. One semester elective course--BASIC programming--available in 5 sections to seniors. Enrollment approximately 300 students.	Add three sections of advanced BASIC programming; lab fully scheduled.	Add three sections of advanced BASIC programming; lab fully scheduled.
	Business Department Instituting Peach Tree Accounting Program with 2 micro-computers, with dual disks and monitors, and 1 printer.	Increase the number of students into the program. Field test word-processing program.	Implement computers in business course. Implement word processing program.
	English Department	Field test micro-computer as word-processor with classes in creative writing.	Implement word processing program as integral part of sophomore English course for all students and as an alternative medium for upper class writing electives
	Social Studies	Simulation programs in problem solving and decision-making skills.	Implement software
	Science	Field test micro-computers as lab instruments.	Implement software

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OVERVIEW OF SECONDARY PROGRAM (continued)

School	1981-1982	1982-1983	1983-1984 (Proposed)
EJH	Interested teachers learning BASIC programming language	Field test literacy program in lab.	Implement keyboarding course with grade 7 students. Implement computer literacy program for grade 7 students.
	English	Field test micro-computer as word-processor with classes in creative writing.	Implement software.
	Social Studies	Simulation programs.	Implement software.
	Foreign Language		Implement modules developed at West Junior High.
	Mathematics		Field test programming elective.
WJH	Interested teachers in literary and programming courses	Field test computer literacy program in lab.	Implement keyboarding course with grade 7 students. Implement computer literacy program for grade 7 students.
	English	Field test micro-computer as word-processor with classes in creative writing.	Implement software.
	Social Studies	Simulation programs.	Implement software.
	Foreign Language	Field test teacher developed software.	Implement teacher-developed software.
	Mathematics		Field test programming elective.

USAGE OF MICROCOMPUTERS 1982 - 83

Sample of a 10 week period

School	No. of Computers	No. of Students	Hands on time	Activities
Bancroft	2 A 3rd machine, gift of the PTO, is housed in the media center & available to students & teachers on a sign up basis; presently being used at maximum.	174	Average 30 min. per week per team of 2 students	LOGO; MECC simulation & problem solving. Machines are scheduled for these activities 80% of school day. Remaining 20% is used on a sign up basis by teachers, aides, and/or students.
Sanborn	2	256	Varies from 6 - 30 min. per week per team of 2 students	LOGO;MECC simulation in the classroom; class of 6 perceptually handicapped learning LOGO. Machines are scheduled every period for students working in pairs or for class use. In addition 225 min. (before school, recess, time during lunch period) 1st graders use micros. Machines are scheduled 100% of the available time.

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School	No. of Computers	No. of Students	Hands on time	Activities
South	2	206	Varies from 15-30 min. per week per team of 2 students	4th & 5th grade students learning LOGO; all 2nd gr. children have had experience loading & running a learning program. Machines are being used 100% of school day.
West El	4	321 (134 4th grade 157 6th grade 20 5th grade 10 gifted & talented)	Varies from 14-48 min. per student per week	Mostly drill & practice, tutorial, teacher management, simulatioi and informal teacher trainin: Schedule is posted & machines are available 100% of the school day, before & after school..

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School	No. of Computers	No. of students	Hands on time	Activities
WJII	8 (computer lab)	180	30 min. per week per team 2 students for 10 week period	BASIC course
		16	each period of the day	Scheduled by class or individually. Filled to capacity.
	1 (media ctr.)		Maximum use.	Scheduled for simulation in the classroom & individual student or teacher use in the media center.
Doh. Jr. High	8 (computer lab)	220	80 min. per week for 10 weeks.	BASIC course.
		maximum or 16 29 periods per week and from 2-3p.m.		Available to any student who has passed the Computer Literacy test.
	1 (media center)		maximum use.	Scheduled for simulation in the classroom and. individual student or teacher use in. the media center.
AIIS	2 (media center)		Maximum use.	One micro for studen⁻ use - sign up. one micro - scheduled by teachers for simulation and problem solving in the classroom.
	6 (business department)	- used exclusively by business department teachers and students		

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ACQUISITION PROGRAM FOR ELEMENTARY SCHOOLS

School	1981-1982	Approx. Cost	1982-1983	Approx. Cost	1983-1984	Approx. Cost
Bancroft	2 micro-computers with disks and monitors 1 printer software	$6,000			5 micro-computers with disks and monitors 1 printer 1 additional disk drive	$10,020
Sanborn	1 micro-computer with disk and monitor 1 printer software	3,000	1 micro-computer with disk and monitor 1 printer software	3,000	3 micro-computers with disks and monitors 1 printer 1 additional disk drive	6,395
West El.	4 micro-computers with disks and monitors 2 printers software	12,000			7 micro-computers with disks and monitors 1 printer 1 additional disk drive	13,647
South			2 micro-computers with disks and monitors 1 printer software	$6,000	3 micro-computers with disks and monitors 1 printer 1 additional disk drive	6,395

Upkeep: All equipment will carry a one-year warranty. If a machine under warranty will require more than 5 days to repair, an item will be loaned to us. Beyond the warranty, our technician will be able to handle repairs. He will participate in an intensive training program by the manufacturer. A check has been made with schools owning micro-computers about repairs after the warranty period. The majority have not had any major problems, as long as the disc heads are kept clean, and have not had service contracts which are approximately 10% of the cost of the equipment.

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ACQUISITION PROGRAM FOR SECONDARY SCHOOLS

School	1981-1982	Approx. Cost	1982-1983	Approx. Cost	1983-1984	Approx. Cost
AHS	Math Dept PDP 8 - 7 terminals	Presently in use	Math Computer Lab Deck Writer Central processor Printer Interface & wiring	$7,000 less DEC grant, 50%	Classroom Use 7 micro-computers with disks and monitors 3 printers; disk drive	$15,944
					Word Processor Lab 13 micro-computers with disks and monitors 4 printers	$23,305
	Business Dept. 2 micro-computers with dual disks and monitors 3 printers	Presently in use	Business Dept. 4 micro-computers 4 monitors 1 printer 4 drives w cards 4 drives w/o cards	$10,000 (Grants from U.S. Oc. Ed. Program)		
			Media Center 2 micro-computers 2 monitors 2 printers	$6,000	Media Center 4 micro-computers with disks and monitors 1 printer 1 add. disk drive	8,041
Doherty J.H.			Computer Lab 8 micro-computers 8 monitors 1 Corvus System	21,000	Computer Lab 4 micro-computers with disks and monitors 1 printer 1 add. disk drive	7,874
			Media Center 1 micro-computer 1 monitor 1 printer	3,000		

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ACQUISITION PROGRAM FOR SECONDARY SCHOOLS (continued)

School	1981-1982	Approx. Cost	1982-1983	Approx. Cost	1983-1984	Approx. Cost
Doherty JH					Classroom Use 7 micro-computers with disks and monitors 3 printers 3 add. disk drives	$15,944
WJH			Computer Lab 8 micro-computers 8 monitors 1 Corvus System	$21,000	Computer Lab 4 micro-computers with disks and monitors 1 printer 1 add. disk drive	7,874
			Media Center 1 micro-computer 1 monitor 1 printer	3,000		
					Classroom Use 7 micro-computers with disks and monitors 1 printer 1 add. disk drive	15,944

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Implement Phase I of Andover Educational Computing Proposal

GOAL	KEY PERSONNEL	TARGET DATE
1. Conduct inservice sessions		
a. LOGO for teachers	George Brackett	April 26, 1983
b. BASIC	Jim Murphy	May 18, 1983
c. Word Processing	Peggy Fenton	May 16, 1983
d. AIRSWARE/Mastery Management	Gary Chadwell	May 31, 1984
2. Finalize specific goals for program	Assistant Superintendent with Computer Curriculum Committee and Key Teachers	
a. Elementary/junior high school		May 23, 1983
b. Keyboarding		May 4, 1983
c. Word Processing		June 3, 1983
3. Complete preliminary edition of curricula		
a. Keyboarding	Typing Teachers	May 27, 1983
b. Educational Computing	Computer Curriculum Committee	June 10, 1983
4. Identify specific hardware to implement	Annetta Freedman George Brackett Assistant Superintendent	June 17, 1983
5. Conduct training sessions for school administrators on Phase I	George Brackett	July 1983

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GOAL	KEY PERSONNEL	TARGET DATE
6. Conduct awareness sessions with staff	Principals	September 8, 1983
7. Develop model to monitor implementation of Phase I	Assistant Superintendent Instructional Specialists Assistant Principals	September 30, 1983
8. Implement Phase I		
a. Keyboarding	Junior High School Typing Teachers	September 12, 1983
b. Computer literacy	Junior High School Math Teachers	September 19, 1983
c. Word processing	High School English Teachers	September 19, 1983
d. Awareness/instruction	Classroom Teachers	October 1, 1983
e. Programming	Math Teachers	September 19, 1983
f. Field test software	Classroom Teachers	October 1, 1983
9. Conduct community awareness/ community use activities	Assistant Superintendent	October 15, 1983
	Department of Community Services	October 1, 1983
10. Additional inservice for staff	Computer Consultant and Key Andover Staff	December 1983 May 1984
11. Conduct preliminary evaluation	Evaluation Consultant Instructional Specialists/ Assistant Principals	January 15, 1984
12. Conduct final evaluation of Phase I	Evaluation Consultant Instructional Specialists/ Assistant Principals	May 1984

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