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)
Educational Computing
in the
Andover Public Schools

Charles L. Mitsakos
Assistant Superintendent of Schools

January 1983
Report of
The Computer Curriculum Committee

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With grateful acknowledgement for their review and suggestions,
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James Wilen, consultant engineer; and Peter Wu, aerospace engineer,
Physical Sciences, Inc.
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</table>
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 automobiles, 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.)
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. spend
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 R2D2

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

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
   } with number 0 - 5 for colors
   BG
   PU, PD
   HT, ST

   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
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
## Recommended Computer Acquisition Program
### 1983 - 1986

<table>
<thead>
<tr>
<th>School (students)</th>
<th>South (450)</th>
<th>Sanborn (450)</th>
<th>Bancroft (600)</th>
<th>West (900)</th>
<th>Junior Doherty (650)</th>
<th>High West (750)</th>
<th>Andover High School (1300)</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer as:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technological Device 1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1½</td>
<td>1</td>
<td>1</td>
<td></td>
<td>6½</td>
</tr>
<tr>
<td>Teaching Personal Career Tool</td>
<td>1½ (2)</td>
<td>1½ (2)</td>
<td>1½ (3½)</td>
<td>1½ (5)</td>
<td>1½ (14)</td>
<td>1½ (14)</td>
<td>1½ (14)</td>
<td>27½</td>
</tr>
<tr>
<td>For Teachers: 2</td>
<td>1½ (2)</td>
<td>1½ (2)</td>
<td>1½ (3½)</td>
<td>1½ (5)</td>
<td>1½ (14)</td>
<td>1½ (14)</td>
<td>1½ (14)</td>
<td>204½</td>
</tr>
<tr>
<td>For Students: 3</td>
<td>+17</td>
<td>+17</td>
<td>+22½</td>
<td>+33½</td>
<td>+19</td>
<td>+23</td>
<td>+45</td>
<td>221½</td>
</tr>
<tr>
<td>Total need</td>
<td>20</td>
<td>20</td>
<td>27</td>
<td>40</td>
<td>34</td>
<td>38</td>
<td>59</td>
<td>238</td>
</tr>
<tr>
<td>Available</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>37</td>
</tr>
<tr>
<td>Rec. purchase</td>
<td>18</td>
<td>18</td>
<td>24</td>
<td>36</td>
<td>25</td>
<td>29</td>
<td>51</td>
<td>201</td>
</tr>
</tbody>
</table>

1. Assumes 40 minutes/year/student
2. Elementary: 1 micro/15 teachers  Secondary: 1 micro/"department"
3. Assumes 30 minutes/student/week
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.

RECOMMENDATION

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.
Over 40 per cent of our professional staff will have successfully 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 computer 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.
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>West Elementary</td>
<td>Computer literacy program for 215 sixth grade students &amp; introduction to BASIC &amp; LOGO as well as to tutorials, text-editing, games, and simulations on the computer.</td>
<td>Extension of program to selected fourth grade students and sixth grade students.</td>
<td>Introduce all students to computer as a tool. Introduce programming with LOGO in grades 3-6. Field test Project Quill writing software.</td>
</tr>
<tr>
<td>Bancroft</td>
<td>Computer literacy program through LOGO for 243 children in Lofts 1, 2, and 3 and for 6th grade students who have completed IMS.</td>
<td>Extension of program to the fourth graders who were in the third grade program and to students in the 4th, 5th, and 6th grades.</td>
<td>Introduce all students to computer as a tool. Introduce programming with LOGO in grades 3-6. Field test Project Quill writing software.</td>
</tr>
<tr>
<td>Sanborn</td>
<td>Program to teach 83 6th grade students how to write simple programs in BASIC -- thus developing logical analysis skills.</td>
<td>Extension of the program to 5th and 6th grade students. Implementation for primary grades as well</td>
<td>Introduce all students to computer as a tool. Introduce programming with LOGO in grades 3-6.</td>
</tr>
<tr>
<td>South</td>
<td>No equipment</td>
<td>Program to be implemented at grades 4 and 5.</td>
<td>Introduce all students to computer as a tool. Introduce programming with LOGO in grades 3-6.</td>
</tr>
</tbody>
</table>
## OVERVIEW OF SECONDARY PROGRAM

### 1981-1982

**School**  
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.

**Business Department**  
Instituting Peach Tree Accounting Program with 2 micro-computers, with dual disks and monitors, and 1 printer.

**English Department**

**Social Studies**

**Science**

### 1982-1983

**1982-1983 (Proposed)**

**Math Department**

Add three sections of advanced BASIC programming; lab fully scheduled.

**Business Department**

Increase the number of students into the program. Field test word-processing program.

**English Department**

Field test micro-computer as word-processor with classes in creative writing.

**Social Studies**

Simulation programs in problem solving and decision-making skills.

**Science**

Field test micro-computers as lab instruments.

### 1983-1984

**1983-1984 (Proposed)**

Add three sections of advanced BASIC programming; lab fully scheduled.

Implement computers in business course. Implement word processing program.

Implement word processing program as integral part of sophomore English course for all students and as an alternative medium for upper class writing electives.

Implement software
<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EJH</td>
<td>Interested teachers learning BASIC programming language</td>
<td>Field test literacy program in lab.</td>
<td>Implement keyboarding course with grade 7 students. Implement computer literacy program for grade 7 students.</td>
</tr>
<tr>
<td></td>
<td>English</td>
<td>Field test micro-computer as word-processor with classes in creative writing.</td>
<td>Implement software.</td>
</tr>
<tr>
<td>Social Studies</td>
<td>Simulation programs.</td>
<td>Implement software.</td>
<td>Implement software.</td>
</tr>
<tr>
<td>Foreign Language</td>
<td>Field test computer literacy program in lab.</td>
<td>Implement modules developed at West Junior High.</td>
<td>Field test programming elective. Implement keyboarding course with grade 7 students. Implement computer literacy program for grade 7 students.</td>
</tr>
<tr>
<td>Mathematics</td>
<td>Field test micro-computer as word-processor with classes in creative writing.</td>
<td>Implement software.</td>
<td>Implement software.</td>
</tr>
<tr>
<td>WJH</td>
<td>Interested teachers in literary and programming courses</td>
<td>Field test teacher developed software.</td>
<td>Implement teacher-developed software.</td>
</tr>
<tr>
<td></td>
<td>English</td>
<td></td>
<td>Field test programming elective.</td>
</tr>
</tbody>
</table>
Log of Student Use

USAGE OF MICROCOMPUTERS 1982 - 83
Sample of a 10 week period

<table>
<thead>
<tr>
<th>School</th>
<th>No. of Computers</th>
<th>No. of Students</th>
<th>Hands on time</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bancroft</td>
<td>2</td>
<td>174</td>
<td>Average 30 min. per week per team of 2 students</td>
<td>LOGO; MECC simulation &amp; 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.</td>
</tr>
<tr>
<td>Sanborn</td>
<td>2</td>
<td>256</td>
<td>Varies from 6 - 30 min. per week per team of 2 students</td>
<td>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.</td>
</tr>
<tr>
<td>School</td>
<td>No. of Computers</td>
<td>No. of Students</td>
<td>Hands on time</td>
<td>Activities</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------</td>
<td>-----------------</td>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>South</td>
<td>2</td>
<td>206</td>
<td>Varies from 15-30 min. per week per grade students</td>
<td>4th &amp; 5th grade students learning LOGO; all 2nd gr. children have had experience loading &amp; running a learning program. Machines are being used 100% of school day.</td>
</tr>
<tr>
<td>West El</td>
<td>4</td>
<td>321 (134 4th grade, 157 6th grade, 20 5th grade, 10 gifted &amp; talented)</td>
<td>Varies from 14-48 min. per student per week</td>
<td>Mostly drill &amp; practice, tutorial, teacher management, simulation; and informal teacher training. Schedule is posted &amp; machines are available 100% of the school day, before &amp; after school.</td>
</tr>
<tr>
<td>School</td>
<td>No. of Computers</td>
<td>No. of students</td>
<td>Hands on time</td>
<td>Activities</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------</td>
<td>----------------</td>
<td>-----------------------------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>WJH</td>
<td>8 (computer lab)</td>
<td>180</td>
<td>30 min. per week per team</td>
<td>BASIC course</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 students for 10 week period</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 (media ctr.)</td>
<td>16</td>
<td>each period of the day</td>
<td></td>
</tr>
<tr>
<td>Doh. Jr. High</td>
<td>8 (computer lab)</td>
<td>220</td>
<td>80 min. per week for 10 weeks</td>
<td>BASIC course.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>maximum or 16</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>29 periods per week and from</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2-3 p.m.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 (media center)</td>
<td></td>
<td>maximum use.</td>
<td></td>
</tr>
<tr>
<td>AHS</td>
<td>2 (media center)</td>
<td></td>
<td>Maximum use.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 (business dept.)</td>
<td></td>
<td>One micro for student use - sign up.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>one micro - scheduled by teachers for simulation and problem solving in the classroom.</td>
<td></td>
</tr>
<tr>
<td>------------</td>
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<td>--------------</td>
<td>------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Bancroft</td>
<td>2 micro-computers with disks and monitors</td>
<td>$6,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 printer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>software</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sanborn</td>
<td>1 micro-computer with disk and monitor</td>
<td>3,000</td>
<td>1 micro-computer with disk and monitor</td>
<td>3,000</td>
</tr>
<tr>
<td></td>
<td>1 printer</td>
<td></td>
<td>1 printer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>software</td>
<td></td>
<td>software</td>
<td></td>
</tr>
<tr>
<td>West El.</td>
<td>4 micro-computers with disks and monitors</td>
<td>12,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 printers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>software</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South</td>
<td></td>
<td></td>
<td>2 micro-computers with disks and monitors</td>
<td>$6,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 printer</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>software</td>
<td></td>
</tr>
</tbody>
</table>

**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.
### ACQUISITION PROGRAM FOR SECONDARY SCHOOLS

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>AHS Math Dept</td>
<td>PDP 8 - 7 terminals Presently in use</td>
<td></td>
<td>Math Computer Lab Deck Writer Central processor Printer Interface &amp; wiring</td>
<td>$7,000 less DEC grant, 50%</td>
<td>Classroom Use 7 micro-computers with disks and monitors 3 printers; disk drive</td>
<td></td>
</tr>
<tr>
<td>Business Dept.</td>
<td>2 micro-computers with dual disks and monitors 3 printers Presently in use</td>
<td></td>
<td>Business Dept.</td>
<td>4 micro-computers 4 monitors 1 printer 4 drives w cards 4 drives w/o cards</td>
<td>$10,000 (Grants from U.S. Oc. Ed. Program)</td>
<td>Word Processor Lab 13 micro-computers $23,305 with disks and monitors 4 printers</td>
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<tr>
<td>Media Center</td>
<td>2 micro-computers 2 monitors 2 printers</td>
<td></td>
<td>Media Center</td>
<td>4 micro-computers 8,041 with disks and monitors 1 printer 1 add. disk drive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Lab</td>
<td>8 micro-computers 8 monitors 1 Corvus System</td>
<td></td>
<td>Computer Lab</td>
<td>4 micro-computers 7,874 with disks and monitors 1 printer 1 add. disk drive</td>
<td></td>
<td></td>
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<tr>
<td>Media Center</td>
<td>1 micro-computer 1 monitor 1 printer</td>
<td></td>
<td>Media Center</td>
<td>1 micro-computer 3,000</td>
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<tr>
<td>Doherty JH</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>WJH</td>
<td></td>
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</tr>
</tbody>
</table>

### Computer Lab
- **1981-1982**
  - 8 micro-computers
  - 8 monitors
  - 1 Corvus System
  - $21,000

- **1982-1983**
  - 4 micro-computers
  - 7,874

- **1983-1984**
  - 4 micro-computers
  - 7,874

### Media Center
- **1981-1982**
  - 1 micro-computer
  - 1 monitor
  - 1 printer
  - 3,000

- **1982-1983**
  - 3,000

- **1983-1984**
  - 3,000

### Classroom Use
- **1981-1982**
  - 7 micro-computers
  - 15,944

- **1982-1983**
  - 7 micro-computers
  - 15,944

- **1983-1984**
  - 7 micro-computers
  - 15,944
Implement Phase I of Andover Educational Computing Proposal

GOAL

1. Conduct inservice sessions
   a. LOGO for teachers
   b. BASIC
   c. Word Processing
   d. AIRSWARE/Mastery Management

2. Finalize specific goals for program
   a. Elementary/junior high school
   b. Keyboarding
   c. Word Processing

3. Complete preliminary edition of curricula
   a. Keyboarding
   b. Educational Computing

4. Identify specific hardware to implement

5. Conduct training sessions for school administrators on Phase I

KEY PERSONNEL

1. Conduct inservice sessions
   George Brackett
   Jim Murphy
   Peggy Fenton
   Gary Chadwell

2. Finalize specific goals for program
   Assistant Superintendent with Computer Curriculum Committee and Key Teachers

3. Complete preliminary edition of curricula
   Typing Teachers
   Computer Curriculum Committee

4. Identify specific hardware to implement
   Annetta Freedman
   George Brackett
   Assistant Superintendent

5. Conduct training sessions for school administrators on Phase I
   George Brackett

TARGET DATE

1. Conduct inservice sessions
   April 26, 1983
   May 18, 1983
   May 16, 1983
   May 31, 1984

2. Finalize specific goals for program
   May 23, 1983
   May 4, 1983
   June 3, 1983

3. Complete preliminary edition of curricula
   May 27, 1983
   June 10, 1983

4. Identify specific hardware to implement
   June 17, 1983

5. Conduct training sessions for school administrators on Phase I
   July 1983
Implement Phase I of Andover Educational Computing Proposal

**GOAL**

6. Conduct awareness sessions with staff

7. Develop model to monitor implementation of Phase I

8. Implement Phase I
   a. Keyboarding
   b. Computer literacy
   c. Word processing
   d. Awareness/instruction
   e. Programming
   f. Field test software

9. Conduct community awareness/community use activities

10. Additional inservice for staff

11. Conduct preliminary evaluation

12. Conduct final evaluation of Phase I

**KEY PERSONNEL**

<table>
<thead>
<tr>
<th>GOAL</th>
<th>KEY PERSONNEL</th>
<th>TARGET DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.</td>
<td>Principals</td>
<td>September 8, 1983</td>
</tr>
<tr>
<td>7.</td>
<td>Assistant Superintendent, Instructional Specialists, Assistant Principals</td>
<td>September 30, 1983</td>
</tr>
<tr>
<td>8. a.</td>
<td>Junior High School Typing Teachers</td>
<td>September 12, 1983</td>
</tr>
<tr>
<td>8. b.</td>
<td>Junior High School Math Teachers</td>
<td>September 19, 1983</td>
</tr>
<tr>
<td>8. c.</td>
<td>High School English Teachers</td>
<td>September 19, 1983</td>
</tr>
<tr>
<td>8. d.</td>
<td>Classroom Teachers</td>
<td>October 1, 1983</td>
</tr>
<tr>
<td>8. e.</td>
<td>Math Teachers</td>
<td>September 19, 1983</td>
</tr>
<tr>
<td>8. f.</td>
<td>Classroom Teachers</td>
<td>October 1, 1983</td>
</tr>
<tr>
<td>9.</td>
<td>Assistant Superintendent, Department of Community Services</td>
<td>October 15, 1983</td>
</tr>
<tr>
<td>10.</td>
<td>Computer Consultant and Key Andover Staff</td>
<td>December 1983</td>
</tr>
<tr>
<td></td>
<td></td>
<td>May 1984</td>
</tr>
<tr>
<td>12.</td>
<td>Evaluation Consultant, Instructional Specialists, Assistant Principals</td>
<td>May 1984</td>
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