DOCUMENT RESUME

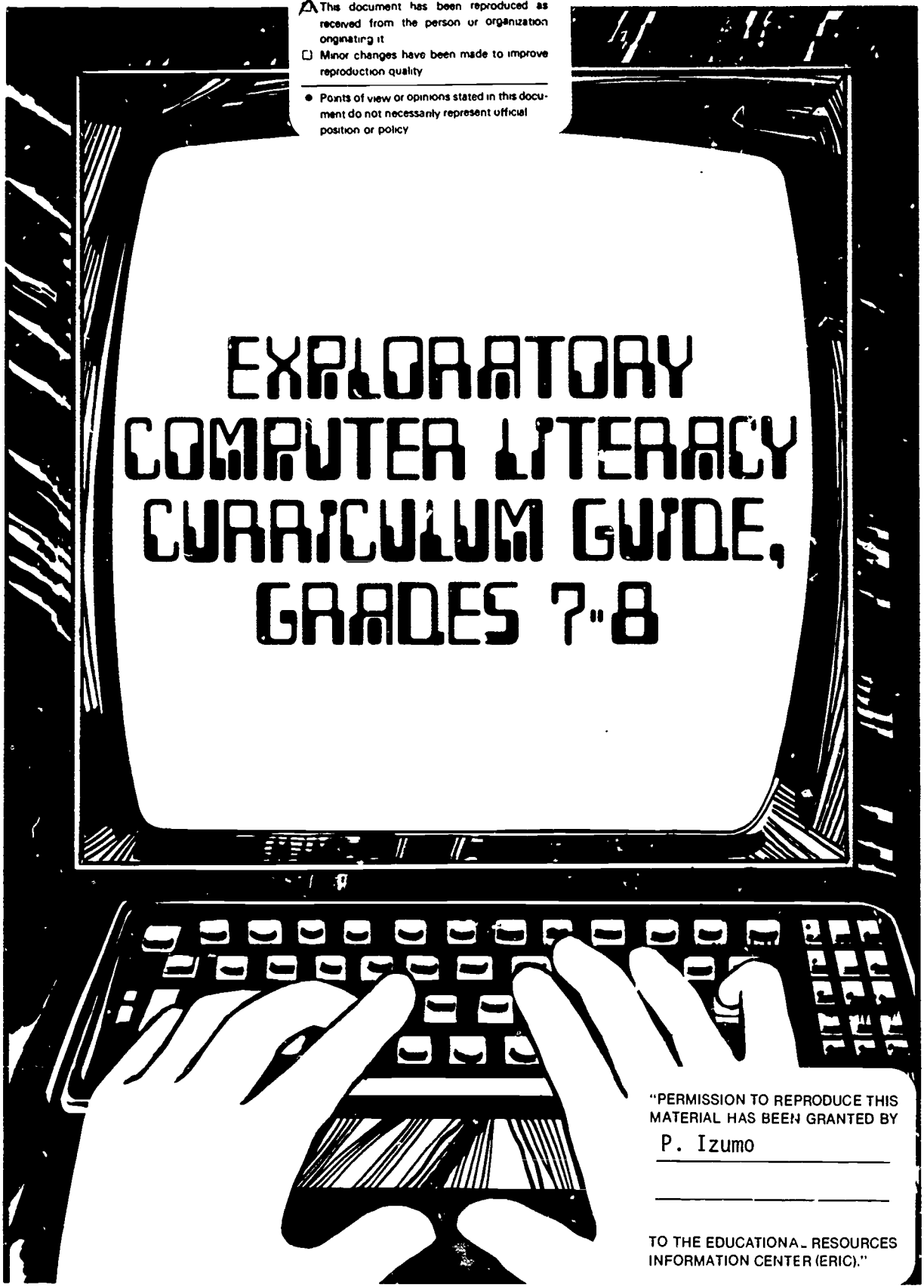
ED 264 835 IR 011 919

TITLE	Exploratory Computer Literacy Curriculum Guide, Grades 7-8.
INSTITUTION	Hawaii State Dept. of Education, Honolulu. Office of Instructional Services.
REPORT NO	RS-85-7792
PUB DATE	May 85
NOTE	142p.; For similar guides for grades 1-6, see ED 256 289 and ED 260 689; for a curriculum guide for grades 9-12, see IR 011 920.
PUB TYPE	Guides - Classroom Use - Guides (For Teachers) (052)
EDRS PRICE	MF01/PC06 Plus Postage.
DESCRIPTORS	*Computer Literacy; *Computer Software; Curriculum Enrichment; Educational Media; Glossaries; Grade 7; Grade 8; Junior High Schools; *Learning Activities; *Microcomputers; *Models; State Curriculum Guides; Statewide Planning
IDENTIFIERS	Database Management Systems; *Hawaii; Spreadsheets

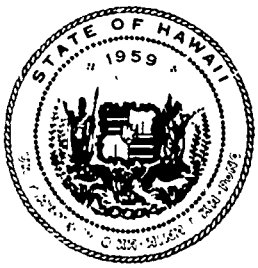
ABSTRACT

Designed to offer direction for classroom teachers and administrators in the development of an exploratory computer literacy program for grades 7 and 8, this resource unit comprises four major sections, four appendices, and two resource lists. The introductory section provides information on the history of Hawaii's computer literacy program; cites its three parts--an exploratory component, a computer science component, and a vocational-technical component; states this guide's intent to address the exploratory component; and explains the foundations and rationale for the publication. The section on curriculum addresses such questions as: (1) where this new program will be placed in the curriculum; (2) the instructional modes that will be involved; and (3) the teaching methodology that will be used. Four examples of instructional modes--topic, tutor, tutee, and tool--are explained and prescribed for specific learning situations. Four guidelines are given to assist secondary schools in implementing the exploratory computer literacy program, and five models are listed for delivering exploratory computer literacy via courses, unit content, or computer laboratories. Guidelines for curriculum development include a taxonomy of goals, objectives, and student expectations for exploratory computer literacy in grades K-12. A scope and sequence chart condenses the taxonomy into essential phases and shows, for grades 7 and 8, the benchmark grade at which it is recommended that each student expectation be met. The final section provides sample activities for classroom use within the major categories of entry level, language arts, mathematics, science, and social studies. Each sample activity includes suggestions for teachers on instructional mode, prerequisites, classroom management, materials, time required for activity, and teacher preparation. Appendices include an exploratory computer literacy framework, task force recommendations, a glossary of computer acronyms and terms, and bonus activities. Resources listed include teacher references and recommended periodicals, and related films and videotapes. (JB)

EXPLORATORY COMPUTER LITERACY CURRICULUM GUIDE, GRADES 7-8



OFFICE OF INSTRUCTIONAL SERVICES/GENERAL EDUCATION BRANCH ☐ DEPARTMENT OF EDUCATION
STATE OF HAWAII ☐ RS 85-7792 ☐ MAY 1985



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FOREWORD

Computer applications are increasing in research, business, and industry to the point where their effects impact almost daily on the lives of people. More recent advances have drastically reduced costs to make the computer available for use in small businesses, recreation, and even the home. This guide is an effort to provide direction for a computer literacy program in which all students in Grades 7-8 can gain experiences and knowledge that will enable them to function in a society dependent on computer technology.

The Exploratory Computer Literacy Curriculum Guide, Grades 7-8 is designed to help the classroom teacher choose materials and activities for students in implementing computer literacy. The guide is offered in the beginning stages of computer literacy and thus will undergo periodic revision. Because of the dynamic nature of the computer program in our schools, users must remain alert to evolving trends both locally and nationally. The section titled Resources will accommodate instructional units to be developed as future needs arise. Included in the Resources section is the Teacher References list, which provides sources of further information.

We hope that all intermediate level teachers and principals will find this guide useful for initiating and directing computer literacy programs in their classrooms and schools.

Francis M. Hatanaka, Superintendent

ACKNOWLEDGMENT

The Exploratory Computer Literacy Curriculum Guide, Grades 7-8, reflects the joint efforts of the staff at the University of Hawaii Curriculum Research and Development Group and at the Department of Education, Office of Instructional Services through an ECIA Chapter 2 developmental grant. The draft version of the guide for grades 7-12 was developed by the Curriculum Research and Development Group under the leadership of Dr. Francis Pottenger III. Evaluation of the pilot use of the draft was conducted by the Curriculum Research and Development Group under the leadership of Dr. Morris Lai. Revision of the draft into separate guides for grades 7-8 and grades 9-12 was done through Developing Instructional Computing, an ECIA, Chapter 2 Project, under the management of Rosemary Hill Darabian, General Education Branch, Office of Instructional Services.

Recognition is extended to the teachers, private school representatives and university personnel who assisted in the development of the Computer Literacy Framework (Exploratory Component) which provides the foundation for this guide.

The efforts of the members of the Task Force on the Delivery of Computer Programs at the Secondary Level are recognized for developing alternatives that the schools could consider in delivering exploratory computer literacy.

Appreciation is extended to the teachers in the pilot schools whose input was invaluable in the revision of the guide. They are:

Dennis Katayama	Moanalua Intermediate School
Lucas Matsumoto	Moanalua Intermediate School
Floyd Larson	Stevenson Intermediate School
Samuel Ono	Stevenson Intermediate School

The Department of Education also acknowledges the following state, district and school personnel who provided recommendations and support in the development of the guide:

Evelyn Horiuchi	Educational Specialist, Computer Education
Judy McCoy	Educational Specialist, Language Arts
Miles Muraoka	Educational Specialist, Science
Kathleen Nishimura	Educational Specialist, Mathematics
Dr. Elaine Takenaka	Educational Specialist, Social Studies
Velma Omura	Honolulu District Educational Specialist
Betty Mow	Central District Educational Specialist
Kerry Koide	Leeward District Educational Specialist
Nellie Matsunami	Windward District Educational Specialist
Debbie Ziemke	Kalakaua Intermediate School Teacher

Special recognition is extended to Carol Yoshioka for her artistic contributions and word-processing skills.

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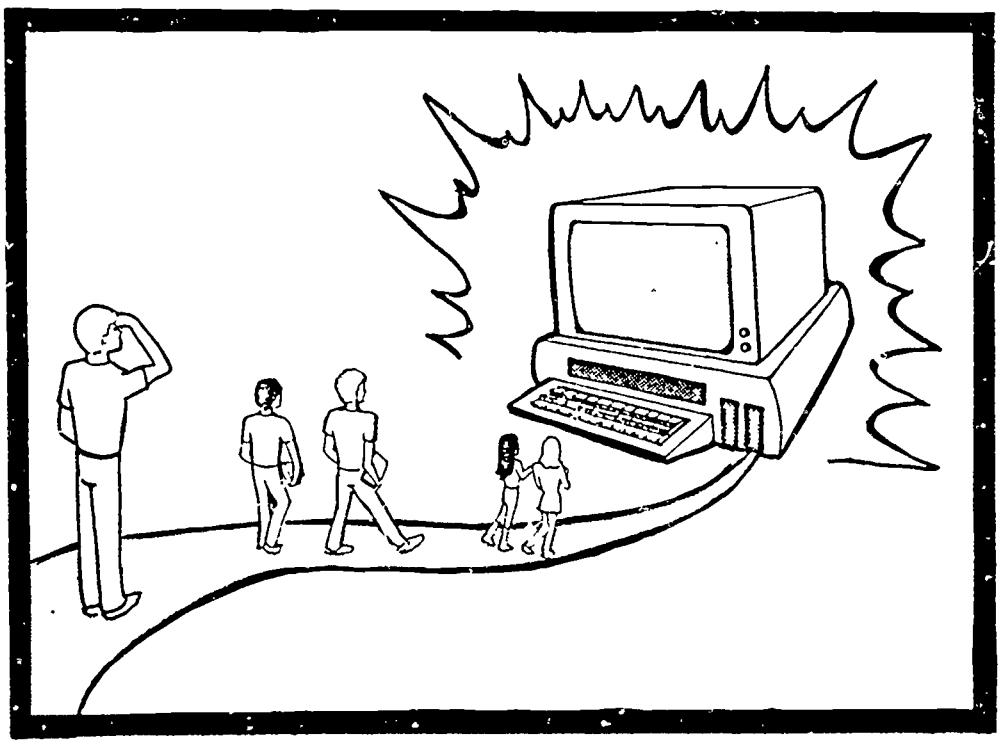


INTRODUCTION

Computer literacy brings a new challenge to the schools of Hawaii because it involves the study of an emerging technology. This guide is designed to offer direction for teachers and administrators in the development of an exploratory computer literacy program for grades 7 and 8. The literacy program outlined will provide a foundation on which schools can design a program for developing students' understanding and appreciation of computers in our society.

The intent of the exploratory component of computer literacy is to develop an awareness, appreciation, and understanding of the functions and impact of computers in daily life. This component is a thematic area of the curriculum in that the delivery in the classroom is designed for interfacing with all regular subject areas. Instructional areas addressed in the Activities section are language arts, mathematics, social studies, and science.

The initial work for the exploratory component of computer literacy was undertaken by an advisory group of teachers and educational specialists who defined the rationale, goals, and objectives of the program in the Computer Literacy Framework (Exploratory Component). The Framework provides the curricular goals, objectives and benchmark student expectations for Grades 3, 6, 8 and 12 used to formulate this 7-8 guide. An elementary guide was completed in 1984 for Kindergarten through grade 6. This intermediate school guide has been developed to continue the program for computer literacy awareness and to help teachers work toward the benchmark student expectations for grade 8 and reinforce concepts learned earlier by their students. A guide similar to this one has been developed concurrently for the high school level.

Computer Literacy Components

There are three components of Hawaii's computer literacy program: an exploratory component, a computer science component and a vocational-technical component. The computer science and vocational-technical components are intended for secondary school use only, while the exploratory component is for both elementary and secondary levels. This guide deals with the exploratory component of computer literacy for grades 7-8.

The exploratory component of computer literacy aims to develop computer-literate students who can function in a society where contact with computers is becoming a daily necessity. For purposes of setting educational standards, students who are computer literate are those who have an awareness, appreciation and understanding of the functions of computers and their impact on daily life; feel confident in using computers; have a knowledge of how computers can be used as a tool for problem solving and decision making; recognize the limitations as well as the usefulness of computers in advancing human welfare; and recognize the educational and career opportunities related to the specific and general uses of the computer.

Thematic Nature of the Exploratory Component

The exploratory component of computer literacy is a thematic area of the curriculum. Thematic areas are those special areas of school programs (such as career education, environmental education and exploratory computer literacy education) in which instruction can be delivered within regular subjects. Exploratory computer literacy can be integrated in the traditional subjects of language arts, mathematics, science and social studies, and it can be incorporated in other thematic areas.

Foundations of the Guide

The exploratory component of computer literacy introduces computers into the school curriculum with minimum disruption of current programs. Computer literacy was pioneered by groups such as Minnesota Educational Computing Consortium and the Department of Computer Science, California State University at Chico. The National Council of Teachers of Mathematics was also instrumental in raising the awareness of the nation's schools for the need to introduce computer literacy into the school curriculum through its paper, Agenda for Action, Recommendations for School Mathematics of the 1980's. In this paper, the Council takes the strong stand that mathematics programs should "take full advantage of the power of calculators and computers at all grade levels...." It goes on to say, "A computer literacy course, familiarizing the student with the role and viewpoint of the computer, should be part of the general education of every student."

In Hawaii the inclusion of computer literacy in the curriculum was established within the Department of Education Plan for Computers in Education, which describes the major areas for using computers in education. The exploratory component of computer literacy was further developed by an advisory group composed of educational specialists and teachers from elementary, intermediate, high schools and colleges in the private and public sectors. The recommendations of this group provided a basis for the exploratory computer literacy framework for grades K-12. This Exploratory Computer Literacy Framework, hereafter called Framework, provides the foundation for the present guide.

The Computer Literacy Framework (see Appendix A)

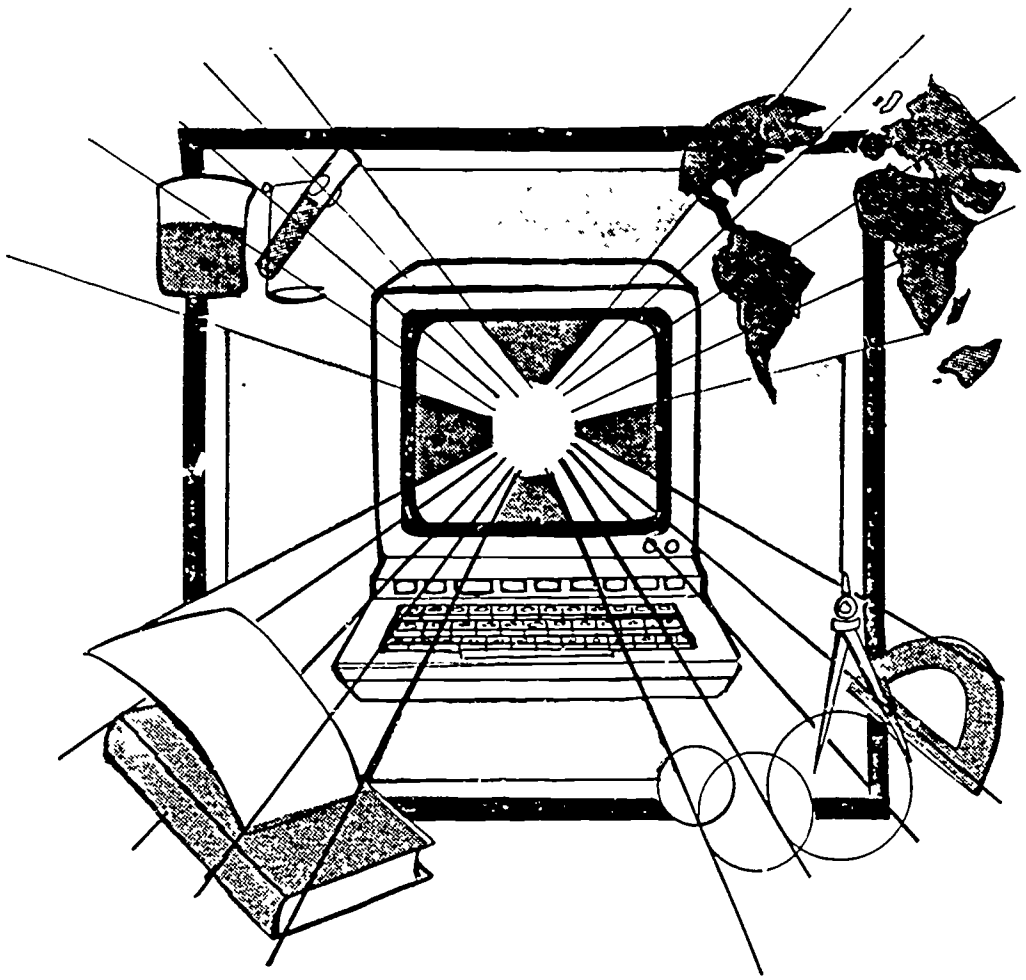
The Framework identifies the curricular objectives and the benchmark student expections related to the State Plan for Computers in Education. It provides the basic structure for the exploratory component of computer literacy. The benchmark student expectations are statements of competence that students are expected to attain at various benchmarks - in grades 3, 6, 8 and 12. They are written in the form of demonstrable behavior that requires an application of knowledge, skills or attitudes.

The Guide Rationale

The teacher who incorporates computer literacy into the classroom will gain a new set of instructional alternatives. The computer can be a patient, non-judgmental tutor for the slower student and a quick-responding, multi-faceted problem solver for the exceptional student. It can be used not only as a tutor or tool but also as a tutee or topic. More will be said about instructional modes in the next section.

This guide attempts to give teachers direction so that the computer is not used for only one purpose. There are student expectations that require skill and knowledge, and there are other expectations that call for positive attitudes and experimentation, so that the computer will not become an unrelenting drillmaster or a device just for games. The guide gives direction while providing enough latitude for exploration, experimentation and individual growth.

CURRICULUM DESCRIPTION



CURRICULUM DESCRIPTION

Several questions must be addressed for the classroom implementation of computer literacy: (1) Where in the curriculum will this new program be placed? (2) Which instructional modes will be involved? (3) What teaching methodology will be used?

Curriculum Relationships

Due to the thematic nature of the exploratory component of computer literacy, the subject matter is lodged in both its own curriculum space as well as that of existing instructional areas: principally, mathematics, science, social studies and language arts.

Mathematics. In one of its four goals, the Mathematics Program Guide includes:

> "...understanding the uses and limitations of modern technological advances such as computerization...."

The concept of computer literacy is further endorsed in the statement of Ten Basic Skill Areas appended to the Mathematics Program Guide:

> "It is important for all citizens to understand what computers can and cannot do....The increasing use of computers in government, industry and business demands an awareness of computer uses and limitations."

Computer literacy has been a concern of the mathematics community for many years. The computer is a major tool of today's mathematician, and mathematicians have contributed to each step of its evolution. Therefore it is not surprising that computer programs for the delivery of each of the major topics of the mathematics guide (numbers, operations, geometry, measurement and problem solving) are available in computer software.

Science. The Secondary Science Curriculum Guide incorporates a variety of statements in its goal and objectives structure that support the intent of computer literacy. The one most encompassing objective reads:

> "Facilitate the students ability to use scientific knowledge, processes, instruments and language to clarify values, examine issues, and solve problems in fulfilling personal, social and career life roles."

Within the scientific community the computer has become an essential tool in data analysis and hypothesis and model generation since the 1950's. It has become so versatile that applications are found in almost every modern scientific laboratory. As a tool, the computer functions to enhance the basic informational processing capacity of the scientist. In keeping with this trend, the Science Curriculum Guide emphasizes the process skills of science. These skills are:

observing
classifying
measuring
using space-time relationships
collecting and analyzing data
graphing
inferring and predicting
making and testing hypotheses
identifying and controlling variables
model building
using equipment
using scientific vocabulary
communicating
thinking
process integration

Software has been produced to facilitate development of these skills. Also the microcomputer-based laboratory (MBL) is becoming more widely available to science teachers. MBL gathers data directly from the environment by means of low-cost transducers. "These devices measure physical properties (such as light and temperature), translate the measurements into computer-readable electrical currents, and then display them on the computer monitor....Such interfacing techniques turn the microcomputer into a tool that allows students to quantify the world about them just as real scientists do." (Electronic Learning, Feb. 1985, pp. 44-47.)

Language Arts. Two of the three program goals in the Language Arts Program Guide, K-12, are closely related to the goals of the exploratory component of Hawaii's computer literacy program:

> "To assist students to develop, to the highest degree possible, informed control over their use of language.
>
> To increase student understandings of the nature and structure of the English language within the broad perspective of communication."

Computer applications in word processing and information storage have created a revolution in business and industry that is now spilling over into the operation and management of the home. More and more students come from homes where a computer is as much a part of the furniture as is the radio, TV, telephone and electric lamp. More and more students are coming to school with assignments composed at the computer keyboard.

Integrated courseware packages have evolved to include programs which offer prewriting instruction, a word processor and editing aids, enabling student compositions to be generated, stored and revised with ease. Writing for students need no longer involve tedious revision and retyping. Word processing can provide more time for creativity and development of thought.

Computers have also long since invaded the realm of literature. Science fiction literature with futuristic themes is filled with references to

computers, and literature is a natural source of valuable commentary on the potential power and limitations of computers.

Social Studies. Computers are as much a tool of the social scientist as of the physical or biological scientist. Wherever collection, storage, retrieval or analytical processing of large amounts of information is necessary, the computer is being used.

Spreadsheets and statistical programs provide opportunities for students to exercise research skills. All-purpose data base programs can help students develop their own data base for a particular sociological study and then formulate good questions to pull generalizations from the data. Future computer conferencing among schools sharing large data bases is a definite potential with on-line interaction of computers. These applications of computers in this subject area support goal number five in the Secondary Social Studies Program Guide:

> "The student is able to select and use appropriate criteria, procedures and information sources to assess the validity or significance of findings about past, present or future human life or affairs."

Computers are having, and will have, more powerful effects on society and individuals than anyone can imagine or predict. Our hope for making wise and beneficial use of technology and avoiding some of the potential disasters is to have an educated citizenry with an attitude of responsibility and a sense of control. Thus the impact of computer technology on society is a continuing topic of study and conjecture by the social science community.

Instructional Modes

It is recognized that students will gain knowledge of computers through several modes or methods of instruction. Four categories of instructional modes will be used in the classroom. Three involve the use of computers. The four categories are:

- the computer as a tutor,
- the computer as a tutee,
- the computer as a tool,
- the computer as a topic.

The computer as a tutor includes methods of instruction which use the computer to guide a student through a lesson. These include:

- Drill and Practice
- Games and Simulation
- Testing and Response
- Tutorial Instruction

The computer as a tutee includes methods of instruction using computer programming techniques by students who instruct the computer to perform a

specific task. These include:

- Problem Solving
- Algorithm Construction
- Flowcharting
- Programming

The computer as a tool includes methods of using the computer to provide a service to the student. It acts as an instructional aid. Many of these are teacher management uses from which the students receive direct output. In others, students use the computer as a simple processing device as they would a calculator or a typewriter. These include:

- Test Scoring
- Attendance
- Curriculum Material Generation
- Grade Keeping
- Material Management
- Communications
- Data Processing
- Word Processing

The computer as a topic deals with instruction in the mechanics of computers, how computers function and their impact on the areas of science, technology and education as well as daily life. With this mode, the computer is not directly used. The facets of study include the:

- Structure and functions of computers as machines
- History of the computer
- Career opportunities in computers
- Social impact of the computer
- Value of the computer to self and society
- Uses of the computer in society.

Examples of Instructional Modes

To meet the computer literacy student expectations, the various instructional modes discussed above will be used. For example, to meet the eighth grade expectation, "The student recognizes that programming languages are used to give instructions to the computer," all four modes of instruction can be utilized to provide the student with the learning experience necessary to satisfy the expectation.

In the Topic Mode, a student can become acquainted with the types and uses of programming languages via a lecture or videotape that demonstrates computer programming, such as "The Computer Show #4."

In the Tutor Mode, if BASIC is the language being taught or discussed, an introductory software package for BASIC could be used by the student.

In the Tutee Mode, the student can write a BASIC program to calculate the sum of a set of numbers entered into the computer.

Finally, in the Tool Mode, a pre-packaged graphing program can be used to create graphs based on student data.

Some instructional modes may be more appropriate to certain subject areas for a particular student expectation. However, the greater the number of instructional modes utilized, the greater the probability for achieving and reinforcing the particular student expectation.

Implementing the Exploratory Computer Literacy Program

In implementing a program of exploratory computer literacy in a classroom, the availability of resources must first be considered. Since school resources (hardware, software, personnel, budget, facilities) vary, each school must determine for itself the most appropriate instructional arrangement for delivery of exploratory computer literacy. The Computers in Instruction - Framework for Administrators guide, developed in 1984 by the General Education Branch, Office of Instructional Services, Department of Education, provides guidelines to administrators in planning their local school efforts for implementing the computer literacy program.

The Task Force on the Delivery of Computer Programs at the Secondary Level was created to examine the current needs for computer-related programs at the secondary level and to provide guidelines for implementing the three components of computer literacy, one of which is the exploratory component.

The following guidelines were developed by this Task Force to assist secondary schools in implementing the exploratory computer literacy program.

1. The school administrator, in consultation with the staff and other resource personnel, shall determine the instructional arrangement for delivery of the exploratory computer literacy program within available resources.

2. The frequency and length of the instructional unit shall also be established within available resources.

3. The school shall be responsible for developing a computer acquisition program for the delivery of instruction.

4. The school shall determine what personnel will be used to provide exploratory computer literacy instruction. The school should work with district personnel for the inservice training needs of its staff.

The following models for delivering exploratory computer literacy were developed by the Task Force as alternatives the schools could consider in offering this thematic area. Further details on the alternative models are provided in Appendix B. Examples of these instructional models or management schemes are incorporated in the Activities section.

1. Elective One-Semester Courses

   Semester courses, addressing the student expectations identified for grade 8 or grade 12, may be offered as an elective. The courses would consist of classroom instruction in combination with hands-on experiences in a computer lab to maximize the number of students accommodated by the program.

2. Unit Within Content Area Course

A unit of study of set duration (4-8 weeks) would be worked into a part of a required course (e.g., language arts, social studies, mathematics). The unit would consist of hands-on experiences in a computer lab preceded by classroom instruction.

3. Shared Computer Lab or Resource Center

Instruction in computer literacy would be conducted in regular classrooms through existing courses (e.g., language arts, mathematics, social studies, science, business). Hands-on experiences would be provided in a computer lab where use is scheduled according to school-established procedures.

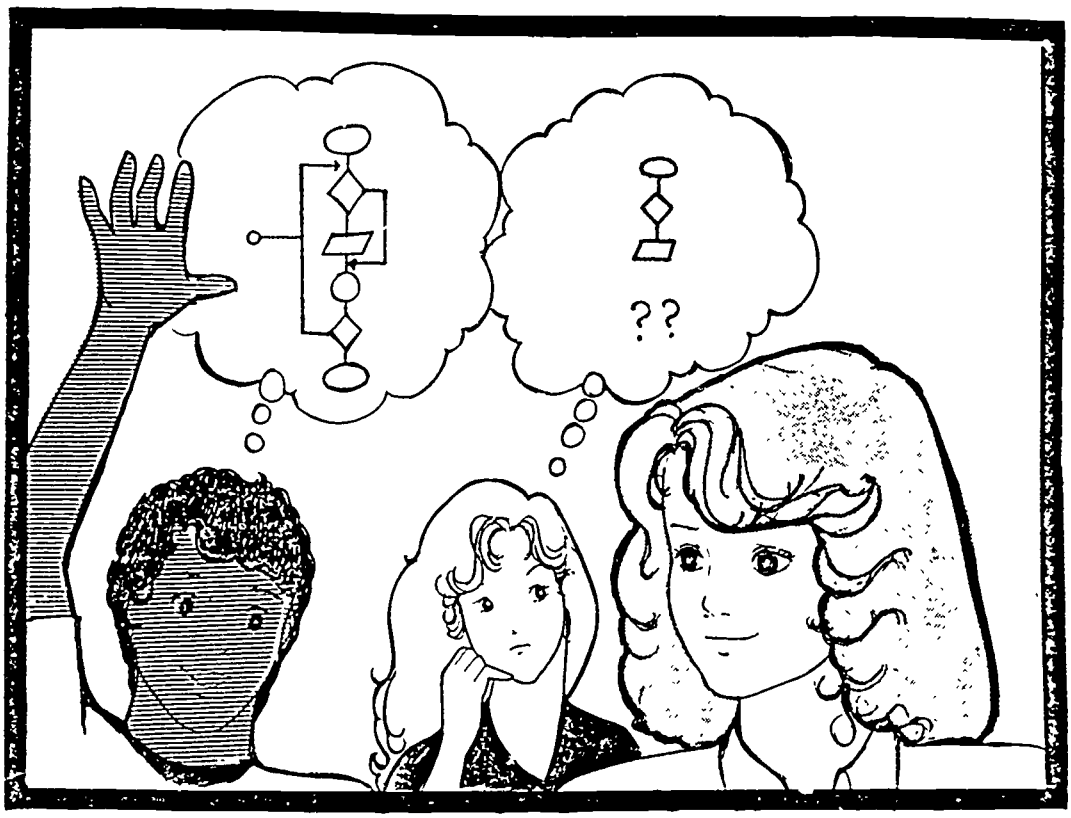
4. Computer Mini-Lessons

A series of mini-lessons on different aspects of computer literacy could be introduced through existing courses in several content areas. Hands-on experiences could be provided in the classroom on a rotation basis so that a limited number of microcomputers could be rotated among the classrooms involved.

5. Demonstration Mode

A unit of study for a set duration would be taught in an existing content area course using one microcomputer. Instruction would be primarily through vicarious experiences provided through demonstrations, audio-visual presentations and off-computer exercises. This mode is included as an initial, interim model until schools are able to acquire additional equipment to increase students' hands-on time.

CURRICULUM GUIDELINES



CURRICULUM GUIDELINES

The guidelines for the development of the content of exploratory computer literacy are included in the following sections: the Taxonomy of Objectives, which provides a complete statement of the goals, objectives and student expectations of the exploratory computer literacy program; the Student Expectations for exploratory computer literacy, which provide the behavioral standards for the program; and the Scope and Sequence Chart, which identifies the contributions of four subject areas in meeting the goals of exploratory computer literacy. The following descriptions of the Taxonomy, Student Expectations and the Scope and Sequence Chart are important for understanding of the Activity Guidelines found in the next section.

The Taxonomy of Objectives

The Taxonomy of Objectives was derived from the Exploratory Computer Literacy Framework. (See Appendix A.)

The Taxonomy which is an analytical outline of the Framework has these design features:

1. Goals are listed and subdivided into objectives which are further subdivided into student expectations.

2. Objectives are phrased so that they can be used to identify relevant classroom materials.

3. The numerical identification system is designed to accept expansion or reduction of goals and objectives as experience requires.

The numeric system of the Taxonomy consists of one-, two- and three-digit numbers, each separated by decimal points. The first digit always represents a goal, whether it stands by itself or in a two- or three-digit number. Likewise, the second digit represents an objective and the third digit stands for a student expectation.

The coding of the Taxonomy can be expanded by adding numbers at the appropriate decimal position. For example, there are presently five goals covered in the K-12 Framework. If it were necessary to add a sixth goal, it could easily be inserted by adding another section that would start with the number six, listing the objectives and expectations below in the prescribed decimal position. Deletions can be made by dropping any goal, objective or expectation that is no longer needed. If an entry is deleted, all subordinate entries must be deleted and the numbering of subsequent entries adjusted.

Use of the Taxonomy's numeric system is found in all the instruments to give a common basis for identification of exploratory computer literacy components. It is used in the Student Expectations Chart, the Scope and Sequence Chart and the specific Activities.

The Taxonomy of Goals, Objectives and Student Expectations for Exploratory Computer Literacy, Grades K-12

GOAL 1: The student will feel confident about using computers.

1.1. Interacts with a prepackaged computer program.

1.1.1. The student recognizes that a computer needs instructions to operate.
1.1.2. The student reads computer instructions, keyboard and output.
1.1.3. The student uses basic control keys and commands.
1.1.4. The student selects and uses appropriate written resources (e.g., handouts, manuals) for operating the computer.
1.1.5. The student experiments with programs as a user.
1.1.6. The student takes appropriate action in response to error messages in using prepackaged programs.

1.2. Identifies the need for information to be processed according to a set of predefined computer rules: organized, coded, given meaning and transmitted.

1.2.1. The student gives reasons for processing information.
1.2.2. The student identifies the structural components of information processing, e.g., organizing, coding, processing and reporting.
1.2.3. The student sequences the steps required in a process.
1.2.4. The student recognizes that computers process information by searching, sorting, deleting, updating, summarizing, storing, etc.

1.3. Given a simple algorithm/flowchart explains what it accomplishes, i.e., interprets, generalizes, and discusses applications.

1.3.1. The student interprets a simple algorithm/flowchart.
1.3.2. The student generalizes how an algorithm/flowchart is used.
1.3.3. The student discusses the applications of algorithms/ flowcharts.

1.4. Identifies the fact that we communicate with computers through specific symbols and words.

1.4.1. The student recognizes that programming languages are used to give the computer instructions.
1.4.2. The student recognizes words or symbols that operate the computer.

1.5. Develops positive attitudes and behaviors toward computers.

1.5.1. The student demonstrates positive behaviors and attitudes towards computers by seeking work or play with computers.
1.5.2. The student demonstrates positive behaviors and attitudes towards computers by describing past experiences with computers with positive affect words like fun, challenging, etc.

GOAL 2: The student will know how the computer can be used as a tool for problem solving and decision making.

2.1. Uses computerized information systems (computer or computer system) to solve simple problems and make decisions.

2.1.1. The student uses the computer to assist in decision making.
2.1.2. The student translates a simple algorithm/flowchart into a program.
2.1.3. The student develops an algorithm for solving a specific problem and/or solve a set of similar problems.
2.1.4. The student describes how computers can assist in problem solving and decision making.

GOAL 3: The student will be aware of, appreciate and understand the functions and impact of computers in daily life.

3.1. Identifies and describes basic operations of computer systems including identification of input, memory, control, arithmetic and output components.

3.1.1. The student identifies the Input/Output peripherals.
3.1.2. The student describes the functions of the Input/Output and Processing (control, memory, arithmetic/logic) components.

3.2. Recognizes data processing, process control, and information storage and retrieval applications in business and industry, government, education, health and social services, recreation, creative arts, etc.

3.2.1. The student identifies computer applications in business and industry, government, education, health and social services, recreation, creative arts, etc.

3.3. Recognizes how computers affect employment, public surveillance, privacy of individuals, progress and culture, personalization/ impersonalization, regulatory and enforcement functions, and daily relationships with people, agencies, organizations, etc.

3.3.1. The student values efficient information processing.
3.3.2. The student understands the advantages and disadvantages of routine tasks.
3.3.3. The student appreciates the economic benefits of computerization for society.
3.3.4. The student values increased communication and availability of information made possible through computer use.
3.3.5. The student understands that computers can be used to effect distribution and use of economic and political power, in criminal and other anti-social activities, to change society in undesirable ways.
3.3.6. The student identifies applications of computer science and technology in medicine, law enforcement, education, engineering, business, transportation, military, recreation, government, library and creative arts.

3.4. Recognizes that technology differs from science in that the aim of technology involves the means of building and doing useful things while the aim of science is the development of knowledge and understanding.

3.4.1. The student knows how electronic technology evolved.

GOAL 4: The student will recognize the limitations as well as the usefulness of computer (science) technology in advancing human welfare.

4.1. Recognizes disadvantages of computers as tools, dependency, limitations, cost, etc.

4.1.1. The student lists at least three limitations of computers in the advancement of human welfare.

4.2. Identifies major applications of computers for information storage and retrieval, simulation and modeling, quality or process control, and decision making and problem solving.

4.2.1. The student describes how computers assist people in advancing human welfare.

GOAL 5: The student will recognize the educational and career opportunities related to the specific and general uses (applications) of computers.

5.1. Recognizes careers in Support Services (e.g., data entry, word processing, computer operations personnel), Technical Services (e.g., programmer, analyst, data processor, equipment maintenance and repair personnel), Scientific Personnel (e.g., computer scientist, electrical engineer, computer engineer) in the community that involve computers.

5.1.1. The student identifies support service, technical and scientific careers that involve computers.

5.1.2. The student identifies national and international careers that involve computers.

5.2. Recognizes opportunities related to integrating the computer in other careers.

5.2.1. The student compares educational requirements and opportunities for careers that involve computers.

Student Expectations

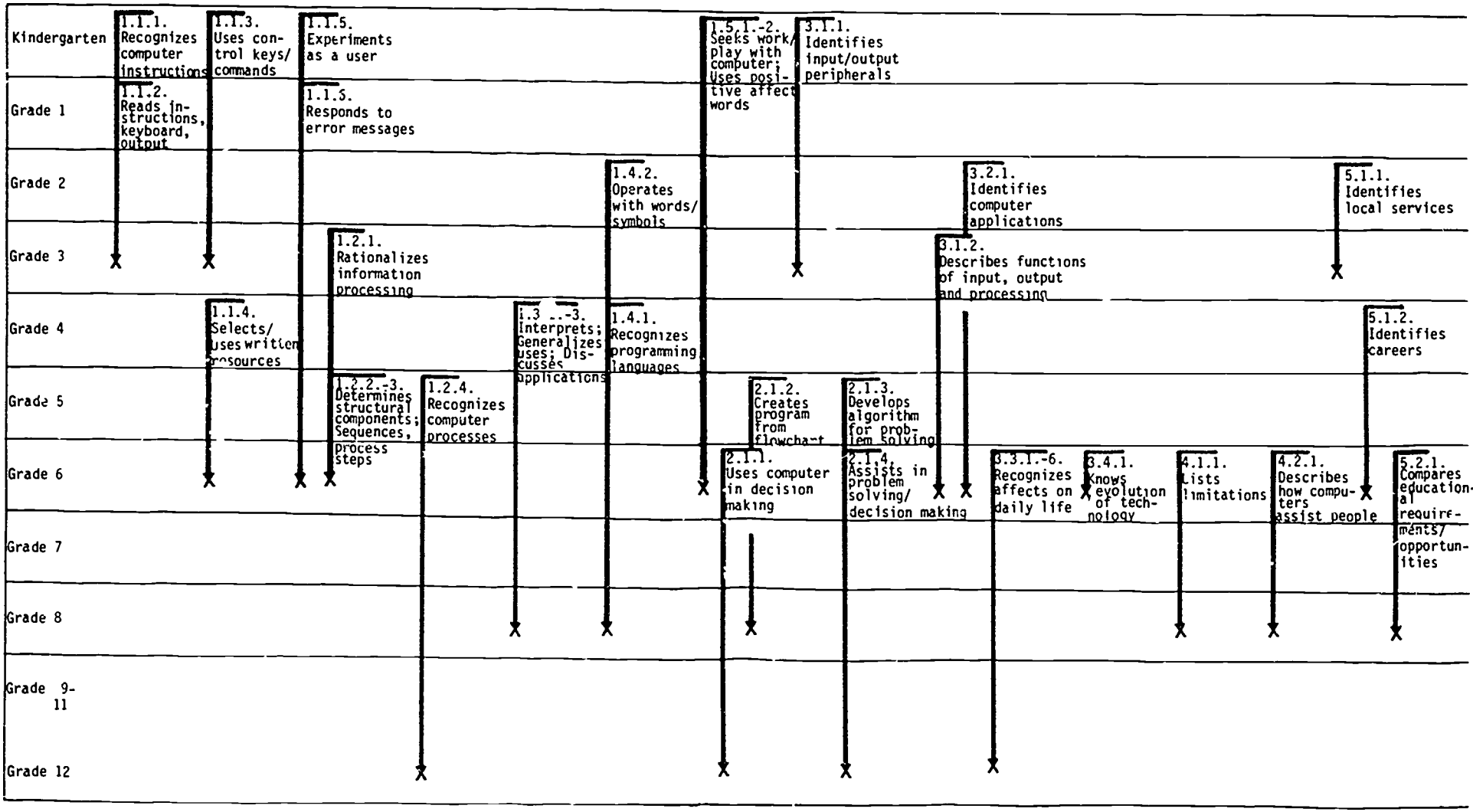
To set standards and provide evaluation guidelines, benchmark expectations have been written into the Exploratory Computer Literacy Framework.

The student expectations are written in a form which calls for conduct that can be evaluated and which assumes the application of knowledge, skills and attitudes. These expectations provided that kind of basis for developing the activities outlined in the guide. In the chart on the following page, student expectations are shown that are benchmarked with an 'x' at grades 3, 6, 8 or 12.

A teacher of exploratory computer literacy at the intermediate level should aim for the expectations benchmarked at grade 8. For those students who have not yet attained the lower level expectations, the teacher should provide them with the background and experience necessary to fulfill all student expectations benchmarked through grade 8. The sample activities in the first category--Entry Level--offer introductory material for those students.

Activities that reinforce student expectations already achieved can strengthen students' skills and expand their level of knowledge.

STUDENT EXPECTATIONS CHART
Exploratory Computer Literacy K-12



Scope and Sequence

The Scope and Sequence Chart brings together four important pieces of information and shows the interrelationships among them. It condenses the taxonomy into short essential phrases. It shows the point at which instruction towards student attainment of the student expectations is introduced or reinforced and indicates the benchmark grade at which each student expectation is recommended to be met. The chart also shows the contributions of the four subject areas--language arts, mathematics, science and social studies--and the generic module, Entry Level, in meeting the goals of computer literacy.

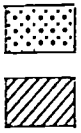
The numeric system of the taxonomy is listed on the left of the Scope and Sequence Chart. The one-digit numbers are the general goals and the two-digit numbers are the objectives. Each student expectation is indicated by a three-digit number and is identified with the grade level and subject area in which activities leading to its achievement or supporting its reinforcement are provided. Activities that introduce a student expectation are represented by the dotted shading, while activities that reinforce a student expectation already achieved are shown with the slashed shading. Slashed shading begins with the grade at which the benchmark expectations are to be met. Not all student expectations are appropriate to each subject area.

concept, skill introduced

concept, skill expectation reached and reinforced

	Bench-mark Grade	Entry Level	GRADE 7 Lang. Arts	Math	Science	Soc. Studies	GRADE 8 Lang. Arts	Math	Science	Soc. Studies
1.4.2. operates with words/symbols	8									
1.5. Develops Positive Attitudes/Behaviors										
1.5.1. seeks work/play with computer	6									
1.5.2. uses positive affect words	6									
2. Problem Solving/Decision Making										
2.1. Uses Computerized Information Systems										
2.1.1. uses computer in decision making	12									
2.1.2. creates program from flowchart	8									
2.1.3. develops algorithm for problem solving	12									
2.1.4. describes problem solving/decision making process	12									
3. Functions/Impact										
3.1. Identifies/Describes Computer Operations										
3.1.1. identifies input/output peripherals	3									
3.1.2. describes functions of input, output and processing	6									
3.2. Recognizes Computer Applications										
3.2.1. identifies applications	6									
3.3. Recognizes Impact on Daily Life										
3.3.1. values efficient information processing	12									
3.3.2. understands pro/cons of routine tasks	12									

Scope and Sequence



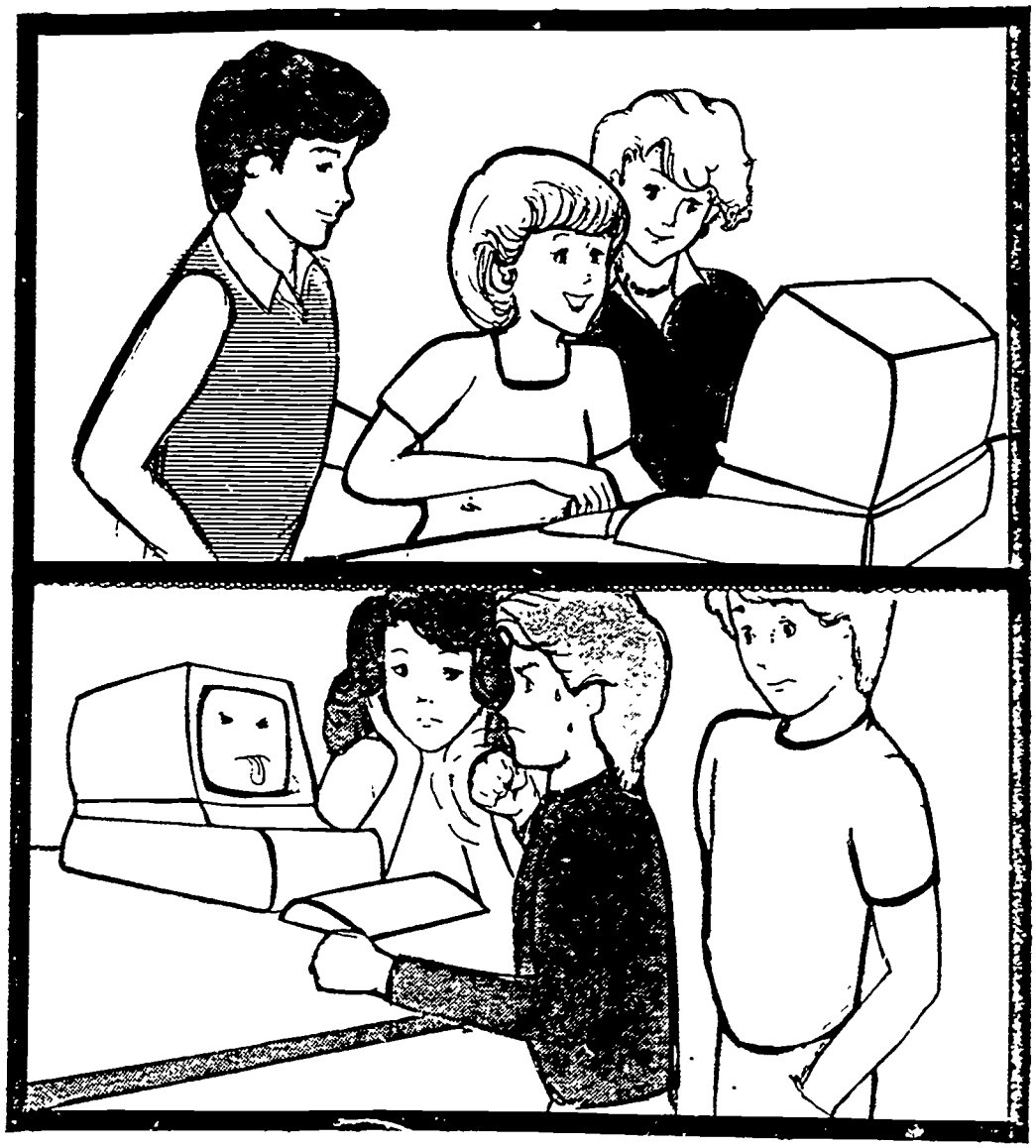
1. Confidence about Computer Use	Bench-mark Grade	Entry Level	GRADE 7 Lang. Arts	Math	Science	Soc. Studies	GRADE 8 Lang. Arts	Math	Science	Soc. Studies
1.1. Interacts with Computer										
1.1.1. recognizes computer instructions	3									
1.1.2. reads instructions, keyboard, output	3									
1.1.3. uses control keys/commands	3									
1.1.4. selects/uses written resources	6									
1.1.5. experiments as a user	6									
1.1.6. responds to error messages	6									
1.2. Identifies Computer Rules										
1.2.1. rationalizes information processing	6									
1.2.2. determines structural components	6									
1.2.3. sequences process steps	6									
1.2.4. recognizes computer processes	12									
1.3. Explains Algorithm/Flowchart										
1.3.1. interprets	8									
1.3.2. generalizes uses	8									
1.3.3. discusses applications	8									
1.4. Identifies Methods of Communication w/Computer										
1.4.1. recognizes programming languages	8									

concept, skill introduced

concept, skill expectation reached and reinforced

	Bench-Mark Level	Entry Level	GRADE 7 Lang. Arts	Math	Science	Soc. Studies	GRADE 8 Lang. Arts	Math	Science	Soc. Studies
3.3.3. appreciates economic benefits	12									
3.3.4. values communication/information	12									
3.3.5. understands effects on economics, politics, crime	12									
3.3.6. identifies applications of computer science	12									
3.4. Differentiates Science/Technology										
3.4.1. knows evolution of electronic technology	6									
4. Limitations/Usefulness										
4.1. Recognizes Disadvantages										
4.1.1. lists limitations	8									
4.2. Identifies Major Applications										
4.2.1. describes how computers assist people	8									
5. Education/Career Opportunities										
5.1. Recognizes Support/Technical/Scientific Careers										
5.1.1. identifies local services/personnel	3									
5.1.2. identifies national/international careers	6									
5.2. Recognizes Opportunities for Integrating Computers in Other Careers										
5.2.1. compares educational requirements/opportunities	8									

ACTIVITIES



ACTIVITIES

Activity Guidelines

Sample Activities. The suggested sample activities on the following pages support the goals, objectives and student expectations of the Taxonomy. These activities provide teaching strategies for introducing certain concepts or developing specific skills in exploratory computer literacy. They are not intended to be the only method of presentation but are instead "starting points" from which teachers can expand into their own approaches, using their own ideas and creativity.

Subject. The sample activities in the first category of Entry Level take into consideration two major concerns: generic activities that are appropriate (usually) to any of the subject areas; introductory activities that are meant to serve as a means to help students, inexperienced with computers, in grades 7-8 quickly reach the student expectations set for grades 3 and 6. Therefore, these activities are precursors to those found in the subject areas of language arts, mathematics, science and social studies.

Student Expectations. The student expectations listed for each sample activity are written in condensed phrases. For further details, refer to the Taxonomy of Goals, Objectives and Student Expectations for Exploratory Computer Literacy in the section titled Curriculum Guidelines. Some of the student expectations will be introduced in the various activities, while others will be reinforced, having been initiated at an earlier grade level. The Scope and Sequence Chart, in the same section as mentioned above, illustrates where, when and how these student expectations are best considered.

Instructional Mode. The major mode or method of instruction is indicated for each activity. Some activities suggest more than one mode. It is at the discretion of the teacher as to what modes seem most appropriate for his or her circumstances. Refer to the discussion on these modes in the section titled Curriculum Description.

Prerequisites. Many of the sample activities expect a certain level of experience from the students. In several cases, a reference is made to other activities from Entry Level that would be worthwhile considering first. A few sample activities require a specific unit of study within a subject area to be in progress.

Classroom Management. The concerns for classroom management, found in the sample activities, include the number of microcomputers available to the teacher and the location of these machines. A microcomputer for classroom demonstration purposes should have one or two large monitors or several smaller monitors distributed throughout the classroom for visibility to all students. If two to four microcomputers are available in the classroom, a schedule for a computer time should be established. Students must first plan their project or assignment on paper, check out their preparations with the teacher, and upon approval sign up for a designated block of computer time. Other desk assignments, related to the subject area or computer literacy, must be provided to involve all students in something constructive while waiting for their computer time.

With a computer lab setting, which is recommended, the teacher may need two to three assistants to either maintain order in the classroom while he or she is in the lab or to help out in the lab while he or she remains in the classroom. Although volunteer help from parents, colleagues or student-teachers is a convenient solution, it may not be all that reliable for any length of time. A more realistic approach would be to train two to three students in each class who are more "computer literate" and willing to take on special responsibilities to help you. (Rewards could include bonus points, extra computer time or the additional knowledge and experience gained by this opportunity.)

It is suggested that at least two assistants be in the lab while the teacher is not there, so one can contact the teacher in his or her classroom for any concerns that arise. As with computers in a classroom, there should be a requirement for students to prepare their exercise on paper, have it approved and then sign up for a block of computer time. A second block of time should only be granted to a student after all others have had their turns.

Materials. A number of resources (with specific page numbers) are suggested as possible background reading for the teacher and text material for students. It should be clarified that the frequent references to Spotlight on Computer Literacy by Ellen Richman are for the 1985 edition, which has rearranged some of the chapters from earlier editions. As the material is geared toward Apple equipment, some adjustments may be needed in the activities for other brands of microcomputers. Materials written for other brands of computers are included in the Teacher References located in the Resources section.

Time for Activity. Only an approximate time period for each activity can be suggested, since numerous variables such as, number and location of available microcomputers, number of students, range of computer skills among the students, length of classroom period and other classwork assigned, are involved.

Teacher Preparation. Implementing the Exploratory Computer Literacy Guide, Grades 7-8 does require the teacher to plan in advance. Orders for particular software can take from one to two months. It is important to run through an entire tutorial program or experiment with a tool or utility program (as word processing) prior to any classroom activity with it. Keeping an eye out for current articles related to computer literacy will prove most helpful. Continual learning is an inherent part of teaching any subject, including computer literacy.

SAMPLE ACTIVITIES

ENTRY LEVEL

SAMPLE ACTIVITY #1
Computer Careers and Guest Speakers

Subject:

Career education can be offered in any subject area.

Student Expectation(s):

3.3.3. Appreciates economic benefits
4.2.1. Describes how computers assist people
5.1.1. Identifies local services/personnel
5.1.2. Identifies national/international careers

Instructional Mode:

Topic

Prerequisite(s):

The class should have experienced team work in previous activities.

Classroom Management:

No computer is required. Students will work in teams and independently.

Material(s):

Resources for text, such as:
Spotlight on Computer Literacy by Ellen Richman, Chapter 13;
Computer Literacy--Problem-Solving with Computers by C. E. Horn and J. L. Poirot, Chapter VII;
Scholastic Computing--An Introduction to Computers by Jack L. Roberts, Chapter 13;
Computers Today by Donald H. Sanders, pages 583-587.
Various magazines with colored pictures, from common household magazines to computer periodicals.
Current newspapers.
Construction paper and tools.

Time for Activity:

Five class periods.

Teacher Preparation:

Read in advance some background information on computer careers from such resources as listed above. Prepare students for team work. Help them organize themselves so each team has a leader who coordinates the members' activities. Proper procedures must be covered for inviting, receiving and thanking guest speakers.

1. Ask students to compile four lists on the chalkboard: one for jobs that require computers; one for jobs that use computers to improve productivity; one for jobs that could not possibly use computers; and one for jobs with an uncertain category. Guide students as they set up these lists. Discuss the reasons for placing particular jobs in each list.

2. Divide the class into four groups, each assigned to one of the four categories of jobs listed on the chalkboard. Each group will be responsible for the following tasks:

   a. Prepare a collage of magazine pictures and drawings of people whose jobs belong to the assigned category; display on a bulletin board.
   b. Select one job in that category, locate a person in that position and invite him or her as a guest speaker to explain to the class his or her job responsibilities and the role of the computer in that position (or potential future role).
   c. Scan the want ads in the local newspaper and in computer periodicals for jobs in that category; post on the bulletin board within the collage or next to it.

3. Assign all students to read some material on computer careers from one or more of the resources given above or other related articles. Accompanying questions should be assigned for discussion. Sample questions might be:

   a. Name five jobs in which people use computers in doing their work. How is the computer used in each?
   b. What basic skills or characteristics are expected of computer programmers? of system analysts? of data entry operators?
   c. Make and compare a list of jobs that have "disappeared" because of electronic computers to a list of jobs created during the "Computer Revolution."

SAMPLE ACTIVITY #2
Robotics

Subject:

Robotics as part of career education can be offered in any subject area.

Student Expectation(s):

4.1.1. Lists limitations of computers
4.2.1. Describes how computers assist people

Instructional Mode:

Topic

Prerequisite(s):

Entry Level Sample Activity #1 - Computer Careers and Guest Speakers or some comparable experience.

Classroom Management:

No computer is required. Students could work independently or in pairs prior to the group discussion.

Material(s):

Resources for text, such as:
Computer Literacy--Problem-Solving with Computers by C. E. Horn and J. L. Poirot, pages 135-139;
Computer Literacy--Programming, Problem Solving, Projects on the Apple by Warren and Bobbie Jones, Kevin Bowyer and Mel Ray, pages 225-235;
Computers Today by Donald H. Sanders, pages 646-647;
Educational Microcomputing Annual, Volume I, 1985, pages 47-49 ("It's 1984 and Robots are in the Classroom.").
Film projector and the film, "The Robot Revolution" (or "Robots--Intelligent Machines Serving Mankind") or videotape player and the videotape, "Computers" (1756-1).

Time for Activity:

Two to three class periods; one for showing the film or videotape, one for a follow-up discussion and perhaps another for research or reading.

Teacher Preparation:

Assemble as many articles as possible on robotics and its impact on society and jobs. Preview the film or videotape to prepare a few specific questions for class discussion. The film and videotape suggested above present the overall impact of computers on society, including the work of robots, present and future. Refer to the audiovisual listing in the Resources section.

1. Introduce the film or videotape with a handout sheet of questions which could include:
   - What is robotics?
   - What types of jobs do robots do?
   - What are the advantages and disadvantages of robots?
   - What is the future impact of robots on jobs and people?

2. Show the film or videotape and allow time afterward for students to complete the handout.

3. Have students read some material on robotics, from resources such as given above. Additional questions could be assigned.

4. Discuss questions from the film or videotape and the reading. Using the Readers' Guide to Periodical Literature, have students research additional considerations, such as the development of robotics in the last ten years and the Japanese plan to find new jobs for people displaced by robots.

5. Ask students to be "on the lookout for" newspaper articles relating to robotics and its impact on people and jobs and bring these clippings in for sharing and posting.

SAMPLE ACTIVITY #3
How Computers Work

Subject:

This topic is best presented in Mathematics or Science classes but can be introduced in other subject areas.

Student Expectation(s):

1.2.1. Rationalizes information processing
1.2.2. Determines structural components
1.2.3. Sequences process steps
1.2.4. Recognizes computer processes
3.1.1. Identifies input/output peripherals
3.1.2. Describes functions of input, output and processing

Instructional Mode:

Topic

Prerequisite(s):

None

Classroom Management:

One microcomputer system with printer is effective for demonstration purposes.

Material(s):

Text resources, such as:
Spotlight on Computer Literacy by Ellen Richman, Unit I;
Scholastic Computing--An Introduction to Computers by Jack L. Roberts, Chapter 1, 3 and 4;
Computer Literacy--Programming, Problem Solving, Projects on the Apple by Warren and Bobbie Jones, Kevin Bowyer and Mel Ray, Chapter 2;
Computer Literacy--Problem-Solving with Computers by C. E. Horn and J. L. Poirot, Chapter IX and X;
Computers Today by Donald H. Sanders, Chapter 1.

Time for Activity:

Two class periods: one for introduction and reading; one for follow-up discussion and demonstration.

Teacher Preparation:

Read in advance background information on computer systems and components, such as from any of the above resources.

1. Introduce this lesson by asking the class what they know about computers:

   a. Where are they used? In what forms can they be found? (in clocks, sewing machines, thermostats, etc.)
   b. Why are they used?
   c. What can and cannot they do?
   d. Why should we become acquainted with them?

2. Clarify the four jobs or functions of computers: accepting information (input), storing information (storage), processing information and providing the processed information (output). A diagramatic scheme of these jobs on an overhead transparency would be helpful. A sample scheme follows this activity.

3. Assign students some reading material pertaining to computer systems and components from the above resources or other related articles and have them write answers to specific questions from the reading.

4. During the ensuing discussion, demonstrate how the classroom microcomputer can input, store, process and output information, using some BASIC commands. Pass around an uncovered (damaged) disk and explain why proper handling is necessary. Show the internal components of the microcomputer and allow students to examine some "dead" chips with a strong magnifying glass.

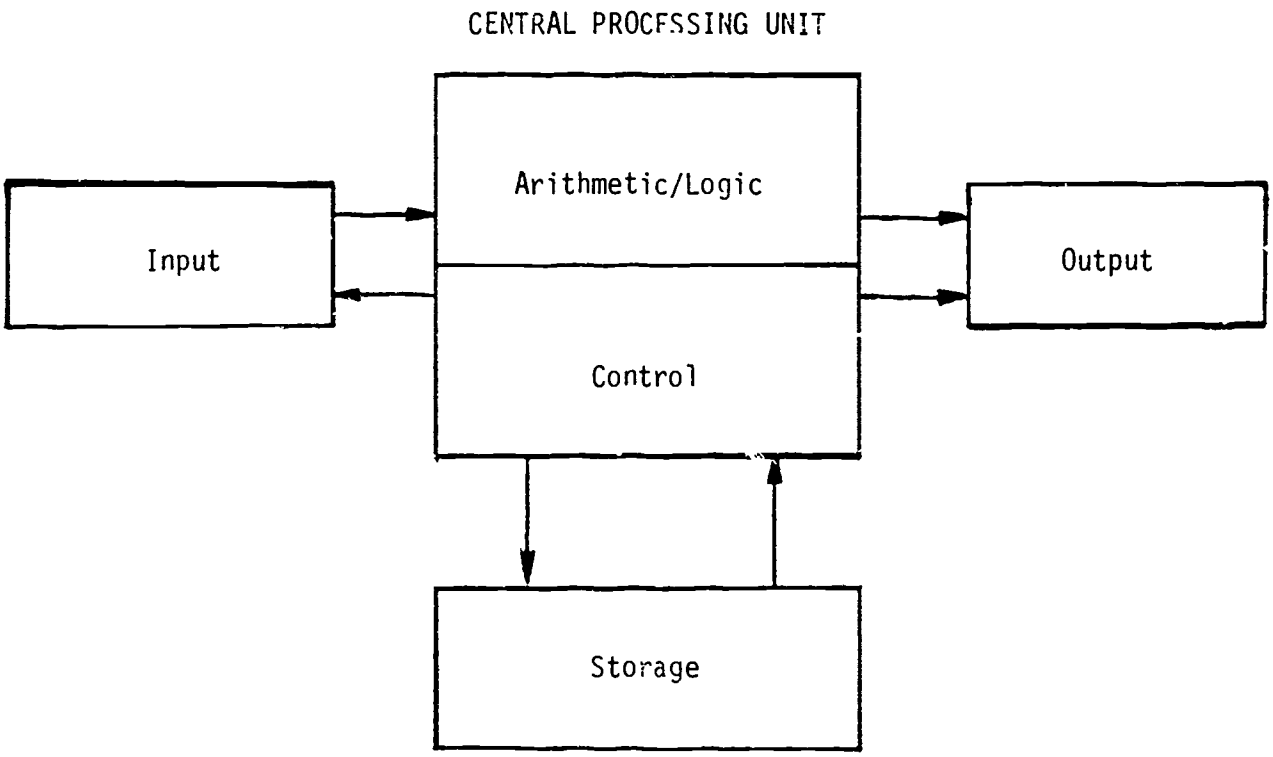
5. In a notebook for exploratory computer literacy, have students maintain a vocabulary of all the key terminology covered, such as:

microcomputer	keyboard	RAM
minicomputer	disk drive	ROM
mainframe computer	monitor	nanosecond
terminal	printer	computer chip
input	program	silicon
memory	hardware	character
central processing	software	bit
CPU	read/write head	byte
output	tape drive	kilobyte
diskette	data	megabyte

   Review these terms frequently and ask students to continue adding to the list as they progress through other Exploratory Computer Literacy activities. Refer to the Glossary of terms in Appendix C.

6. Within a two-week period, as the computer vocabulary grows, try out Entry Level Sample Activity #5 - Computer Bingo as a follow-up on developing terminology.

COMPUTER FUNCTIONS



Schematic Chart of Computer Functions

SAMPLE ACTIVITY #4
Getting Acquainted with the Keyboard

Subject:

Keyboard acquaintance can be offered in any subject area.

Student Expectation(s):

1.1.1. Recognizes computer instructions
1.1.2. Reads instructions, keyboard, output
1.1.3. Uses control keys/commands

Instructional Mode:

Tutor

Prerequisite(s):

Entry Level Sample Activity #3 - How Computers Work or some comparable experience is recommended.

Classroom Management:

A lab setting with two students per computer is recommended. Refer to Activity Guidelines, page 35, for rotating hands-on experience.

Material(s):

Introductory software on use of the computer (e.g., "Apple Presents Apple" for Apple IIe, "Exploring the IBM Personal Computer" for IBM PC, "Training for the Apple IIe" etc.).
Microcomputers with one disk drive each.
Keyboard charts.

Time for Activity:

One class period per lab of students. The number of available computers and the number of students in a class needing this lesson will determine the total time required.

Teacher Preparation:

Have a large computer keyboard and a typewriter keyboard on cardboard available for the class. Preview the particular software to be used.

1. Compare the computer keyboard with that of the typewriter, using the two large cardboard charts. Have students locate the basic keys; review the use of the shift keys and space bar. Explain the function of the RETURN (or ENTER or ↵) key. Distinguish the O from the Ø key.

2. Demonstrate how to start up the system with a prepared disk. Review proper handling of the disk:

   a. Place the disk into the drive;
   b. Turn on the monitor to warm up a few seconds;
   c. Turn on the computer; notice the red light and the whirring sound of the disk drive as it loads the program into RAM memory;
   d. Watch the monitor to know when the disk is completely loaded; the whirring sound will stop and the red light on the disk drive will turn off.

3. Have students load a system master disk or BASIC disk, if necessary. Introduce the cursor and prompt to the students. Have them type their names, then erase what they typed, using the left-facing arrow key (or BACKSPACE key or DEL key).

4. Have students type anything and press the RETURN key. Explain Syntax Errors briefly. (The information was not in the BASIC computer language, so the microcomputer could not read or accept the input.) Inform students that they will have a chance later to become familiar with BASIC and will be able to instruct the computer what they want it to do.

5. Show students how to clear the screen. (For Apple, press the ESC key, then type the symbol @ or type HOME and press the RETURN key. For IBM, type CLS for "clear screen". For Commodore, press CLR with the shift key. For TRS-80, press the CLEAR key or type CLS.) Have them turn off the system, then load it with the introductory software.

6. Give students time to run through the software. Be available to help when needed. Show the proper procedure for turning off the system and returning the software.

SAMPLE ACTIVITY #5
Computer Bingo

Subject:

The terminology game can be offered in any subject area that covers the vocabulary.

Student Expectation(s):

1.2.2. Determines structural components
1.2.4. Recognizes computer processes
1.5.2. Uses positive affect words
3.1.1. Identifies input/output peripherals
3.1.2. Describes functions of input, output and processing

Instructional Mode:

Topic

Prerequisite(s):

The class should be building a vocabulary on computer terminology.

Classroom Management:

No computer is necessary. Students will work independently.

Material(s):

A vocabulary list of computer terminology from previous activities in exploratory computer literacy; each student should have this list in his or her own notebook.
8½"x11" sheets of plain paper, pens and red markers.

Time for Activity:

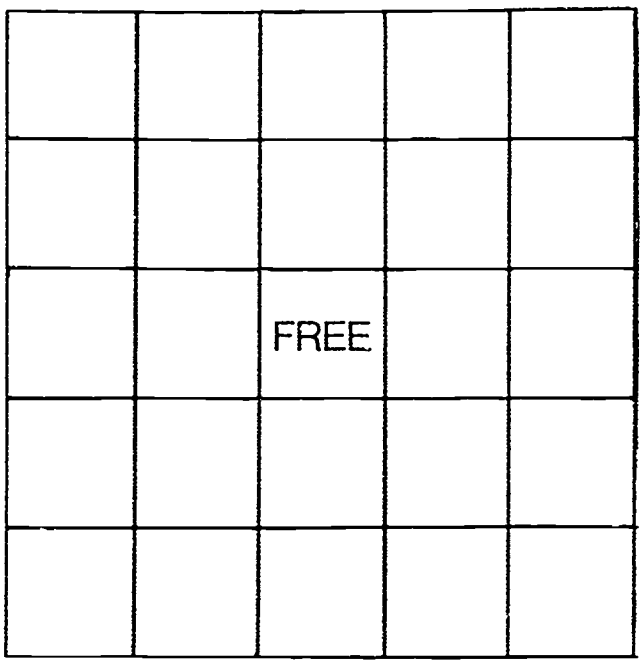
One class period or less.

Teacher Preparation:

Review terminology with class prior to this activity.

1. Give each student one sheet of paper. Have students draw six vertical lines across the paper and six horizontal lines down the paper, making a large square of 25 smaller squares on the page. Designate the third square on the third row as a free space.

Example:



2. Write a list of computer terms on the board (at least 25 terms). Have students select terms at random and write in ink a different term in each of only 19 squares.

3. Have students exchange playing cards. Give each student a red marker.

4. Read a definition for one of the terms. Ask students to mark the square on their card having that term with a red number which matches the definition number. Continue procedure.

5. Inform them that the "winner" is the student who marks all the terms on his or her card first and whose term numbers match the definition numbers. The "winner" may call the next game or be given extra computer time.

SAMPLE ACTIVITY #6
Using the INPUT Statement in BASIC

Subject:

Programming is best suited to the subject areas of Mathematics and Science.

Student Expectation(s):

1.1.1. Recognizes computer instructions
1.4.1. Recognizes programming languages
1.4.2. Operates with words/symbols
1.5.1. Seeks work/play with computer

Instructional Mode:

Tutee/Topic

Prerequisite(s):

Students should know how to operate the microcomputer and have had some introductory work with the BASIC statements of REM, PRINT, LET, END.

Classroom Management:

A lab setting with two students per computer is recommended. For the classroom demonstrations there should be one microcomputer with a large monitor or two. Refer to Activity Guidelines, page 35, for rotating students.

Material(s):

Microcomputers and system master disks or BASIC disks, if necessary. Because of variations in BASIC, certain modifications of the programming activities may be necessary. Check your user's manual for modifications.

Resources for reference or text, such as:

Computer Literacy--A Hands-On Approach by Arthur Luehrmann and Herbert Peckham, pages 186-195;

Spotlight on Computer Literacy by Ellen Richman, Chapter 19;

Computer Literacy--Programming, Problem Solving, Projects on the Apple by Warren and Bobbie Jones, Kevin Bowyer and Mel Ray, pages 58-60;

Computer Literacy--Problem-Solving with Computers by C. E. Horn and J. L. Poirot, Chapter XIII;

Computers Today by Donald H. Sanders, pages 408-414.

Time for Activity:

Two class periods.

Teacher Preparation:

Review any of the references suggested above or other related articles on

BASIC Input/Output techniques.

1. Review with students how to get information in and out of a program using the PRINT statement. Introduce the two other methods for getting information in and out of a program:

   READ and DATA statements and the INPUT statement.

   Run the following simple examples for demonstration purposes.

```
NEW
10  REM     TESTING READ-DATA STATEMENTS
20  READ    A, B
30  DATA    39, 48
40  PRINT   A, B
50  END
```

   Indicate that more work will be done later on READ and DATA statements.

```
NEW
10  REM     TESTING INPUT STATEMENT
20  PRINT   "ENTER TWO NUMBERS."
30  INPUT   A, B
40  PRINT   A, B
50  END
```

   Emphasize the interaction between the computer and the user when using INPUT statements.

2. Be sure to review (or introduce) the use of numeric variables (A, B, etc.) versus string variables (A$, B$, etc.)

```
NEW
10  REM     TESTING READ-DATA STRINGS
20  READ    A$, B$, C
30  DATA    MARY JONES, AL SMITH, 1461
40  PRINT   A$, B$, C
50  END
```

```
NEW
10  REM     TESTING INPUT STRINGS
20  PRINT   "WHAT IS YOUR NAME, PLEASE?"
30  INPUT   N$
40  PRINT   "HELLO "; N$
50  END
```

3. As a demonstration, have students help you design a program that outputs a letter on the screen to a veterinarian. The letter should describe some bizarre illness that a classmate's pet has. Only PRINT and INPUT statements must be used. An example follows:

```
NEW
10  PRINT   "WHAT'S YOUR NAME?"
20  INPUT   N$
```

```
30  PRINT   "HOW OLD ARE YOU?"
40  INPUT   A
50  PRINT   "NAME A LARGE FOUR-LEGGED ANIMAL."
60  INPUT   A$
70  PRINT   "NEXT, NAME A VEGETABLE (PLURAL)."
80  INPUT   V$
90  PRINT   "NAME A PART OF AN ANIMAL'S HEAD."
100 INPUT   H$
110 PRINT   "NAME AN ADJECTIVE TO DESCRIBE APPEARANCE."
120 INPUT   J$
130 PRINT   "NAME AN ADJECTIVE TO DESCRIBE BEHAVIOR."
140 INPUT   K$
150 PRINT   "FINALLY, GIVE THE LAST NAME OF A FAMOUS PERSON."
160 INPUT   F$
170 PRINT   "NOW FOR YOUR LETTER TO THE VETERINARIAN."
180 PRINT
190 PRINT   "DEAR DR. "; F$
200 PRINT   "       MY PET "; A$; " SEEMS TO BE ILL."
210 PRINT   "HE HAS SEVERAL "; V$; " GROWING OUT OF HIS "; H$; "."
220 PRINT   "HE'S USUALLY A VERY "; J$; " PET, BUT LATELY HE'S
    BEEN ACTING "; K$; "."
230 PRINT   "PLEASE TELL ME WHAT TO DO BECAUSE I HAVE "; A; " OTHER ";
    A$; "S IN THE HOUSE AND I DON'T WANT THE OTHERS TO HAVE THE SAME
    PROBLEM."
240 PRINT   "           SINCERELY,"
250 PRINT   "           "; N$
260 END
```

While running the program, draw boxes on the chalkboard, each with a label of a variable from the above program. As students give their responses, write them in the appropriate box to help keep track of input variables.

Ask students to take note of the use of semicolons in PRINT statements and of the use of spaces at the beginning and end of quotes to prevent words in the text from running into words or numbers represented by variables.

4. Have students work in pairs on the following assignments:

   a. Think of a short story that has four or five key words that can be stored as variables (their values can vary). Then ask four or five questions with PRINT statements, each followed by an INPUT statement to store the answer. Finally, use some PRINT statements to write your "story." Use the variables in place of those key words. After designing their programs on paper, allow the pairs of students to try out their programs at the microcomputers on a rotational basis.
   b. Using INPUT statements, write a program that makes the computer print the area of any triangle, given the base and height of the triangle. (Area = ½*base*height)

c. Using INPUT statements, write a program that will allow you to input the number of hours you slept last night. Have the computer print the total number of hours and the total number of days you will sleep in a year at that rate.

5. Show students how to save their programs on an initialized data disk and test their interactive programs on others.

6. If your microcomputers accept the condensed version, show students the shortcut for combining the PRINT and INPUT statements:

```
INPUT   "HELLO, WHAT IS YOUR NAME? "; N$
```

SAMPLE ACTIVITIES

LANGUAGE ARTS

SAMPLE ACTIVITY #1
Beginning Use of Word Processor

Subject:

Language Arts

Student Expectation(s):

1.1.1. Recognizes computer instructions
1.1.2. Reads instructions, keyboard, output
1.1.3. Uses control keys/commands
1.1.4. Selects/Uses written resources
1.1.5. Experiments as a user
1.1.6. Responds to error messages
1.5.1. Seeks work/play with computer
1.5.2. Uses positive affect words
3.2.1. Identifies applications
4.2.1. Describes how computers assist people

Instructional Mode:

Tool/Topic/Tutor

Prerequisite(s):

Students should be familiar with the operation of the microcomputer and be able to use the keyboard comfortably.

Classroom Management:

A lab setting with two students per computer is recommended. For the classroom demonstrations there should be one microcomputer with a large monitor or two. One or two printers should be available. Refer to Activity Guidelines, page 35, for rotating students.

Material(s):

Microcomputers and printers.
Word processor software and manual, such as:
AppleWriter, Milliken's Word Processor, Bank Street Writer, PFS: Write, Superscripsit, C64 - Wordprocessor, etc.
Blank diskettes.
Handout for demonstration and exercise.

Time for Activity:

Two or three class periods; one for the class demonstration and one or two for a work session.

Teacher Preparation:

Become familiar with the software program and accompanying manual.

Initialize as many blank diskettes as there are machines. Prepare a demo file with a letter having errors. If possible, train one or two students as your assistants in demonstrations and as consultants to other students. A sample letter and assignment-paragraphs follow this activity.

1. Explain what a word processor is and discuss the advantages over a typewriter.

2. Distribute the handouts which briefly summarize the major aspects of the particular word processor the class will be using. Follow the procedure in the handout for the demonstration. Have a student assistant (whom you have "prepped" earlier) operate the computer while you talk through the demonstration.

   a. Show how to load the program.
   b. From the main editor menu, load the tutorial file. Explain that the editor menu provides an overview of the kinds of things you can do with the word processor.
   c. Go through the tutorial with the class explaining points where necessary.
   d. Load the demo file and make some editing changes where needed, eliciting suggestions from students; have the assistant key in the changes that the class requests. Show how to save the file.
   e. Print the demo letter that has been edited. Talk about the print menu selections needed to get a double-spaced printout on your printer.

3. Assign students an exercise to key in with the original errors, as provided in the same handout. Let them work in pairs. Have them circle the errors and plan their editing strategies prior to their turn in the lab. When they have finished editing, have students save the new file and print it out.

4. Following the work session, have students compare their printouts and discuss any problems or concerns.

SAMPLE LETTER
for Word Processing Demonstration

Dear MS. smith:

I am writting you about an error no my creditcard statment for last month Transaction number 506I were posted as $605.00 but should have registered as $60.50!

Enclosed in a copy of my credit card receipt.Please contact the DO GOOD Company to verify the carge. My acount nubmer, as seen on the scripi, is 5700-69-421.

i will appreciate your correcting these error. Please inform me of the action took.

Sincerely,

Mr. Aoki

Have students help you find the errors in this letter prepared on disk. Demonstrate how the errors may be corrected, using the word processing software. Show how one sentence can be moved to another area, such as "My account number...."

EXERCISE PARAGRAPHS
for the Word Processor

Ancient Times

Since teh earlliest times poeple used their fingers to show "how many.' They could show the number of animals killed no a hunt They could show the num ber of people living in a dwelling. It was easy to show Large numbers in groups of ten by holding up both hands. That is how ten become the basis of our number system today.
Primative people also needed a ways to calculat and store infromation for future use. to keep track of the number of animal killed, theycollected small rocks and pebbles in a pile. Each stone stood for one amin.l. Later they scratched notches and symbols in stone or wood to record store information.

On of the first tools used to express numbers were the abacus. The Chinese abacus was develop about 5000 years ago. it was builded out of wood and beads. it could be held and carryed around easily. The abacus was so sucesful that its use spread from china to many othercountries. The abacus is still in us in some country today.

The abacus does not actualy do the computing, as today"s calculators do. People who are good at usin an abacus can ofen do calculations as quickly as an person who is used a calculator! It help people keep track of nubmers as they do the computing.

Have students key in the paragraphs as they are. Then they are to edit according to their previous planning. Ask them to switch the last two sentences around.

SAMPLE ACTIVITY # 2
Computer Propaganda

Subject:

Language Arts

Student Expectation(s):

3.1.1. Identifies input/output peripherals
3.1.2. Describes functions of input, output, processing
3.2.1. Identifies applications
3.3.6. Identifies applications of computer science
4.1.1. Lists limitations
4.2.1. Describes how computers assist people
5.1.1. Identifies local services/personnel

Instructional Mode:

Topic

Prerequisite(s):

Students should have had some hands-on experience with a microcomputer and be familiar with its components. You should be addressing Essential Competency #9 that concerns communication skills:

"Distinguish fact from opinion in TV and radio news broadcasts, advertising, newspaper and magazine articles and public speeches."

Classroom Management:

No classroom microcomputer is needed. Students can work in pairs as they investigate advertising propaganda.

Material(s):

Advertisements from newspapers and magazines, especially from computer journals, such as:
Byte, Classroom Computer Learning, Creative Computing, Electronic Education, Family Computing, Popular Computing, etc.
Computer newspapers, such as Computerworld.

Time for Activity:

A one-week period should be provided for all necessary research and interviews. Some of the work must be done outside of class, but other class activities can still be conducted throughout this period.

Teacher Preparation:

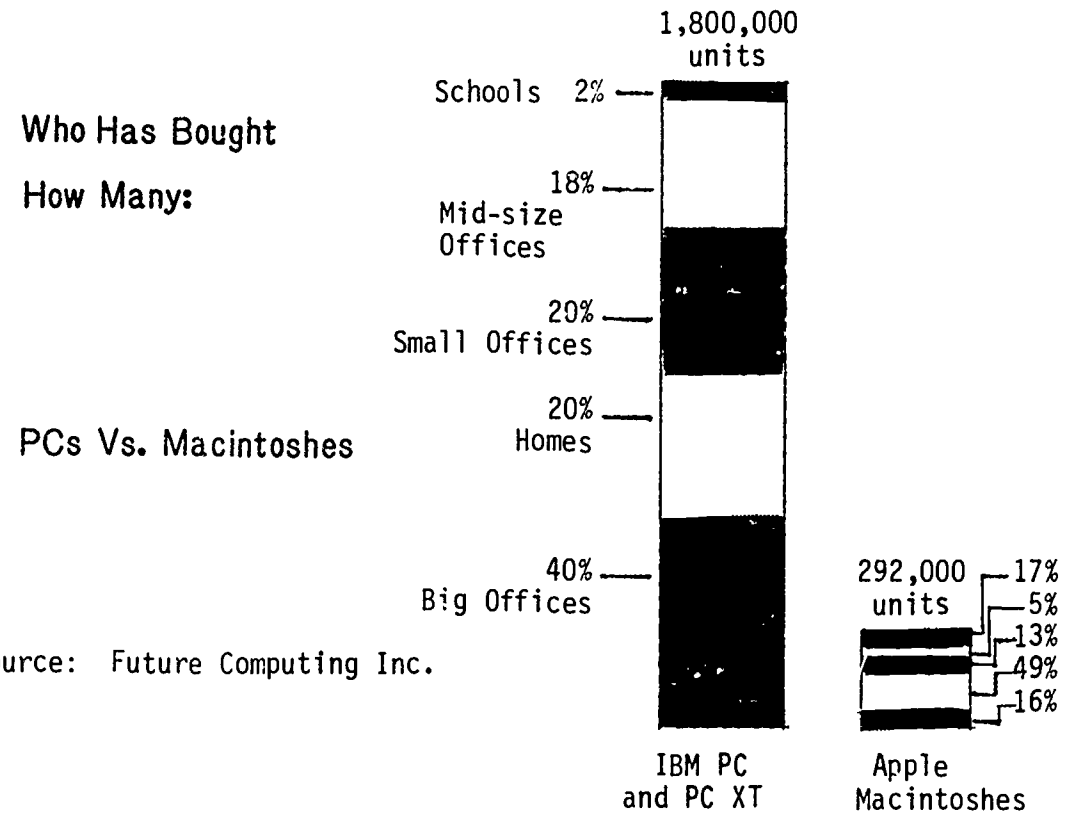
Round up an adequate number and variety of magazines and newspapers, such as

suggested above. Find an article that compares sales of two or more computer companies.

1. Introduce the activity by asking:

   a. How many students have home computers?
   b. What kinds of microcomputers do they have? (Keep track of the survey on the chalkboard.)
   c. What made them decide on that brand?
   d. For what purposes do they and their families use the computers?
   e. Are they and their families happy with their purchase? Why or why not?
   f. Did advertisements influence their purchase decision? What kind--TV or magazine?

2. Emphasize how computer companies are waging advertising wars in an effort to capture larger shares of the microcomputer market. Share an article that compares sales of computer companies. The recent comparison below might be relevant (late 1984 statistics).



Source: Future Computing Inc.

3. Have students search through the magazines and newspapers provided to analyze advertising campaigns of the major computer companies, (perhaps five companies). Allow students to work in pairs as they investigate the company assigned to them. They must keep a record of:

   a. Facts about the computer products advertised;
   b. Opinions presented in the ads;

c. Emotions played upon by the ads;
d. Eye-catching gimmicks.

4. Ask students to follow-up and research the accuracy of the information by contacting a vendor or service personnel for that company. The interview should be brief but specific in terms of claims made by the ads on their products. It may be by phone or in person, preferably the latter since a personal demonstration might be given by a sales representative.

5. Request each pair of students to prepare a summary report on their ad analysis and interview "facts." This should be presented to the class for discussion.

6. Include in the discussion:

   a. What is propaganda?
   b. Is it found in computer ads?
   c. Do any particular companies tend to use it more than others?
   d. Do any companies seem to emphasize facts over opinion or gimmicks?
   e. Compile a list of facts on the chalkboard that a purchaser should know before selecting a computer.

SAMPLE ACTIVITY #3
Designing a Data Base for Book Reviews

Subject:

Language Arts

Student Expectation(s):

1.2.1. Rationalizes information processing
1.2.4. Recognizes computer processes
1.5.1. Seeks work/play with computer
1.5.2. Uses positive affect words
2.1.1. Uses computer in decision making
3.2.1. Identifies applications
3.3.1. Values efficient information processing
3.3.2. Understands pros/cons of routine tasks
3.3.4. Values communication/information
4.1.1. Lists limitations
4.2.1. Describes how computers assist people

Instructional Mode:

Tool/Topic

Prerequisite(s):

Students should be familiar with the operation of the microcomputer and be able to use the keyboard comfortably. Book reviews should be a requirement in this class, and students should have at least one ready now.

Classroom Management:

For the classroom demonstration one microcomputer with a large monitor or two should be used. If two to four microcomputers are available, one student at a time can use a machine on a rotational basis. A computer lab setting is recommended.

Material(s):

PFS: File, published by Software Publishing Corporation, or some other program for storing and retrieving data.
Program user manual.
Microcomputers with two disk drives each.
Written book reviews, prepared by students.

Time for Activity:

One period is needed for a classroom demonstration and the designing of the data base. Throughout the week allow each student to enter his or her own book review, while working on other assignments. At the end of the week, one period is needed to demonstrate the usefulness of the new data base.

Teacher Preparation:

Spend one or two hours experimenting with the program, to become familiar with its operation and documentation. After students have entered book reviews on their data disks, be sure to combine their disks into one master disk for the classroom data base using the COPY function.

1. Review with the class the terms "data base" and "information retrieval." Distinguish the terms field, record and file in a data base. Refer to Appendix C for terms. (Illustrate these terms from this activity, such as: a field is TITLE or AUTHOR; a record is the whole book review format; the file is the collection of book reviews from the class.) Inform students that they will be creating a class data base for book reviews.

2. Demonstrate PFS: File (or similar software) and the procedure the students will follow in designing, entering, searching and updating the data base they are about to create. Show how and when to use the program disk and the data base disk.

3. Have students as a class suggest how their book review data base should look. A possible format follows:

```
TITLE:        XXXXXXXXXXXXXXXXX
AUTHOR:       XXXXXXXXXXXXXXXXX
# OF PAGES:   NNNN
KIND:         X
THEME:        XXXXXXXXXXXXXXXXX
LEVEL:        NNN
RATING:       N
REVIEW BY:    XXXXXXXXXXXXXXXXX
TEXT:         XXXXXXXXXXXXXXXXX
              XXXXXXXXXXXXXXXXX
              XXXXXXXXXXXXXXXXX
              XXXXXXXXXXXXXXXXX
              XXXXXXXXXXXXXXXXX
              XXXXXXXXXXXXXXXXX
```

4. Using the DESIGN function, either key in the format or have a volunteer student do so.

5. Request all students to prepare the necessary data on paper before getting on the computers to enter their book reviews on the data base. Signing up for computer time should be a prerequisite for using the equipment.

   a. Explain the importance for filling in all given positions for a numeric entry, as # OF PAGES: 0 3 9 2. If PFS: File is to compare the number of pages from two books, it examines the first digit from left to right of each book. Thus if 1487 were the datum from one book and 392 from the other, the latter would be selected as larger.
   b. Remind them that the TEXT can only accommodate six lines of 18 characters each. So conciseness is important. However, pressing CTRL and N will allow continuation to next page, if more text is desired.

c. Define the field KIND as indicating "F" for fiction or "N" for nonfiction; LEVEL as indicating the minimum grade level with or without a "+" (for above that level); RATING as an evaluation score of a number from 1 to 5, with 5 rating the best.

6. After all students have entered their book reviews on the data base, discuss any questions or problems that students may have encountered. With the demonstration microcomputer, retrieve several records and check the reviews. Show how students can search for one or more books by area of interest (theme), author or rating.

   a. Discuss the advantages and disadvantages of their new data base.
   b. Elicit ideas from students for reasonable improvements of this data base.
   c. Require all book reviews throughout the year to be added to this data base and encourage students to use it for making their own reading selections.

SAMPLE ACTIVITIES

MATHEMATICS

SAMPLE ACTIVITY #1
Using the FOR-NEXT Statement in BASIC

Subject:

Mathematics

Student Expectation(s):

1.1.1. Recognizes computer instructions
1.3.1. Interprets a simple algorithm/flowchart
1.4.1. Recognizes programming languages
1.4.2. Operates with words/symbols
1.5.1. Seeks work/play with computer
1.5.2. Uses positive affect words
2.1.2. Creates program from flowchart

Instructional Mode:

Tutee/Topic

Prerequisite(s):

Students should be comfortable with operating the microcomputer and have background in BASIC, using the REM, PRINT, LET, GOTO, INPUT, END statements. Prior flowcharting experience is suggested. Entry Level Sample Activity #6 is a good precursor to this activity.

Classroom Management:

A lab setting with two students per computer is recommended. For the classroom demonstration there should be one microcomputer with a large monitor or two. Refer to Activity Guidelines, page 35, for rotating students.

Material(s):

Microcomputers and system master disks or BASIC disks, if necessary. Because of variations in BASIC, certain modifications of the programming activities may be necessary. Check your user's manual for modifications.
Resources for reference or text, such as:
Computer Literacy--A Hands-On Approach by Arthur Luehrmann and Herbert Peckham, pages 289-301;
Spotlight on Computer Literacy by Ellen Richman, Chapter 22;
Computer Literacy--Problem-Solving with Computers by C. E. Horn and J. L. Poirot, pages 250-251;
Computers Today by Donald H. Sanders, pages 424-426;
Computer Literacy--Programming, Problem Solving, Projects on the Apple by Warren and Bobbie Jones, Kevin Bowyer and Mel Ray, page 88-89;
BASIC Discoveries by Linda Malone and Jerry Johnson, pages 43-48.

Time for Activity:

Two to four class periods, depending on the number of microcomputers available.

Teacher Preparation:

Review any of the references suggested above or other related articles on BASIC FOR-NEXT statements and looping structures.

1. Introduce the FOR-NEXT statements by keying in and running a short counting program on the demonstration microcomputer:

```
NEW
10  REM     JUST COUNTING
20  FOR     N = 1 TO 5
30  PRINT   N
40  NEXT    N
50  END
```

2. Explain that the FOR-NEXT statements provide a counting loop, and a loop is a series of statements that is repeated. With the FOR command the user directs the computer to start a variable at one number and keep counting until it reaches another number. The NEXT command directs the computer to go to the next number in the counting sequence. In between the FOR and NEXT statements the user can put other statements that will be repeated. Contrast FOR-NEXT with IF-THEN statements that students have already used.

3. Present other short programs on the demo microcomputer, using the FOR-NEXT statements; include the STEP command. Have students make predictions for the output before the programs are run. Here are a few:

```
NEW
10  REM     CHECKING STEP COMMAND
20  FOR     X = 2 TO 10 STEP 2
30  PRINT   X
40  NEXT    X
50  END
```

```
NEW
10  REM     BLINK BLINK
20  FOR     N = 1 TO 10
30  PRINT   "BLINK"
40  REM     A WAITING LOOP
50  FOR     M = 1 TO 100
60  NEXT    M
70  NEXT    N
80  END
```

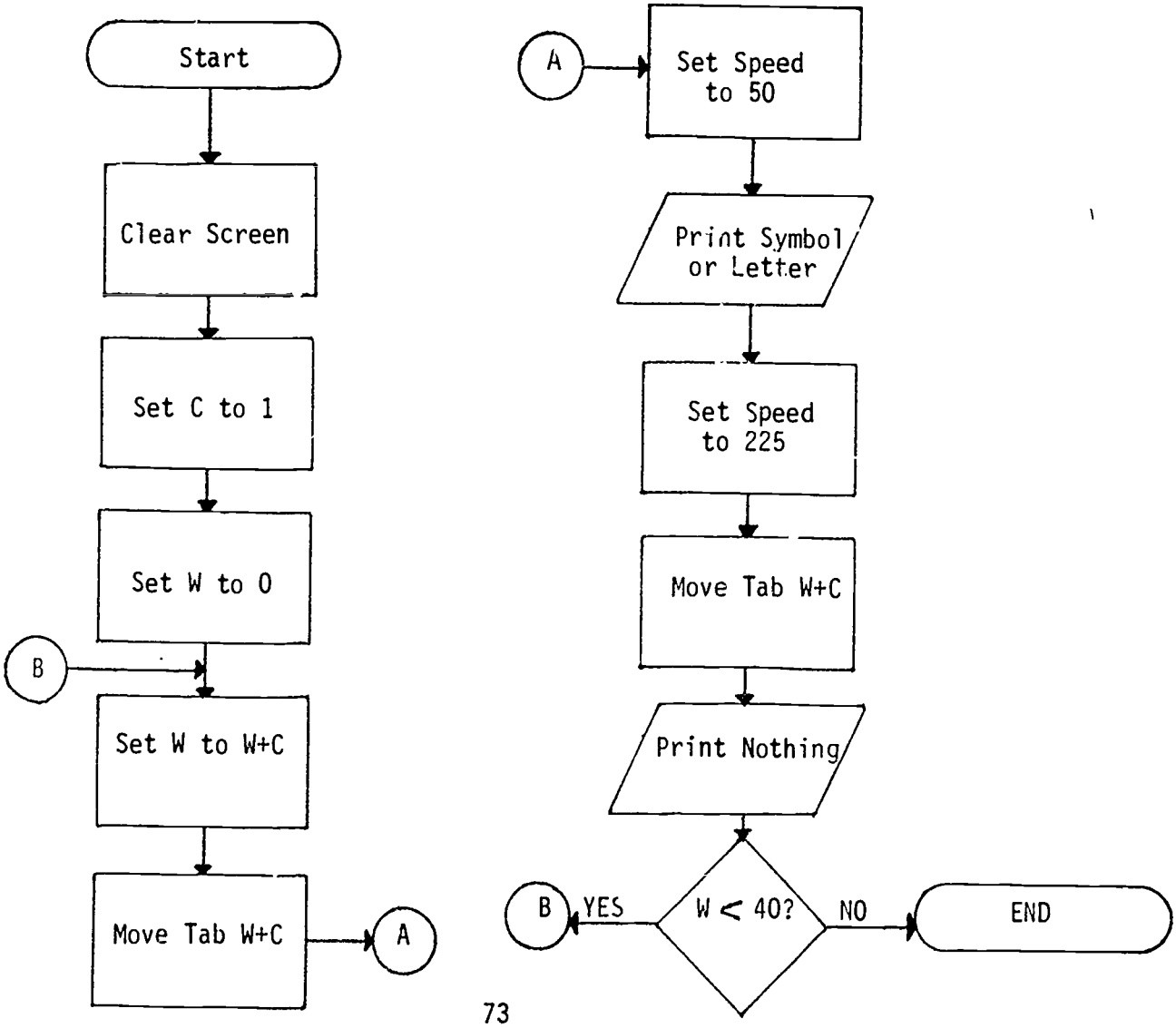
```
NEW
10  REM     CHECKING INPUT COMMAND
20  PRINT   "ENTER A NUMBER FROM 1 TO 25."
30  INPUT   S
```

```
40  FOR     N = 63 TO 115 STEP S
50  PRINT   "N is "; N
60  NEXT    N
70  END
```

4. Clarify that GOTO statements should not be used within a FOR-NEXT loop to transfer to a different statement number.

5. Assign a FOR-NEXT problem for students to explore in pairs. The suggested exercise here is to serve not only as a means to practice the new command but also as a precursor to Graphics. It requests students to animate some symbol or letter in text-mode (for the Apple). Introduce the HTAB command, (for horizontal tabulation), and the SPEED command.

   a. Make the symbol or letter move across the screen from left to right.
   b. Interpret the flowchart first and code the program on paper. When ready, try it out on the computer.
      (For some classes it may be best to interpret the flowchart together.)



c. Here is one way the program can be coded.

```
NEW
10  HOME
20  LET    C=1
30  FOR    W=1 TO 39
40  HTAB   W+C
50  SPEED  = 50
60  PRINT  "@";
70  SPEED  = 225
80  HTAB   W+C
90  PRINT  " ";
100 NEXT   W
110 END
```

d. Have students print out their listings and save their programs on diskettes. These can be shown during the follow-up discussion, during which time a student could load and run his or her program on the demo microcomputer.

e. As a follow-up activity, ask students how the program could be modified to make the symbol or letter move down the screen. Introduce the VTAB (vertical tabulation) command. Have the class as a group design the modified program and run it on the demo microcomputer.

SAMPLE ACTIVITY #2
Beginning Low-Resolution Graphics

Subject:

Mathematics

Student Expectation(s):

1.1.1. Recognizes computer instructions
1.4.1. Recognizes programming languages
1.4.2. Operates with words/symbols
1.5.1. Seeks work/play with computer
1.5.2. Uses positive affect words
2.1.3. Develops algorithm for problem solving

Instructional Mode:

Tutee/Topic

Prerequisite(s):

Students should know how to operate the microcomputer and be familiar with the BASIC statements of REM, PRINT, LET, FOR-NEXT, END. Entry Level Sample Activity #6 and Sample Activity #1 in Mathematics should have been covered.

Classroom Management:

A lab setting with two students per computer is recommended. Monitors must be in color. One computer with a large color monitor should be available for class demonstration purposes. Refer to Activity Guidelines, page 35, for rotating students.

Material(s):

Microcomputers and printer that support color graphics. (This activity is assuming Apple II equipment and Applesoft BASIC. Because of variations among brands of computers, certain modifications of this activity may be necessary. Check your user's manual for modifications.)
Resources for reference or text, such as:
Spotlight on Computer Literacy by Ellen Richman, Chapter 24;
Computer Literacy--A Hands-On Approach by Arthur Luehrmann and Herbert Peckham, Part 3;
Computer Literacy--Programming, Problem Solving, Projects On the Apple by Warren and Bobbie Jones, Kevin Bowyer and Mei Ray, pages 62-67;
Graphics Discoveries, Book I, by Jerry Johnson.

Time for Activity:

Two to three class periods, depending on the number of microcomputers available and the students' level of BASIC skills.

Teacher Preparation:

Review any of the references suggested above or other related articles on graphics. Practice a few simple programs: explore new possibilities. Save on disk the demonstration program. Prepare a summary sheet of information.

1. Introduce low-resolution graphics by running on the demonstration microcomputer the program that the class will be developing.

2. Distribute the summary sheets and discuss the key elements in low-resolution graphics with the brand of computer available. (A sample summary sheet follows this activity.)

3. Key in a couple of simple graphics programs for the class to see, such as:

```
NEW
10  HOME
20  GR
30  COLOR  = 9
40  PLOT   15, 22
50  END
```

```
NEW
10  HOME
20  GR
30  PRINT  "WHAT COLOR DO YOU WANT";
40  INPUT  C
50  COLOR  = C
60  PLOT   15, 22
70  END
```

4. Have the class as a group design a short program that allows an "infinite" number of colored blocks. You or a student could key it in the demo microcomputer and test it out. (Briefly explain the IF-THEN statement.) Here is a possibility:

```
NEW
10  HOME
20  GR
30  COLOR  = 13
40  PRINT  "FIRST NUMBER OF PLOT = ";
50  INPUT  N1
60  PRINT  "SECOND NUMBER OF PLOT = ";
70  INPUT  N2
80  PLOT   N1, N2
90  PRINT  "DO YOU WANT TO CONTINUE";
100 INPUT  A$
110 IF A$  = "YES" OR A$ = "Y" THEN GOTO 40
120 END
```

5. Assign the following problem as a group activity. Using the chalkboard, guide students as they design the algorithm and plan the coding.

Design a "screen wash" program that will cause the entire screen to be washed with each of the sixteen colors, one color at a time, just like the introductory demo program. Start the "washing" of colors at the upper left edge of the screen, moving to the right, until all of the graphics portion of the screen is colored. Consider using FOR-NEXT statements.

The program should look something like this:

```
 5  REM    SCREEN WASH
10  HOME
20  GR
30  FOR    C = 0 TO 15
40  COLOR  = C
50  FOR    ROW = 0 TO 39
60  FOR    COL = 0 TO 39
70  PLOT   COL, ROW
80  NEXT   COL
90  NEXT   ROW
100 NEXT   C
110 END
```

6. Have students copy the program and work in pairs on all or some of the following exercises.

   a. Key in the original program and run it.
   b. Rewrite the program so the colors appear in the reverse order.
   c. Rewrite the program so the screen is washed from the bottom up.
   d. Rewrite the program so the screen is washed from right to left.

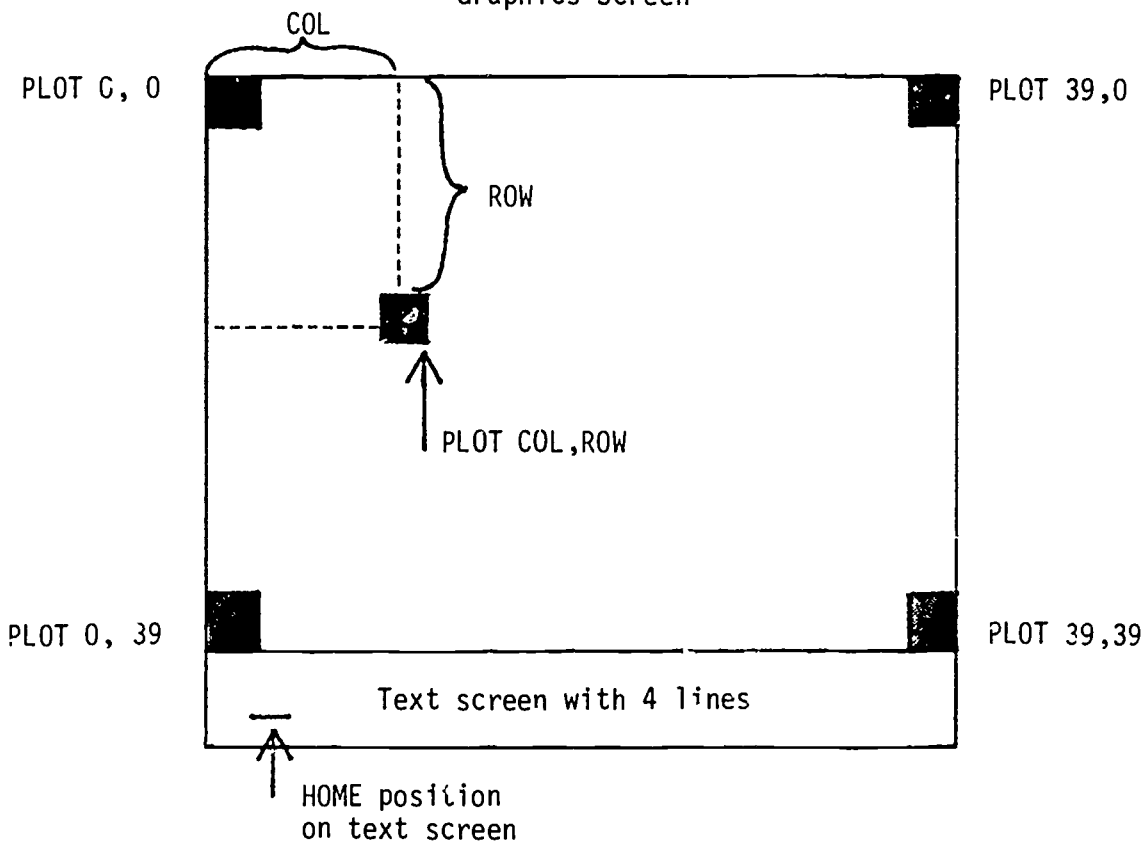
   A listing should be printed out for each. Show students how to use the printer.

GRAPHICS SUMMARY SHEET
Applesoft BASIC

Available Color and Their Reference Numbers

0 = black	4 = dark green	8 = brown	12 = green
1 = magenta	5 = gray	9 = orange	13 = yellow
2 = dark blue	6 = medium blue	10 = gray	14 = aqua
3 = purple	7 = light blue	11 = pink	15 = white

Graphics Screen



Sample Program to Illustrate Use of Each Graphics Command

Command	Comment
10 GR	Clears screen (except for bottom 4 text lines) and enters graphics mode.
20 COLOR = 9	Establishes orange as the plot color.
30 PLOT 15, 22	Plots an orange block at the intersection of the 15th column and the 22nd row.
40 HOME	Clears text screen and moves cursor to upper left corner of text screen.
50 TEXT	Resets the full screen to the text mode.
60 END	

SAMPLE ACTIVITY #3
Introduction to Spreadsheets

Subject:

Mathematics

Student Expectation(s):

1.1.5. Experiments as a user
1.1.6. Responds to error messages
1.5.1. Seeks work/play with computer
1.5.2. Uses positive affects words
2.1.1. Uses computer in decision making
3.2.1. Identifies applications
3.3.1. Values efficient information processing
4.2.1. Describes how computers assist people

Instructional Mode:

Tool/Topic

Prerequisite(s):

Students should be familiar with the operation of the microcomputer and be able to use the keyboard comfortably. Students should have background in BASIC, using the REM, PRINT, INPUT, END statements. Consider doing the Entry Level Sample Activity #6 - Using the INPUT Statement in BASIC.

Classroom Management:

A lab setting with two students per computer is recommended. For the classroom demonstration there should be one microcomputer with a large monitor or two. One or two printers should be available. Refer to Activity Guidelines, page 35, for rotating students.

Material(s):

Microcomputers and printers.
Spreadsheet software such as:
    Visicalc or LOTUS.
Blank diskettes.
Handout for demonstration and exercise.

Time for Activity:

One to two class periods, depending on the number of microcomputers available.

Teacher Preparation:

Become familiar with the software program and accompanying manual.

Initialize as many diskettes as there are teams of students. Prepare a spreadsheet page on disk, such as this example. Have the formulas entered in only the first two "B" cells. Prepare the handout sheet that includes a copy of this example.

INTRODUCTORY SPREADSHEET

	A	B
1	NUMBER	
2	HALF	+B1/2
3	TWICE	+B1*2
4	TIMES 3	
5	PLUS 5	
6	MINUS 2	
7	TIMES 25	
8	PLUS 100	
9	25% OF	
10	SQUARED	

1. Draw the following chart on the chalkboard:

	A	B
1		
2		
3		

2. Explain that this is an outline of a very simple spreadsheet. Show how the intersection of two lines (vertical line from A and horizontal line from 1) forms a block called a cell (in this case A1.) Complete the cell structure with labels.

3. Discuss what an electronic spreadsheet is. Ask students if they have used one before; if so, have one or two students explain for what purpose they used it. Elicit ideas from the class as to what other purposes spreadsheets could serve, (budgets, inventory, grading systems, research-data collecting, etc.)

4. Show students how a simple spreadsheet could be created from a short BASIC program. Using the demonstration microcomputer, key in the following program.

```
NEW
10  REM    SIMPLE SPREADSHEET
20  PRINT  "ENTER ANY NUMBER."
30  INPUT  N
40  PRINT  "", "A", "B"
50  PRINT  "1", "NUMBER", N
60  PRINT  "2", "HALF", N/2
70  PRINT  "3", "TWICE", N*2
80  END
```

Be sure to clarify the symbols / and *.

5. Run the program using different numbers from several students. Have a student compare this spreadsheet with the outline on the chalkboard and explain what this one is showing.

6. Inform students that a pre-packaged spreadsheet program is similar to this one but is more complex and capable of automatically recalculating new entries without having to be re-run.

7. Distribute a handout that summarizes the functions of the spreadsheet the class will be using and explains the assignment. Demonstrate how this particular spreadsheet works.

   a. How to start the program;
   b. How to enter a label, a value or a formula;
   c. How to implement formulas (adding, finding averages, etc.);
   d. How to print the worksheet.

8. Have students work in pairs as they fill in the formulas for cells B2 to B10 or the sample problem provided. (The title for this exercise is not to be included in the spreadsheet.) Allow them computer time to create the simple spreadsheet, test it with various numbers and make one printout of it.

9. After all pairs of students have completed this exercise, load the spreadsheet file you had prepared. Show, compare and discuss results.

SAMPLE ACTIVITIES

SCIENCE

SAMPLE ACTIVITY #1
Computer Evolution

Subject:

Science (Physical Science is most appropriate.)

Student Expectation(s):

3.4.1. Knows evolution of electronic technology

Instructional Mode:

Topic

Prerequisite(s):

None

Classroom Management:

One microcomputer should be available for demonstration purposes.

Material(s):

Resources for text, such as:
Spotlight on Computer Literacy by Ellen Richman, Chapters 8-9;
Scholastic Computing--An Introduction to Computers by Jack L. Roberts, pages x-xxxi;
Computer Literacy--Problem-Solving with Computers by C. E. Horn and J. L. Poirot, Chapter III.
Videotape player and videotape, "Evolution: Computers, Yesterday and Today."

Time or Activity:

Three class periods; one for the videotape, two for follow-up discussions and readings.

Teacher Preparation:

Preview the videotape to prepare a few specific questions for class discussion. Obtain samples of a vacuum tube, transistor and integrated circuit chips from a local electronics dealer and computer hardware vendor or through MECC.

1. Provide students with a handout of questions to guide them through the viewing of the videotape. Show the videotape and request that the handout be completed for discussion the next day.

2. During the discussion of computer evolution, emphasize the role of the vacuum tube, transistor and integrated circuit chip. Pass around the samples of these pieces of equipment. Provide a magnifying glass for students to examine the micro chip. Show where the integrated circuit chips are located inside the classroom microcomputer.

3. Assign specific reading from the material listed above or other related articles. Among questions for further discussion: What makes the computer different from pre-computer aids to calculation?

4. Offer two bonus assignments:

   a. Create an abacus and demonstrate its usefulness as a pre-electronic calculator. Use the instructions provided in Appendix D.
   b. Build a model of Napier's bones and demonstrate its usefulness as calculating rods. Use the instructions provided in Appendix D.

SAMPLE ACTIVITY #2
Computer Simulation

Subject:

Science (Biology or Life Science is most appropriate.)

Student Expectation(s):

1.5.2. Uses positive affect words
2.1.1. Uses computer in decision making
3.2.1. Identifies applications
4.2.1. Describes how computers assist people

Instructional Mode:

Tutor/Tool

Prerequisite(s):

Students should have had previous hands-on experience with a microcomputer. They should have some knowledge of food chains and food webs and experience in making observations and collecting data.

Classroom Management:

For the classroom demonstration one microcomputer with a large classroom monitor or two should be used. If three or four microcomputers are available, teams of students could use them on a rotational basis. A computer lab setting is recommended.

Material(s):

"Odell Lake" simulation program from Science Volume 3 software, MECC, with copies of the Odell Lake worksheet from the MECC Teacher Manual.
Transparency of "Odell Lake Answer Key" and a blank transparency for preparing a data-collecting worksheet.
Overhead projector.

Time for Activity:

One or two class periods, depending on the classroom management scheme.

Teacher Preparation:

Read the background information in the manual. Run through the entire program yourself.

1. Tell students they are going to be scientists studying food webs at

Odell Lake, but because it is too expensive to actually go there, they will use a computer simulation of the lake for making their observations.

2. Run one sequence of the Odell Lake simulation for the whole class, eliciting from students ideas about what data they will need to be recording on paper as they observe the behavior of one fish in relation to other fish in the lake. Together develop a data-collection worksheet and draw it on the overhead transparency.

3. Either as a whole group or on a team basis, have students run through several sequences of the simulation. Have them vary their selections of fish and actions taken. Intermingle with the students and give help when needed in collecting data.

4. Ask students to prepare a food chain using the Odell Lake worksheet and data they have collected.

5. During a follow-up discussion, include the role of the computer simulation in understanding food webs:

   a. In what ways does the computer show how it really could be at Odell Lake?
   b. What aspects of a real lake are not included in this simulation? (e.g., weather, seasons, disease, encounters between fish of the same species, etc.)
   c. How does this simulation help us as we learn to make scientific observations, collect data and learn about food chains? (e.g., We can make more observations in an hour with the simulation than out at a real lake; we can easily return to the simulation, if more data are needed; it is less expensive to study the simulation than to take a field trip to a real lake...maybe not as fun but more organized, etc.)

SAMPLE ACTIVITY #3
Graphing Data

Subject:

Science (Life or Physical Science is most appropriate.)

Student Expectation(s):

1.5.2. Uses positive affect words
2.1.1. Uses computer in decision making
3.2.1. Identifies applications
3.3.1. Values efficient information processing
4.2.1. Describes how computers assist people

Instructional Mode:

Tool/Topic

Prerequisite(s):

Students should be familiar with operating the microcomputer. Also they should have done some science laboratory work in which data have been collected.

Classroom Management:

A lab setting is recommended. One computer with a large monitor or two should be available for classroom demonstration purposes. The class will then have to divide into teams for using the computers.

Material(s):

A plotting program, such as:
Dataplot program, from Muse-Software, Inc., or Appleplot program, from Apple Computer, Inc., or PFS: Graph, from Software Publishing Corporation.
Microcomputers and printers.

Time for Activity:

Two class sessions. Class demonstration of about 15 minutes; team work time for the remainder of the first period. A follow-up discussion-demonstration for the second session.

Teacher Preparation:

Read the documentation that comes with the software you plan to use and try out the program with a sample of students' data.

1. Demonstrate to the class the process of inputting a set of their data.

Show how to develop various kinds of graphs for the same data and compare the usefulness of each graph for the purpose of the particular lab activity.

2. Allow students to work as teams, so each team can input their own data on the computer and print out their graphs. Meanwhile each student should be assigned to prepare a traditional graph on paper. (Plotting data by hand is still an important skill.) Intermingle with students to help when needed.

3. Upon completion of the graphing exercises, show various sets of student data on the demonstration computer. Plot the data from all teams on one graph. Interpret the graphs with the class. Compare the appropriateness of certain kinds of graphs to certain situations.

4. Have students discuss the advantages and disadvantages of using the computer for graphing data. Discuss why a research scientist would use the computer in analyzing data. Include concerns for speed, repetition and handling large amounts of data.

SAMPLE ACTIVITIES
SOCIAL STUDIES

SAMPLE ACTIVITY #1
Computer Crime

Subject:

Social Studies

Student Expectation(s):

3.3.5. Understands effects on economics, politics, crime

Instructional Mode:

Topic

Prerequisite(s):

None

Classroom Management:

No computer is required. Students could work independently or in pairs.

Material(s):

Resources for reference or text, such as:
Scholastic Computing--An Introduction to Computers by Jack L. Roberts, pages 221-225;
Computer Literacy--Problem-Solving with Computers by C. E. Horn and J. L. Poirot, pages 101-106;
Computers Today by Donald H. Sanders, page 540 ("Three Dramatic Bank Crimes");
Spotlight on Computer Literacy by Ellen Richman, pages 74-75;
Computers and Social Controversy by Tom Logsdon, Chapter 7;
"Computer Crime," Computer Literacy Instructional Module by MECC (includes hardouts).

Time for Activity:

Three class periods; one for research; one for presentations and reading; one for a follow-up discussion.

Teacher Preparation:

Read selected material on the topic, such as from the references suggested above.

1. Have students research a computer crime. (Articles on computer crime are listed in Reader's Guide to Periodical Literature.) In their written summary of the crime, ask them to:

   a. Indicate what role the computer played;

b. Determine whether or not the crime could have been accomplished without a computer;
c. Include the punishment meted out to the criminal.

2. Allow students to present these research summaries to the class.

3. Assign students additional materials to read from such resources as listed above. Accompanying questions could be assigned.

4. Conduct a follow-up discussion that includes:

   a. Reasons why it is difficult to prevent computer crime;
   b. Ways in which computer crime affects the economy;
   c. Comparison of sentences given to computer criminals versus their nontechnical counterparts.

SAMPLE ACTIVITY #2
Entering Data on a Data Base

Subject:

Social Studies

Student Expectation(s):

1.2.4. Recognizes computer processes
1.5.1. Seeks work/play with computer
1.5.2. Uses positive affect words
2.1.1. Uses computer in decision making
2.1.4. Assists in problem solving/decision making
3.2.1. Identifies applications
3.3.1. Values efficient information processing
3.3.4. Values communication/information
4.2.1. Describes how computers assist people

Instructional Mode:

Tool/Topic

Prerequisite(s):

Students should be familiar with the operation of the microcomputer and be able to use the keyboard comfortably. They should be currently studying the fifty states.

Classroom Management:

For the classroom demonstration one microcomputer with a large monitor or two should be used. If two to four microcomputers are available, pairs of students can use them on a rotational basis. A computer lab setting is recommended. Refer to Activity Guidelines, page 35, for further details.

Material(s):

PFS: File, published by Software Publishing Corporation, or some other program for storing and retrieving data.
Program user manual.
Microcomputers with two disk drives each.
A States Data Base on disk.
Information Please Almanac, six to twelve copies.
Course textbooks on the United States History or Geography.

Time for Activity:

Two to three class periods, depending on the number of available microcomputers. One period is needed for demonstration and initial research into the almanacs.

Teacher Preparation

Spend one or two hours experimenting with the program, to become familiar with its operation and documentation. Use the DESIGN function to build a file for the states data, according to a format similar to the one below:

STATES DATA BASE

```
STATE:                                        ABBREV.:
CAPITAL:
FLOWER:
YEAR ENTERED UNION (NNNN):
1980 STATE POPULATION (NN,NNN,NNN):
1980 LAND AREA IN SQUARE MILES (N,NNN,NNN):
STATE FORESTS, PARKS IN ACRES (N,NNN,NNN):
MEAN ALTITUDE IN FEET (N,NNN):
HIGHEST POINT                                 ALTITUDE
    NAME                                      (NN,NNN)
:                                             .:
LOWEST POINT                                  ALTITUDE
    NAME                                      (N,NNN)
:                                             .:

PRESS CTRL AND N FOR PAGE 2;
PRESS CTRL AND C FOR MENU.
```

Add a form to the file for each state, filling in only the state name and two-character abbreviation on each form. Prepare an assignment handout. After students have entered the data on their data disks, be sure to combine their disks into one master disk for the classroom data base using the COPY function.

1. Review with the class the terms "data base" and "information retrieval." Introduce the States Data Base concept and the fact that they will be building and using a computerized data base. Distinguish the terms field, record and file in a data base. Refer to Appendix C for terms.

2. Have students work in pairs, assigning the fifty states fairly equally among the teams.

3. Hand out assignment sheets to all students, requesting them to fill in the names of partners and states for which they are responsible.

4. Demonstrate the PFS: File (or similar software) and the procedure the students will follow in searching and updating their states. Show how and when to use both the program disk and the States Data Base disk.

   a. Run through the specifics of retrieving one state, such as Hawaii, and updating the form for it by inserting data on the Capital, the Flower, the year Entered Union (NNNN), etc.

b. Explain the importance of entering the full field for numeric entries, such as State Forests, Parks in Acres (N,NNN,NNN). If the value is less than the space provided, insert 0's such as 0,082,469 for the above. This is known as fixed-length data. PFS doesn't distinguish the place value of numeric fields, so in comparing sizes, 82,469 would seem larger to PFS than 582,469. PFS takes the first digit from left to right in comparing two separate numbers. If the first digit in one number is larger than the other first digit, then PFS selects that total value as larger than the other.

5. Ask students to research the needed information from the almanac prior to using the computer. Their data must be ready to be entered on the data base. Signing up for computer time should be a prerequisite for using the equipment.

6. Provide an accompanying reading assignment from the textbook, so students will have something constructive to do while waiting for the almanacs and microcomputers.

SAMPLE ACTIVITY #3
Selecting Data and Reporting From a Data Base

Subject:

Social Studies

Student Expectation(s):

1.2.4. Recognizes computer processes
1.5.1. Seeks work/play with computer
1.5.2. Uses positive affect words
2.1.1. Uses computer in decision making
2.1.4. Assists in problem solving/decision making
3.2.1. Identifies applications
3.3.1. Values efficient information processing
3.3.4. Values communication/information
4.1.1. Lists limitations
4.2.1. Describes how computers assist people

Instructional Mode:

Tool/Topic

Prerequisite(s):

Students should have completed Sample Activity #2 in Social Studies, during which they set up a States Data Base with specific data.

Classroom Management:

For the classroom demonstration one microcomputer with a large monitor or two should be used. If two to four microcomputers are available, pairs of students can use them on a rotational basis. A computer lab setting is recommended. Refer to Activity Guidelines, page 35, for further details.

Material(s):

PFS: File, published by Software Publishing Corporation, or some other program for storing and retrieving data.
Program user manual.
Microcomputers with two disk drives each.
At least one printer.
The States Data Base, previously entered on disk.

Time for Activity:

Two to three periods, depending on the number of available microcomputers.

Teacher Preparation:

Practice with the PRINT function. Prepare an assignment handout.

1. Review the work that was accomplished in the previous activity on the States Data Base. Have a student demonstrate to the class the retrieval of a state form he or she has updated.

2. Have students work in pairs. Hand out assignment sheets to all students and have them fill in names of their partners. They are to write a report that includes information retrieved from the States Data Base, such as:

   a. What states entered the union between 1800 and 1850?
   b. What states have land area greater than 100,000 square miles?
   c. What states have the mean altitude greater than 3,000 feet?

3. Demonstrate the use of the SEARCH/UPDATE function to find all the states with more than a million acres of State Forests and Parks (i.e., > 1,000,000).

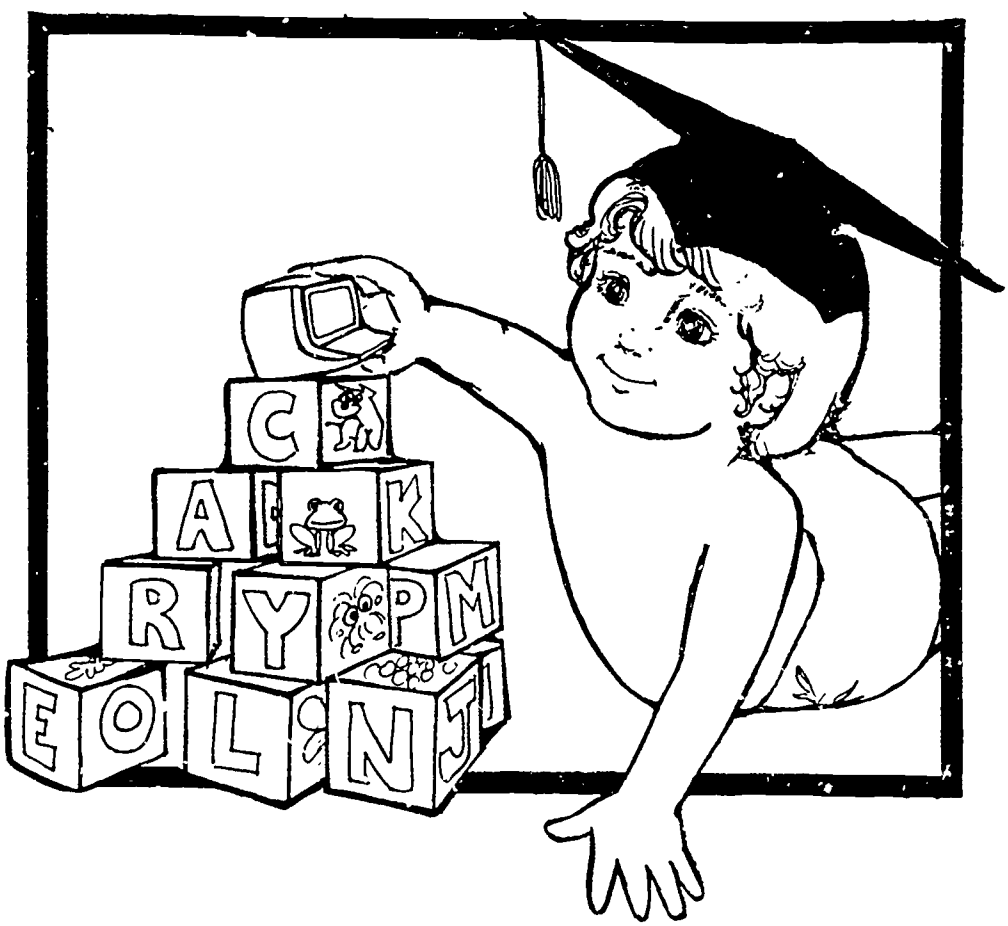
4. Show how the PRINT function works. Include the RETRIEVE SPEC selection and the PRINT SPEC selection, which requires an "X" in the blank beside the item to be printed. An "S" beside the "X" for State Forests, Parks in Acres, requests a Sort of States to be listed in the order of forest and park size. Remind students to always check the printer before printing to see if it is on and the paper is properly loaded.

5. Allow time for pairs of students to complete their assignment, including preparing the final hand-written report. (If students had been trained on a word processor, the reports could be computer generated.) Signing up for computer time should be a prerequisite to using the equipment.

6. Have students present their results to the class. Discuss the advantages and disadvantages of using a computer for research purposes. Consider possible conclusions that could be drawn from the data.

   a. Are there any similiarities among states that entered the union between 1800 and 1850?
   b. Where are the larger states found?
   c. Do the states with the highest mean altitudes tend to have larger or smaller populations?

APPENDIX



APPENDIX A

EXPLORATORY COMPUTER LITERACY FRAMEWORK

EXPLORATORY COMPUTER LITERACY FRAMEWORK

GOALS: The student will feel confident about using computers

The student will know how the computer can be used as a tool for problem solving and decision making.

The student will be aware of, appreciate, and understand the functions and impact of computers in daily life.

The student will recognize the limitations as well as the usefulness of computer (science) technology in advancing human welfare.

The student will recognize educational and career opportunities related to the specific and general uses (application) of computers.

I. The student will feel confident about using computers.

A. Demonstrations of confidence implies ability to use the computer.

1. Interact with a prepackaged computer program.

(GRADE 3 EXPECTATION: THE STUDENT RECOGNIZES THAT A COMPUTER NEEDS INSTRUCTIONS TO OPERATE.)

(GRADE 3 EXPECTATION: THE STUDENT READS INSTRUCTIONS, THE KEYBOARD, AND OUTPUT.)

(GRADE 3 EXPECTATION: THE STUDENT USES BASIC CONTROL KEYS AND COMMANDS.)

(GRADE 6 EXPECTATION: THE STUDENT SELECTS AND USES APPROPRIATE RESOURCES (MANUALS) FOR OPERATING THE COMPUTER.)

(GRADE 6 EXPECTATION: THE STUDENT EXPERIMENTS WITH PROGRAMS AS A USER.)

(GRADE 6 EXPECTATION: THE STUDENT TAKES APPROPRIATE ACTION IN RESPONSE TO ERROR MESSAGES IN USING PREPACKAGED PROGRAMS.)

2. Identify the fact that information is processed according to a set of predefined computer rules: organize, coded, given meaning and transmitted.

(GRADE 6 EXPECTATION: THE STUDENT GIVES REASONS FOR PROCESSING INFORMATION.)

(GRADE 6 EXPECTATION: THE STUDENT DETERMINES THE STRUCTURAL COMPONENTS OF INFORMATION PROCESSING, E.G., ORGANIZING, CODING, PROCESSING AND REPORTING.)

(GRADE 6 EXPECTATION: THE STUDENT SEQUENCES THE STEPS REQUIRED IN A PROCESS.)

(GRADE 12 EXPECTATION: THE STUDENT RECOGNIZES THAT COMPUTERS PROCESS INFORMATION BY SEARCHING, SORTING, DELETING, UPDATING, SUMMARIZING, STORING, ETC.)

3. Identify the fact that we communicate with computers through specific symbols and words.

(GRADE 8 EXPECTATIONS: THE STUDENT RECOGNIZES THAT PROGRAMMING LANGUAGES ARE USED TO GIVE INSTRUCTIONS TO COMPUTERS.)

(GRADE 8 EXPECTATION: THE STUDENT RECOGNIZES WORDS OR SYMBOLS THAT OPERATE THE COMPUTER.)

4. Use computer languages (e.g., BASIC, PASCAL, LOGO, assembler/machine languages.)

a. Develops good programming style (includes logical structure, documentation readability, efficiency, elegance).

b. Selects and uses appropriate utility programs.

B. Develop positive attitudes and behaviors toward computers

(GRADE 6 EXPECTATION: THE STUDENT DEMONSTRATES POSITIVE ATTITUDES AND BEHAVIORS TOWARD COMPUTERS IN THE FOLLOWING WAYS:

1) SEEKS WORK OR PLAY WITH COMPUTERS.

2) DESCRIBES PAST EXPERIENCES WITH COMPUTERS WITH POSITIVE-AFFECT WORDS LIKE FUN, EXCITING, CHALLENGING, ETC.)

II. The student will understand how a computer can be used as a tool for problem solving and decision making.

A. Explains what a simple algorithm/flowchart accomplishes, i.e., interpret, generalize, and discuss applications.

(GRADE 8 EXPECTATION: THE STUDENT INTERPRETS, GENERALIZES, AND DISCUSSES APPLICATIONS OF A SIMPLE ALGORITHM/FLOWCHART.)

B. Uses a computation/information system (computer or computer system) to solve simple problems and make decisions.

(GRADE 8 EXPECTATION: THE STUDENT TRANSLATES A SIMPLE ALGORITHM/FLOWCHART INTO A PROGRAM.)

(GRADE 12 EXPECTATION: THE STUDENT DEVELOPS AN ALGORITHM FOR SOLVING A SIMPLE PROBLEM AND/OR TO SOLVE A SET OF SIMILAR PROBLEMS.)

III. The student will be aware of, appreciate, and understand the functions and impact of computers in daily life.

A. Functions are treated at two different levels:

1. Identification of basic operations of computer systems including identification of input, memory, control, arithmetic and output components.

(GRADE 3 EXPECTATION: THE STUDENT IDENTIFIES THE INPUT AND OUTPUT UNITS.)

(GRADE 6 EXPECTATION: THE STUDENT DESCRIBES THE FUNCTIONS OF THE INPUT, OUTPUT, AND CPU COMPONENTS.)

(GRADE 8 EXPECTATION: THE STUDENT DESCRIBES THE FUNCTIONS OF THE INPUT, OUTPUT, CPU, ARITHMETIC, AND MEMORY COMPONENTS.)

(GRADE 8 EXPECTATION: THE STUDENT INVESTIGATES ELECTRONIC COMPONENTS AND THEIR FUNCTIONS.)

2. Recognition and use of the data processing, process control, and information storage and retrieval applications in business and industry, government, education, health and social services, recreation, creative arts, etc.

(GRADE 6 EXPECTATION: THE STUDENT IDENTIFIES COMPUTER APPLICATIONS IN BUSINESS AND INDUSTRY, GOVERNMENT, EDUCATION, HEALTH AND SOCIAL SERVICES, RECREATION, CREATIVE ARTS, ETC.)

B. Impact is treated in relation to how computers affect employment, public surveillance, privacy of individuals, progress and culture, personalization/impersonalization, regulatory and enforcement functions, and daily relationships with people, agencies, organizations, etc.

1. Values efficient information processing.

2. Understands advantages and disadvantages of routine tasks.

3. Appreciates economic benefits of computerization for society.

4. Values increased communication and availability of information made possible through computer use.

(GRADE 6 EXPECTATION: THE STUDENT VALUES INCREASED COMMUNICATION AND AVAILABILITY OF INFORMATION MADE POSSIBLE THOROUGH COMPUTER USE.)

5. Understands that computers can be used to effect the distribution and use of economic and political power, in criminal and other antisocial activities, to change society in undesirable ways.

6. Identifies specific applications of computer science and technology in medicine, law enforcement, education, engineering, business, transportation, military, recreation, government, library, creative arts, etc.

C. Understanding that technology differs from science in that the aim of technology involves the means of building and doing useful things while the aim of science is the development of knowledge and understanding.

(GRADE 6 EXPECTATION: THE STUDENT KNOWS HOW ELECTRONIC TECHNOLOGY EVOLVED.)

IV. The student will recognize the limitations as well as the usefulness of computer technology.

A. Recognize disadvantages of computers as tools -- dependency, limitations, costs.

(GRADE 8 EXPECTATION: THE STUDENT LISTS AT LEAST THREE LIMITATIONS OF COMPUTERS.)

B. Identify major applications of computers for information storage and retrieval, simulation and modeling, quality or process control and decision making, computation, data processing.

(GRADE 8 EXPECTATION: THE STUDENT SEQUENCES THE STEPS REQUIRED IN A PROCESS.)

(GRADE 12 EXPECTATION: THE STUDENT RECOGNIZES THAT COMPUTERS PROCESS INFORMATION BY SEARCHING, SORTING, DELETING, UPDATING, SUMMARIZING, STORING, ETC.)

C. Investigate major applications of computers for information storage and retrieval, simulation and modeling, quality or process control and decision making, computation, data processing.

V. The student will recognize educational and career opportunities related to the specific and general (application) of computers.

A. Support services: e.g., data entry, word processing, computer operations personnel, etc.

B. Technical services: e.g., programmer, analyst, data processer, equipment maintenance and repair personnel, etc.

C. Scientific personnel: e.g., computer scientist, electrical engineer, computer engineer, etc.

D. Computer skilled/applications personnel integrated with another category or career.

The following expectations are applicable to V, A-D.

(GRADE 3 EXPECTATION: THE STUDENT IDENTIFIES SUPPORT SERVICE, TECHNICAL AND SCIENTIFIC CAREERS IN THE COMMUNITY AND STATE THAT INVOLVE COMPUTERS.)

(GRADE 6 EXPECTATION: THE STUDENT IDENTIFIES NATIONAL AND INTERNATIONAL CAREERS THAT INVOLVE COMPUTERS.)

(GRADE 8 EXPECTATION: THE STUDENT COMPARES EDUCATIONAL REQUIREMENTS AND OPPORTUNITIES FOR CAREERS THAT INVOLVE COMPUTERS.)

APPENDIX B

TASK FORCE RECOMMENDATIONS

Exploratory Computer Literacy
Delivery at the Secondary Level

The following five models for delivering Exploratory Computer Literacy are recommended by the Task Force as alternatives for schools to consider in offering this thematic subject. A discussion of the advantages and disadvantages of each alternative model is included:

1. Elective One-Semester Course

   Semester courses, addressing the student expectations identified for grade 8 or grade 12, may be offered as an elective. The courses would consist of classroom instruction in combination with hands-on experiences in a computer lab to maximize the number of students accommodated by the program.

   A course description is provided in Appendix B1.

   Advantages: Sufficient time is provided for development of computer literacy understandings, skills and attitudes. Student-computer ratio allows for adequate hands-on time.

   Disadvantages: Another semester elective may be difficult to schedule at the intermediate school level. Computer literacy experiences may be taught in isolation from application areas.

   Suggested Hardware Arrangement: Computer lab with 16 microcomputers and 4 printers. (Based on two students per computer.)

2. Unit Within Content Area Course

   A unit of study of set duration (4-8 weeks) would be worked into a part of a required course (e.g., language arts, social studies, mathematics). The unit would consist of hands-on experiences preceded by classroom instruction. The shorter duration would require greater concentration of time on the use of the computer and close coordination between the classroom teacher and the computer lab instructor.

   A sample school implementation plan is included in Appendix B2.

   Advantages: Computer literacy would be taught in a meaningful context. Student-computer ratio allows for adequate hands-on time. Many more students can be serviced in a school year.

   Disadvantages: The required course would have to be compressed or intensified to cover the necessary content. Computer literacy experiences may be limited to one content area application.

   Suggested Hardware Arrangement: Computer lab with 16 microcomputers and 4 printers. (Based on two students per computer.)

3. Shared Computer Lab or Resource Center

Instruction in computer literacy would be conducted in regular classrooms through existing courses (e.g., language arts, mathematics, social studies, science, business). Hands-on experiences would be provided in a computer lab where use is scheduled according to school-established criteria and procedures. Close coordination among the departments offering computer literacy experiences would be required.

Advantages: Computer literacy could be taught through a variety of applications. Computer use is maximized.

Disadvantages: Scheduling may be complex or inconvenient. Staffing requirements of the computer lab and coordination among application areas must be planned. Inservice training must be provided to a larger target group.

Suggested Hardware Arrangement: Computer lab with a minimum of 16 microcomputers and 4 printers.

4. Computer Mini-Lessons

A series of mini-lessons on different aspects of computer literacy could be introduced through existing courses in several content areas. Hands-on experiences could be provided in the classroom on a rotation basis. Coordination among departments offering computer literacy experiences would be required.

Advantages: Computer literacy could be taught through a variety of applications. Schools with limited hardware and facilities could provide computer experiences to students.

Disadvantages: Hands-on experiences would be limited. Access to microcomputers housed in a classroom would be restricted.

Suggested Hardware Arrangement: A minimum of 2-4 microcomputers and 1 printer to be rotated among classrooms.

5. Demonstration Mode

A unit of study for a set duration would be taught in an existing content area course. Instruction would be primarily through vicarious experiences provided through demonstrations, audio-visual presentations and off-computer exercises. Extremely limited hands-on experiences would be provided. This mode is included as an initial, interim model until schools are able to acquire additional equipment to increase students' hands-on time. Subsequently, the demonstration mode may be used in conjunction with one of the other four models.

Computer Education Course Description

EXPLORATORY COMPUTER LITERACY

(SEMESTER)
Grades 7-12

Objectives:

1. Develop knowledge of operations and functions of computers.
2. Develop ability to use the computer in learning.
3. Develop understanding of the impact, values and ethics of computer applications.
4. Develop knowledge of elementary programming concepts and skills

Description:

This course is designed to provide opportunities for students to develop computer literacy skills and understandings through classroom instruction in combination with hands-on computer experiences. The focus of the class is on using the computer in learning through CAI programs, word processing and other application packages, and information retrieval. Programming concepts and skills are taught in a problem-solving context. Discussion of the impact, values and ethics of computer applications are integrated into the course and not isolated as a separate unit.

Sample School Plan
Model 2: Unit Within Content Area Course

Resources Required:

1 teacher, computer education
1 computer lab with 16 microcomputers

Plan Provisions:

1. A maximum of 30 students per classroom period can be serviced over a four-week period.

2. One required content area is chosen for the delivery of the program. Language arts of social studies is recommended.

3. Lesson plans are coordinated between the computer literacy teacher and the content area teacher such that:

   a. Lessons are curriculum related.
   b. A project is required.
   c. Grading is the responsibility of the content area teacher.
   d. Discipline is a shared responsibility.
   e. The content area teacher becomes more literate.

4. One week between sessions is allowed for the computer education teacher to prepare for the next teacher's classes.

Implications:

1. 192 students can be serviced in a four-week period.

2. 384 students can be serviced in a quarter.

3. A maximum of 1536 students may be provided computer literacy instruction in a year.

4. If only one grade level is targetted for computer literacy instruction, time can be scheduled for the further development of computer literacy skills in a different content area. Another alternative would be to lengthen the computer literacy period from four weeks to five or six weeks.

Content:

Minimum requirements as outlined by the Task Force.

1. Knowledge of operations and functions of computers.

2. Keyboarding skills.

3. Ability to use the computer as a tool in learning.

4. Knowledge of impact, values, and ethics of computer applications.

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APPENDIX C

GLOSSARY OF ACRONYMS AND TERMS

ACRONYMS

AI	Artificial Intelligence - It is a branch of computer science dealing with the development of machines capable of carrying out functions normally associated with human intelligence such as learning, reasoning, self-correction, and adaptation.
BASIC	Beginners' All-Purpose Symbolic Instruction Code - This is a language used in most microcomputers.
BIT	Binary digit - The smallest unit of computer information. A single bit can specify either a one or a zero.
CAI	Computer-Assisted Instruction - This is the union of programmed instruction and interactive computer systems capable of providing four types of CAI: drill and practice, problem solving, tutorial and simulation.
CBE	Computer-Based Eduction - This is a collective term embracing Computer-Assisted Instruction and Computer-Managed Instruction.
CMI	Computer-Managed Instruction - This is a recordkeeping function of a computer that gives and stores student scores, level of skills, and resources used.
COBOL	Common Business-Oriented Language. It is one of the standard sets of languages most often used on large computer systems. It is geared toward business applications and is beginning to make an appearance on personal computers that have a business orientation.
CPU	Central Processing Unit - This is the brain of the computer which controls what the computer does, defined by a sequence of instructions known as a program.
CRT	Cathode Ray Tube - This is a television-like display screen that uses cathode rays to exhibit readable characters or graphic information. It is also known as a monitor.
DOS	Disk Operating System - This is a collection of programs which can facilitate the use of disk drive.
FORTRAN	Formula Translator - This early high-level language was devised for numerical computations, and although it is somewhat complex and obsolete, it is still one of the most widely used programming languages in scientific environments. Whereas BASIC can be interpreted, FORTRAN requires a compiler.
I/O	Input/Output - This refers to having input and output capabilities.
K	Kilobyte - This is an abbreviation for 1024 bytes...approximately one kilo or 1000.
LISP	List Processing - This is a widely used programming language in artificial intelligence research.

LSI — Large Scale I - This refers to the tens of thousands of microscopic selectronic circuits that are crowded onto a square measuring less than 1/8 inch on each side.

MODEM — Modulator/Demodulator - This device allows communications between computers over phone lines. It translates the computer's digital signals into audio signals and then back again for the receiving computer. An acoustic coupler sends and receives its signals directly through the mouthpiece and earpiece of the phone, whereas the direct-connect modems send and receive through wire connections to the phone.

PLATO — Programmed Logic for Automated Teaching Operations - This computer-based educational system involves a very large computer with 4000 terminals that can be located anywhere in the world. A unique feature of PLATO is that its monitors have a touch sensitive screen that can make responses to a touch made by a finger or a special pen.

RAM — Random Access Memory - This is the computer's general purpose memory, sometimes called read/write memory. RAM may be written to or read from by the Central Processing Unit. Information on RAM is usually volatile; that is it disappears when power to the computer is turned off.

ROM — Read Only Memory - This is a memory in which integrated circuits are programmed with special systems programs or a simple set of instructions which are stored once, usually by the manufacturer, and cannot be changed. The data can be read from ROM to the CPU but cannot be written into.

ACOUSTIC COUPLER (acoustically-coupled modem)

A device used for computer communication over a phone line. It is a connecting device that sends and receives computer signal directly through the mouthpiece and earpiece of the phone.

ADDRESS

The physical location of a word in the computer's memory or of a record on a disk.

ALGORITHM

A step-by-step procedure, often expressed in mathematical terms for solving a problem or obtaining a particular result.

ALPHA-NUMERIC CHARACTERS

Characters represented either ALPHA-betically, NUMERICally, or using other print characters. For example: A B C D E F 1 2 3 4 5 ? * + -.

APPLICATION

The use of a computer system to accomplish a specific goal.

APPLICATIONS SOFTWARE

Programs designed to instruct the computer to perform real-life tasks (see software).

ARITHMETIC/LOGIC UNIT

This element of the computer performs the basic data manipulations in the central processor. It can perform arithmetic functions and logic operations.

ARRAY

A set of numbers or other entities specifically ordered. The elements of an array can be referred to by their position in the set. These arrays are indicated in many languages by subscripted variables, such as A(X), where X is the subscript.

ARTIFICIAL INTELLIGENCE (AI)

A branch of computer science dealing with the development of machines capable of carrying out functions normally associated with human intelligence such as learning, reasoning, self-correction, and adaptation.

ASCII CHARACTERS (pronounced "as key")

A standard binary code using 8 bits to represent 128 character types (2^8 = 128). It is an acronym for American Standard Code for Information Interchange. Most small computers and terminal products support only a subset of the full ASCII character definition. This includes upper- and lower-case alphabetic characters, numbers, and a set of special symbols.

ASSEMBLER or ASSEMBLY LANGUAGES

Translator languages that allow instructions to the Central Processing Unit (CPU) to be created without having to be in binary code form (also known as machine languages). These languages use mnemonic names to stand for one or more machine language instructions. An assembly language is a "shorthand" method for avoiding the tedious use of long strings of ones and zeros found in the machine language.

AUTHOR or AUTHORING LANGUAGE

These are high-level languages that allow the user to program without having much knowledge of a computer language. Some author languages (e.g., PILOT) determine programming needs through the user's responses to a series of questions, and they provide an appropriate formatted program.

BATCH PROCESSING

This usually refers to the use of punched cards (instead of a computer terminal) to input information and run a program on the computer.

BAUD

The measure of the speed that information can be communicated between two devices. If the data are in the form of alphabetical characters, then 300 baud usually corresponds to about 30 characters per second. It is technically the number of bits transmitted or received per second. Also called baud rate.

BINARY

The binary counting system refers to the number system with a base of two. It also refers to the concept of having only two choices: on and off (1 or 0).

BOOT

An abbreviation for "bootstrap" which is the process of loading the operating system of a computer into main memory and starting its operations.

BREAK

To interrupt a computation or program and return the computer control to a user.

BUG

An error in the computer program. A programming error is called a software bug and a malfunction or design error is called a hardware bug. Debugging is the system of eliminating the program errors.

BUS OR BUSS

A set of wires and connections that is used to transfer information between various computer components: central processing unit (CPU), input/output ports, terminals, and interfaces.

BYTE

Usually an eight-bit unit that by various combinations of 0's and 1's represents both text and control characters in computer code. it can represent either an alpha-numeric character or a number in the range of 0 and 255.

CARDS

Printed-circuit boards. Also refers to punched cards.

CARD READER

A device which reads punched/marked cards or forms as an initial step in computer processing.

CASSETTE TAPES

Audio tapes used for storing programs or data for some microcomputers. The cassette system can be compared to a disk system.

CATHODE RAY TUBE (CRT)

A CRT is a television-like display screen that uses cathode rays to exhibit readable characters or graphic information. It is also known as a monitor.

CENTRAL PROCESSING UNIT (CPU)

This is the brain of the computer which controls what the computer does, defined by a sequence of instructions known as a program.

CHARACTER

A letter, number, punctuation mark or symbol.

CHIP or COMPUTER CHIP

A small, flat piece of silicon on which electronic circuits are etched. Usually 1/4" by 1/4" in shape.

CODE

A synonym for a computer program; therefore, a programmer generates code.

COMMAND

The request to the computer that is executed as soon as it is received.

COMMUNICATIONS NETWORK

This is formed when several individual computers are connected so that files or messages can be sent back and forth between both large information systems and individual users.

COMPILER

A program that converts one computer language into another, in order to store it for later use. It usually refers to a program that translates a higher-level language into a computer's machine language.

COMPUTER

An electronic device that manipulates symbolic information according to a list of precise (and limited) instructions called a program.

COMPUTER-ASSISTED INSTRUCTION (CAI)

CAI is the union of programmed instruction and interactive computer systems capable of providing several types of CAI: drill and practice, problem solving, tutorial, and simulation.

COMPUTER LANGUAGE

An artificial language that was designed to allow communication between human beings and computer systems.

COMPUTER LITERACY

This term is usually used to mean the general range of skills and understanding needed to function effectively in a society that is increasingly more dependent on computer and information technology.

COMPUTER-MANAGED INSTRUCTION (CMI)

Abbreviated as CMI, it is a recordkeeping function of a computer that gives and stores student scores, level of skills, and resources used.

COMPUTER SYSTEM

The computer system is composed of four basic elements:

1. I/O (Input/Output system). Shunts chunks of 0's and 1's.

2. CPU (Central Processing Unit). Adds chunks of 0's and 1's.

3. Memory. Holds groups of 1's and 0's in temporary or permanent form.

4. Control Unit. Mastermind for I/O, CPU, and Memory.

COURSEWARE

Computer programs used for instruction, along with manuals, workbooks and other supporting materials.

CURSOR

The indicator of position, that is seen on a video display screen, which can be moved by various commands such as left, right, up or down.

DATA

Facts you enter into a computer.

DATA BASE

The large collection of related data that is usually in several files. it is generally accessible by the computer which is commonly said to be on-line.

DEBUG

To find and eliminate errors in a computer program. It is also used in reference to fixing electronic circuitry.

DECK

The collection of punched cards that are used in batch processing.

DIRECTORY

A list of the files stored on a peripheral storage device, like a disk. They are usually obtained through the operating system program.

DISK or DISKETTE

A memory device. A flat, circular plate on which digital information can be stored and retrieved magnetically.

DISK DRIVE or MAGNETIC DISK DRIVE

A peripheral device for the storage of programs and other information or either floppy disks or hard disks. Floppy disks are thin flexible plastic tapes with a magnetic recording surface. The floppies are more reliable than the simple audio tapes, but hold less information and operate more slowly than hard disks. Hard disks are made of aluminum and are coated with a magnetic recording surface. On large computer systems, these are the most

common form of storage due to the amount of information they can hold, the speed at which they operate, the ease at which the information can be accessed, and their reliability.

DISK OPERATING SYSTEM (DOS)

A collection of programs which can facilitate use of a disk drive.

DISTRIBUTED PROCESSING NETWORKS

The connections between a central computer and remote computer where data are transmitted to the central computer (uploading) for complex processing and then sent back to the remote computer (downloading) for review and further processing. This is similar to timesharing in that the distributed processing networks share the cost and time of the expensive central computer.

DOCUMENTATION

The collection of manuals and instructions that explain the proper use and possible applications of a given piece of hardware or software.

DOT-MATRIX PRINTER

A printer that uses a small array of dots to represent a course image of the characters printed. Most dot-matrix printers which print uppercase characters only use a 5 by 7 matrix of dots to represent each character. The printers that are capable of uppercase and lowercase printing usually use a 7 by 9 matrix of dots to represent a full set of alphabetic characters. The high-resolution dot-matrix devices like the inkjet or precision impact printers which can assemble characters from matrices of 30 by 50 dots that may overlap, are the ultimate in dot-matrix technology.

DOWNTIME

The length of time that a computer or device is not working or is malfunctioning.

DRILL AND PRACTICE

After a student "logs on," the computer presents him or her with prescribed exercises and records the results. The instructor sometimes can retrieve statistics on student's progress.

DUMB TERMINAL

This is an input/output device that does not use an internal CPU. These require host computers for operation, whereas intelligent terminals have small internal central processing units to handle the terminal's functions and communications.

ELECTROSTATIC PRINTING

In this process, an image is made on a suitable, special-purpose conductive paper by discharging a spark between the printhead electrode and the paper. The spark marks the surface layer of the paper by changing the appearance from a reflective silvery color to the dark color of the underlying layers of the paper.

EXECUTE

To run a program using the instructions given.

FIELD

A group of related characters treated as a unit. An item in a record.

FILE

A collection of related records treated as a unit.

FIRMWARE

The programs that have been wired into the computer by the manufacturer.

FLOATING POINT BASIC

A form of BASIC language that allows the use of decimal numbers. Following calculations, the decimal point "floats" to a new position, as required, giving the term its name.

FLOWCHART

A chart to show the sequence and branching of a particular procedure. This is used frequently in the design of computer programs.

FONT

The set of images associated with a given character set like ASCII, EBCDIC, or the special-purpose sets used in computerized typesetting machines like those used for magazines. A typical font for computer output from an impact printer might be one which duplicates the font of a standard typewriter. For a low-resolution dot-matrix printer, the font might be a program in the printer's read-only memory which translates each ASCII code into a visual representation as a matrix of dots.

GRAPHICS

The techniques of creating visual images by using a computer. Black and white or color television display units are used with personal computers. The graphic displays can be used to display the normal letters, numbers and special symbols of character set, and some personal computers have the ability to draw pictures instead of using words for interactions.

HANDSHAKING

By using this method, two different computer systems (or a computer and a peripheral device) can coordinate communication through some form of interconnection. A key part of this process is the ability to send messages about the status of the communications link, as well as messages that are part of the intended information.

HARDCOPY

The graphic images that are recorded on paper so they are readable by humans, for later reference.

HARDWARE

More properly called computer hardware, it is a collection of physical devices which make up a computer system.

HEXADECIMAL

A number system that uses the base sixteen (2 raised to the fourth power), for its representation of integers. In computers which use byte-sized (8 bit) units of memory, this base provides a more convenient, external, humanly-readable representation of internal data. This base utilizes the set of numeric characters 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 and the six letters A, B, C, D, E, F to represent numbers.

HIGH-LEVEL LANGUAGE

Languages such as FORTRAN, BASIC, COBOL, LOGO and many others that use English-like commands to keep the user from having to employ machine code to communicate with the central processing unit. Typically, one high-level language statement will be equivalent to several machine-level instructions.

IMPACT PRINTING

This method makes a printed image by striking the paper in some way, usually involving a form of ribbon as in a standard typewriter. This method can use the dot-matrix character formation and sometimes use predefined fonts, as in the typewriter or on bands or chains of characters contained in some high-speed printers. This method is capable of producing multiple copies at the same time by using carbon paper or something similar.

INFORMATION RETRIEVAL

The methods used to recover specific information from stored data.

INITIALIZE

To set up the starting conditions necessary in order to run a program. To prepare a diskette or disk so that the computer can store data on it later.

INPUT

Information entered into the computer.

INPUT DEVICE

A peripheral device that allows the user to enter information into the computer, like a keyboard.

INPUT/OUTPUT DEVICE

Abbreviated as I/O device, they are peripheral devices such as video terminals that have both input and output components. An I/O device consists of channels (wires or telephone lines) within the computer system through which information flows. It also includes all the devices at the ends of wires or phones that originate or receive information. Some common I/O devices are: card readers and punches, paper tape readers and punches, typewriter devices, CRT's magnetic tape, auxillary disk systems and line printers.

INTEGRATED CIRCUIT

A very small electronic circuit, that usually consists of a ceramic body 1-5 cm. in length, 1-2 cm. in width, and typically 2 or 3 mm. in thickness, with 4-40 metal leads extending from it.

INTEGER BASIC

A form of BASIC where only whole numbers can be processed (decimal numbers will not work).

INTELLIGENT (DISK, TERMINAL, or OTHER PERIPHERAL)

A component that contains its own CPU so that it can execute instructions without the host's CPU.

INTERFACE

The electronic and physical connection between various electrical and electromechanical devices that allows the different devices to communicate with each other. A serial interface transmits or accepts information one bit at a time, whereas a parallel interface transmits or accepts information one computer word at a time.

INTERPRETER

A computer language translator that translates and executes programs from a high-level language into a machine language, one line at a time.

KEYBOARD

A group of buttons on a pad used to input information into a computer system.

KEYPUNCH

A typewriter-like keyboard device that punches holes (which represent data) in cards.

KILOBYTE or K

A measure of computer memory; approximately one thousand characters. An abbreviation for 1024 (2^{10}).

LARGE SCALE INTEGRATION (LSI)

Refers to the tens of thousands of microscopic electronic circuits that are crowded onto a square space measuring less than 1/8 inch on each side.

LISTING

The actual lines of instruction making up a program.

LOAD

The entering of a program into the memory of the computer from some peripheral storage device. It can also refer to the loading of a register when a few bytes are transferred from the main memory into the registers of the central processor in an assembly language program.

LOGO

The name for this program was coined by Wallace Feurzeig at Bolt Beranek and Newman, Inc., and is derived from the Greek word for "word" or "thought".

MACHINE LANGUAGE

The language that a specific machine was built to understand, written as a sequence of numbers. This language is immediately obeyed by the hardware, but is usually rather inconvenient to use.

MACHINE READABLE

Information is stored on a peripheral storage device so that it can be recorded or played back to the computer.

MAGNETIC TAPE DRIVE

This is also called a tape transport, tape unit or tape deck, that has a reel of magnetic tape mounted to it for access under program control. The tape is used as both a form of memory and for I/O. It can be stored conveniently away from the machine when it is put on a tape drive attached to the computer.

MAINFRAME COMPUTER

The largest-sized computer, used by corporations and the government.

MAIN MEMORY

A random access form of memory that is the primary resource for storage of data and programs in a computer. Main memory is a temporary storage space in contemporary personal computers, and when the power is shut off, the information is lost.

MARK SENSE CARD READER

This is an input device that can read cards which have information marked by graphite pencil.

MASS STORAGE

This technique keeps track of large amounts of permanently available data in a machine-readable form. It is slower in access than main memory, but yields larger potential amounts of data. Mass storage is provided by cassette tapes or floppy disks in most small personal computers.

MEGABYTE OR M

A measure of computer memory; approximately one million characters.

MEMORY

This is also called main memory, core memory, or main storage. The memory is the integrated circuits of a computer on which the information can be stored. This is directly accessible to the CPU. See random access memory (RAM) and read only memory (ROM).

MENU

The list of files and programs on a disk or tape.

MICROCOMPUTER

It appeared around 1972 and is a very small computer with small peripherals. The main differences between the microcomputer and its predecessor, the minicomputer, are their power, size and cost. The microcomputer has a central processing unit that is a microprocessor.

MICROSECOND

One-millionth of a second. Most modern computers can add two numbers in less than one microsecond.

MILLISECOND

One-thousandth of a second.

MINICOMPUTER

This is a small low-cost computer with its peripherals and system software that can be used either as a batch terminal in association with a large computer or as an independent machine. These appeared around 1965, and were physically smaller than their predecessors, the mainframe computers.

MODEM

An abbreviation for modulator/demodulator, it allows communication between computers over phone lines. It translates the computer's digital signals into audio signals and then back again for the receiving computer. An acoustic coupler sends and receives its signals directly through the mouthpiece and earpiece of the phone, whereas the direct-connect modems send and receive through wire connections to the phone.

MODULATOR

An electronic black box that is used to translate the television output signals of the computer into a standard radio frequency television signal which can then be fed into the antenna terminals of a television tuned to the appropriate channel. Usually on R.F. (radio frequency modulator).

MONITOR

See cathod ray tube (CRT).

MOTHERBOARD

A printed circuit board that has slots for various other circuit boards to be plugged into.

NANOSECOND

One-billionth of a second. A very fast modern computer can perform additions at the rate of two every few nanoseconds.

NETWORKING

The sharing of resources or the communication between two computers. See resource sharing networks, communications networks, and distributed processing networks.

NUMERIC PAD

A keyboard for numeric input into a computer.

OBJECT CODE

The machine language form of a program is also called the object code of the program and can be directly loaded into memory and executed, since it has already been translated from it humanly readable form to the internal executable form.

OCTAL

The base eight number system, with the digits 0, 1, 2, 3, 4, 5, 6, 7. Many programmers prefer octal to hexadecimal notation, even though octal is a natural notation of numbers only on machines whose "word size" is a multiple of 3 bits.

ON-LINE

A term which usually refers to the location and connection of devices so that they are immediately accessible to the CPU of a computer. It also commonly refers to information that is directly obtained through a computer as opposed to a book, television, etc.

OPERATING SYSTEM

The systems software (usually created by the manufacturer) that manages the computer and its peripheral devices. This allows the user to run programs and to control the movement of information to and from the computer memory and peripheral devices. See software. Several machine independent operating systems of personal computers also exist that can be run on many different computers. These include the Microsoft forms of BASIC, a very traditional, large, computer-like operating system called CP/M, and the interactive, Pascal language operating system called UCSD Pascal.

OPERATOR

A symbol in a programming language that represents an operation to be performed on one or more operands. For example, "+" (add), or "*" (multiply). Also the person who runs the computer.

OPTICAL SCANNER

An I/O device that reads clearly typed or printed information.

OUTPUT

The information reported by the CPU to any peripheral device. It is generally any data that leave the computer.

PARALLEL INTERFACE

This method plugs a peripheral device into a computer so that whole bytes (or groups of bytes) of data are transferred at one time. Multiple wires are therefore typically found in parallel interfaces. The parallel interface in a printer might include seven or eight data wires from three or five control wires. At the price of a more expensive connector, a much higher data transmission rate results.

PASCAL

This compiled computer language is personal computing's answer to the elaborate, conventional languages of COBOL, Algol and PL/I that are found on

larger systems. It was invented by computer scientist Niklaus Wirth (circa 1970) and was initially intended as an aid to teaching computer languages. It now has widespread use in computers of every size, from Apple II computers to the world's largest and faster supercomputer, the Cray-1. Pascal is the language selected for the first computer science Advanced Placement (AP) exam.

PASSWORD

This safety device is essential in order to protect the privacy of a terminal user's programs. Password usage prevents interference by unauthorized terminal users, either accidental or deliberate.

PEEK

An instruction in BASIC that enables the programmer to look at (peek at) any location in programmable memory. It is often used to scan the memory locations which hold the information displayed on the video monitor in order to determine what is being displayed.

PERIPHERAL DEVICES

Devices that can send or receive data to and from a computer. They communicate with the central processing unit and store data in accessible form by use of keyboards, printers, disk drives, music synthesizers, etc.

PILOT

A high level language designed to make it easier for instructors to design software.

PINFEED

This is a standard feature of many computer printers that use paper with holes along both edges in order to keep multiple page printouts in correct alignment.

PIXEL

The smallest available unit of output in a graphics display device that can be controlled by the computer. In a dot matrix printer, the pixel is one dot within the matrix. On a television display device, the pixel is one dot on the screen of the television. Pixels can be black, white or colored, depending on the type of screen used.

POKE

This instruction in BASIC is used to place a value (poke) into any location in programmable memory and is often used in conjunction with PEEK.

PORT

The section of a computer through which the peripheral devices can communicate.

PRINTER

An output device that prints the characters on paper. A KSR or Keyboard Send/Receive option can input as well as output data and converts the printer into a terminal. The RO or Receive Only printer is more common and cannot send data.

PROGRAM

The list of instructions that tells a computer to perform a given task or tasks.

PROGRAMMER

A person who designs and writes a set of instructions for the computer.

PROGRAMMING

Programming is the designing, writing, inputting and testing of a computer program

PROGRAMMING LANGUAGE

See computer language.

PROTOCOL

A set of procedures or conventions used routinely between equipment such as terminals and computers.

QUEUE

A queue is a waiting line within the computer for use of a certain component. These occur most often in a time-sharing or resource-sharing system where several users need to use the same device.

RANDOM ACCESS MEMORY (RAM)

The computer's general purpose memory that is sometimes called read/write memory. RAM may be written to or read from by the Central Processing Unit. Information on RAM is usually volatile; that is, it disappears when power to the computer is turned off.

READ ONLY MEMORY (ROM)

Abbreviated as ROM, it is a memory in which integrated circuits are programmed with special systems programs or a simple set of instructions

which are stored once, usually by the manufacturer, and cannot be changed. The data can be read from ROM to the CPU but cannot be written into.

READ/WRITE HEAD

A device inside a disk drive that reads information on a disk. It can also "write" and erase information.

RECORD

A collection of related items of data or fields treated as a unit.

RELIABILITY

The measure of frequency of failure of the computer and other hardware.

REMOTE ACCESS

Terminals that are physically away from the central computer system (e.g., across town, or across campus) at "remote stations".

RESPONSE TIME

The time interval between the request for a job to be done and when the user receives the results. This is also called turnaround time.

RS-232 INTERFACE

A data communications industry standard for the serial transmission of data to a peripheral device, such as a printer, a video monitor, a plotter, etc.

RUN

The continuous performance of the list of instructions in a given program or procedure. It is also the command to run a program (RUN). When a computer is executing a program, we say it is being run.

SAVE

To store a program on a peripheral storage device for later use. It is also a command.

SCROLLING

The movement of lines on a video display, vertically in such a way that the top line disappears and a new bottom line comes into view at the bottom of the screen.

SERIAL INTERFACE

This interface between a computer and a peripheral device can be done over as few as 3 wires. It is usually slower than the equivalent parallel-communications interface, since each of the eight bits of a byte must be

funneled through one wire in each direction. See interface.

SILICON

A common element in the earth's crust (found in sand and glass), used for making computer chips.

SIMULATIONS

Games and representations of real life situations. Simulations are feasible when real life situations. Simulations are feasible when real life equipment is too expensive or complex (e.g., cyclotron, nuclear reactor); measurement is impossible or disturbs the system (velocity of a falling body); experimental technique required is too complex (e.g., political promotion, science lab techniques); time scale is too long range (genetic studies, population dynamics, economic or atomic reaction, explosive or toxic substances); and finally, when a problem requires extensive data collection and/or bookkeeping.

SOFTWARE

Computer programs that consist of a list of instructions that tell a computer to perform a given task or tasks. There are two basic types of software. Systems software enables the computer to carry out its basic operations. Examples include operating systems, language interpreters or utility programs. Applications software consists of programs that instruct the computer to perform various real-world tasks such as writing checks, playing chess or testing students.

SOURCE PROGRAM

When a program is written by a human being, its source program is the humanly readable form seen on the terminal. The source program gets edited, changed and updated in the process of creating a program. The translator program operates on the source language to produce the object code of the machine language.

STATEMENT

The single meaningful expression or instruction in a high-level language such as FORTRAN, BASIC or COBOL.

STORAGE

This is also known as memory. Some typical forms of storing data for a later time are: magnetic disks, which are flat spinning disks with magnetizable surfaces; magnetic drums, which hold more than 11 million bytes and take about 2.5 milliseconds to retrieve; and punched cards, which hold 80 letters or numbers.

STRING

A group of characters stored by their numeric codes that are used in high-level languages such ad BASIC.

TAPE DRIVE

A peripheral device for the storage of programs and other information onto magnetic tape.

TAPES

An inexpensive mass storage medium which is convenient for large files or archival storage. Data is retrieved sequentially rather than randomly on tape medium.

TELECOMMUNICATIONS

This is the art and practice of sending computer (or verbal) messages through the telephone network or via radio. In the field of personal computering it refers to the use of serial communications techniques and modems that allow messages to be sent via telephone to other personal computers or to centralized information services.

TERMINAL

An input/output device that is intended for the user to interact directly with the machine. It consists of a keyboard through which the user can send information to the computer and a printer or display device through which the computer can present information to the user.

THERMAL PRINTING

A method of scanning special heat-sensitive paper by moving a printhead which contains a dot matrix of electronically controllable heated areas. The heated zones are turned on if a dot image is to be recorded as part of the dot matrix representation of a character during the paper scan.

TIMESHARING

A system where many users of a central processing unit obtain services for short intervals of time. This allows each user to run a program while others are also using the system. The connections are made through direct wires or modems and telephone wires.

TOUCH PANEL

A device that is sensitive to touch, attached to the front of the terminal display screen. It is used to input information at a particular screen location.

TURTLE

A graphic representation of a computer-based robot that can be moved around the computer screen with commands such as FORWARD, BACK, RIGHT, etc.

TURTLE GEOMETRY

A new mathematics based on turtle movement that emphasizes transformations in local space rather than relationships to a fixed global reference point.

TUTORIAL

CAI program which provides actual instruction instead of the teacher. The computer "tells and asks" the student facts and questions, and the teacher takes on the role of consultant or resource person.

UPLOAD

See distributed processing networks.

UTILITY PROGRAMS

The systems software that allows the computer to perform certain basic functions like copying the contents of one disk onto another.

VARIABLE

A variable in a computer language can be thought of as a memory location into which a character or a number may be stored. It usually has a symbolic name which is created by the person writing the program.

VIDEO TERMINAL

A terminal that uses a video display unit like a monitor or CRT as its output device. See cathod ray tube.

VOLATILE

Information that disappears from the memory of the computer when the power is turned off.

WORD

A computer word can vary from 8-65 bits, but most personal computer manufacturers generally use an 8-bit word, which represents the number of bits processed and addressed at one time by the central processor.

APPENDIX D

BONUS ACTIVITIES

THE ABACUS

Essential Element Addressed:

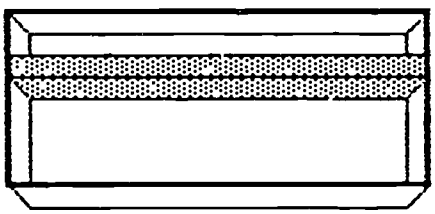
History and Development of Computers

Material(s):

Small box, string, tape, beads, glue, pencil or marker

Instructions for Making It:

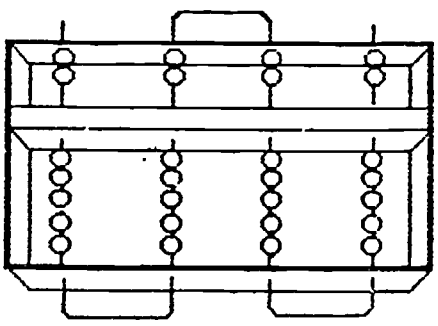
1. Push the box lid or other divider into the box so it is parallel to the bottom and perpendicular to the sides. Trim for a tight fit and glue the lid permanently into position.



2. Measure the long side of the box. Make four holes, equal distance apart, on the top of the box, the bottom of the box, and the lid on the center of the box.

3. Wind tape around the end of a long string to make it easy to thread through the holes in the box.

4. Use the diagram below to guide you in threading the string through the holes in the box and for placing the correct number of beads in each section of the abacus.



5. After making sure the string is pulled tight, fasten the ends of the string with tape or by other means.

Instructions for Using It:

1. All beads below the center bar represent the value of 1.
2. The two beads above the center bar each represent a value of 5.
3. Reading from right to left, each string represents place values of 10.
4. The first row of beads on the right represents the numbers 1-9. When another bead is added, the number becomes 10 and it is necessary to move a bead in the second row which represents tens.
5. The numbers in the next row are hundreds.
6. The numbers in the next row are thousands.

NAPIER'S BONES

Essential Element Addressed:

History and Development of Computers

Material(s):

Heavy paper (11" x 10"), black marker, ruler, scissors

Instructions for Making It:

1. Divide the 11" x 10" paper into 1" squares.
2. Draw a key on the top square on the left-hand side.
3. Write the numbers 1-9, one number per square, in each square on the left-hand column.
4. Write the numbers 1-9, one number per square, in each square on the top row.
5. Use a black marker to connect opposite corners of each of the remaining squares with a diagonal line.
6. Match each numbe. across the top with each number written down the side, writing in the product obtained from multiplication of the two numbers in the square where the two meet. The first digit in the product should be written above the diagonal line, and the second digit below it. If the product is a one digit number, place that digit in the bottom space, and write a 0 in the space above. An example follows:

	1	2	3	4	5	6	7	8	9
1	0/1	0/2	0/3	0/4	0/5	0/6	0/7	0/8	0/9
2	0/2	0/4	0/6	0/8	1/0	1/2	1/4	1/6	1/8
3	0/3	0/6	0/9	1/2	1/5	1/8	2/1	2/4	2/7
4	0/4	0/8	1/2	1/6	2/0	2/4	2/8	3/2	3/6
5	0/5	1/0	1/5	2/0	2/5	3/0	3/5	4/0	4/5
6	0/6	1/2	1/8	2/4	3/0	3/6	4/2	4/8	5/4
7	0/7	1/4	2/1	2/8	3/5	4/2	4/9	5/6	6/3
8	0/8	1/6	2/4	3/2	4/0	4/8	5/6	6/4	7/2
9	0/9	1/8	2/7	3/6	4/5	5/4	6/3	7/2	8/1

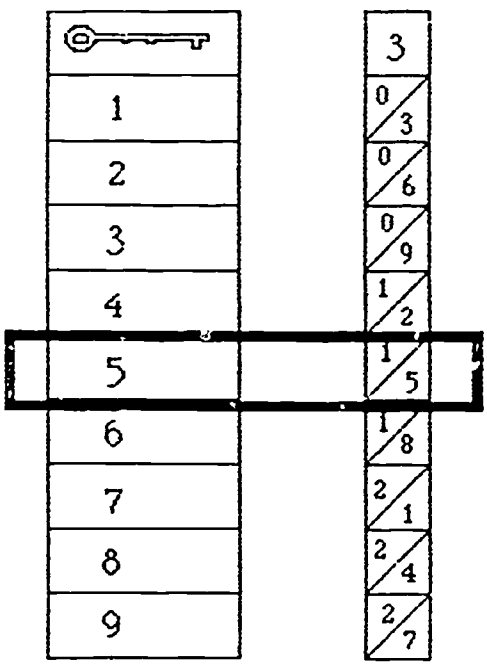
7. Cut out each column on the sheet so that they can be handled separately for use in solving multiplication problems.

Instructions for Using It:

1. To solve one-digit multiplication problems with Napier's Bones:

   Line up the key card and the card for the number being multiplied.

   Example: To multiply 5 x 3, line up the key and the 3 card. Move down the key card to 5 and then move straight across. You come to the answer 15.



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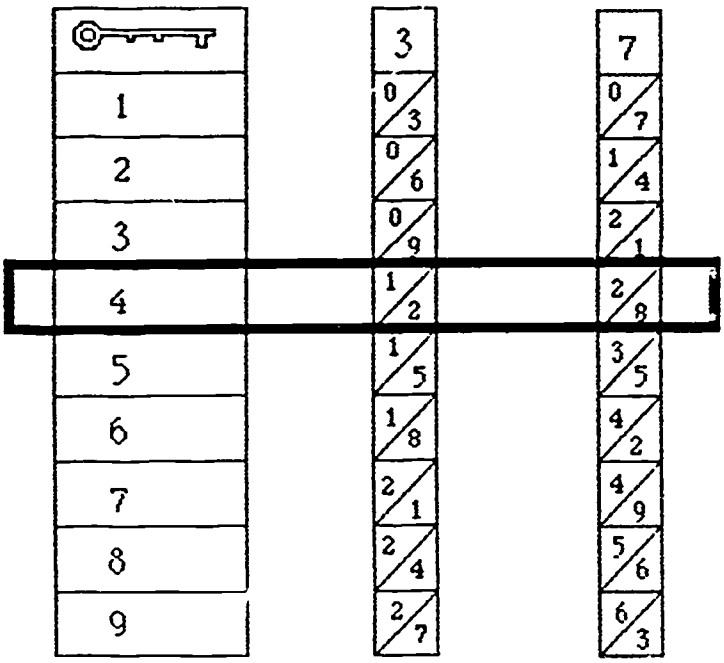
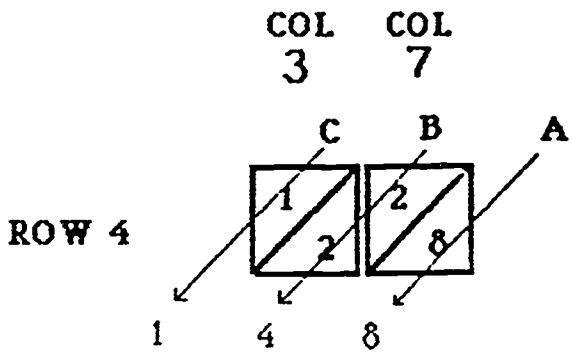
2. To solve multiplication problems with one two-digit number:

Example: To multiply 37 x 4, line up key card, 3 card, and 7 card. To get an answer, start at A and record the number there in the one's place. At B we find two numbers in line, so they are added to get 4. The result of B will be placed in the ten's place. The answer for 37 x 4 is, then 148.

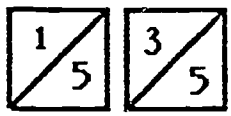




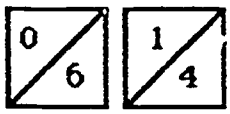
3. To solve multiplication problems with two-digit numbers:

Example: To multiply 37 x 25, work with the number in the one's place (5) first.

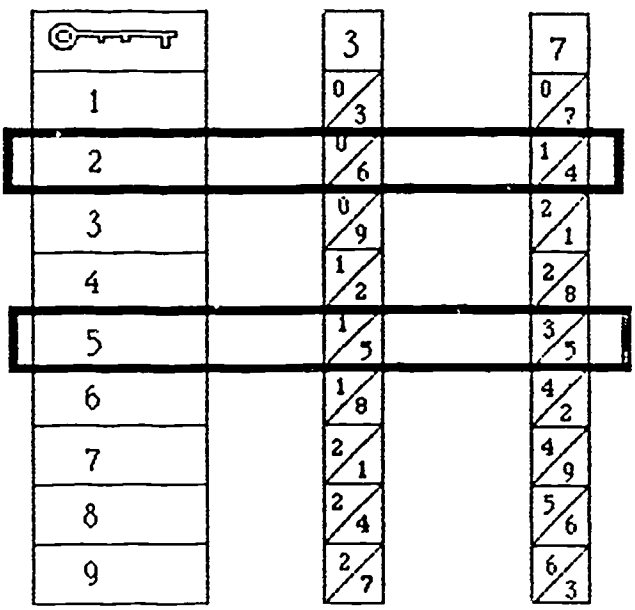
Multiplying 37 x 5 will result in:

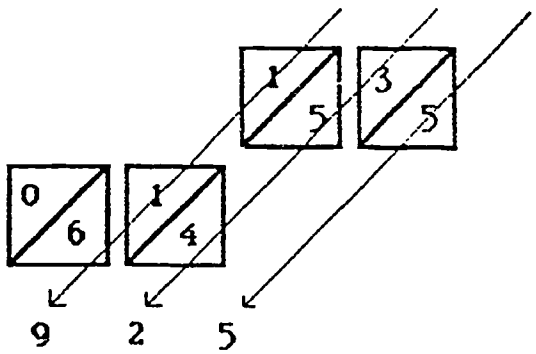


Multiplying 37 x 2 will result in:



Line up the numbers to find the product. The 5 was in the one's place and the 2 in the ten's place in the problem, so numbers must be lined up in this manner.





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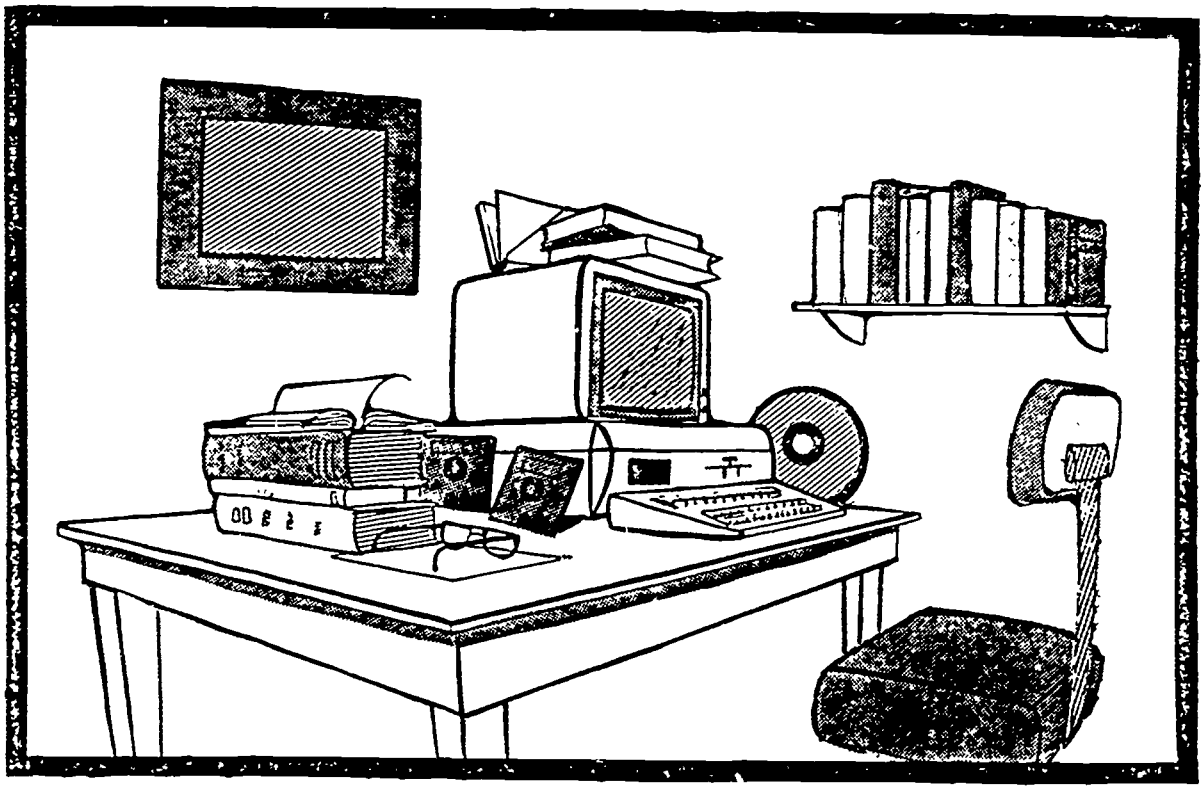
RESOURCES



RESOURCES

TEACHER REFERENCES
AND RECOMMENDED PERIODICALS

TEACHER REFERENCES

BASIC Discoveries. Linda Malone and Jerry Johnson. Creative Publications. 1981.

Computer Consciousness: Surviving the Automated 80's. Domini H. Covvey. Addison-Wesley. 1980.

Computer Literacy: A Hands-On Approach. Arthur Luehrmann and Herbert Peckham. McGraw-Hill. 1983.

Computer Literacy Curriculum Guide. Texas Education Agency, Austin, Texas. 1985.

Computer Literacy: Issues and Directions for 1985. Robert Seidel, Ronald Anderson, and Beverly Hunter. Academic Press. 1982.

Computer Literacy--Programming, Problem Solving, Projects On the Apple. Warren and Bobbie Jones, Kevin Bowyer and Mel Ray. Reston Publishing Company, Inc. 1983.

Computer Literacy--Problem Solving with Computers. Carin E. Horn and James L. Poirot. Sterling Swift Publishing Company. 1981.

Computers for Kids; Apple II plus. Sally Larsen. Creative Computing Press. 1981.

Computers for Kids; Atari Edition. Sally Larsen. Creative Computing Press. 1981.

Computers for Kids; TRS-80 Edition. Sally Larsen. Creative Computing Press. 1980.

Computers for Kids; Vic-20 Edition. Sally Larsen. Creative Computing Press. 1983.

Computers in the Classroom. Henry S. Kepner, Jr., ed. Goodson. Addison-Wesley. 1982.

Computers, Teaching and Learning. Jerry W. Willis et al. Dilithium Press. 1983.

Computers Today. Donald H. Sanders. McGraw-Hill. 1983.

Courseware in the Classroom. Ann Lathrop and Bobby Goodson. Addison-Wesley. 1983.

Kids and the (Apple, IBM or Commodore). Edward H. Carlson. Datamost. 1982.

Microcomputers: A Parent's Guide. Kenneth P. Goldberg and Robert D. Sherwood. John Wiley & Sons, Inc. 1983.

Mindstorms: Children, Computers and Powerful Ideas. Seymour Papert. Basic Books. 1980.

My Students Use Computers. Beverly Hunter. Reston. 1983.

Practical Gude to Computers in Education. Peter Coburn et al. Addison-Wesley. 1982.

Programming the IBM Personal Computer: BASIC. Neill Graham. Holt. 1983.

Scholastic Computing--An Introduction to Computers. Jack L. Roberts. Scholastic Inc. 1984.

School Administrator's Introduction to Instructional Use of Computers. David Moursund. International Council for Computers in Education. 1980.

Spotlight on Computer Literacy. Ellen Richman. Random House. 1985.

Teaching BASIC Bit by Bit. Batya Friedman and Twila Slesnick. MCEP, Lawrence Hall of Science, University of California, Berkley, CA. 1980.

The Mind Tool: Computers and Their Impact on Society, 2nd edition. Neill Graham. West Publishing Company. 1981.

Using A Microcomuter in the Classroom. Gary G. Bitter and Ruth A. Camuse. Reston. 1984.

RECOMMENDED PERIODICALS

Educational Periodicals

ACM SIGCUE Bulletin; Association for Computing Machinery; P.O. Box 12015, Church Street Station, NY 10249

AEDS Journal and AEDS Monitor; Association for Educational Data Systems; 1201 Sixteenth St., NW, Washington, DC 20036

Classroom Computer Learning; Classroom Computer News; 5615 West Carmel Road, Cicero, IL 60650

Educational Technology; 140 Sylvan Avenue, Engelwood Cliffs, NJ 07632

Electronic Learning; Scholastic Inc., 901 Sylvan Avenue, Englewood Cliffs, NJ 07632

Microcomputers in Education; QUEUE, 5 Chapel Hill Drive, Fairfield, CT 06432

Recreational Computing; P.O. Box E, 1263 El Camino Real, Menlo Park, CA 94025

The Computing Teacher; International Council for Computers in Education, Department of Computer and Information Science, University of Oregon, Eugene, OR 97403

Teaching and Computers; Scholastic Inc., 730 Broadway, New York, NY 10003

Periodicals

A+ (Apple); Ziff-Davis Publishing, One Park Avenue, New York, NY 10016

BYTE; 70 Main Street, Peterborough, NH 03458

Compute!; Small Systems Services, Inc., Greensboro, NC 27403

Creative Computing; Elizabeth Styles, ed., P.O. Box 789-M, Morristown, NJ 07960

80-Micro; 80 Pine Street, Petersborough, NH 03458

Family Computing; Scholastic, Inc., 730 Broadway, New York, NY 10003

InforWorld; 530 Lytton Avenue, Palo Alto, CA 94301

Nibble (Apple); P.O. Box 325, Lincoln, MA 01773

PC World (IBM); Subscription Department, P.O. Box 6700, Bergenfield, NJ 07621

Personal Computing; P.O. Box 1408, Riverton, NJ 08077

Popular Computing; Byte Publications, Inc., P.O. Box 307, Martinsville, NJ 08836

SoftSide; P.O. Box 68, Milford, NH 03055

Softtalk (for IBM, Apple); 7250 Laurel Canyon Blvd., North Hollywood, CA 91605

Source World; Source Telecomputing Corporation, 1516 Anderson Road, McLean, VA 22102

RESOURCES

FILMS AND VIDEOTAPES

AUDIOVISUAL SERVICES
641 18th Avenue
Honolulu, HI 96816

Ph: 732-2824

16mm Films

7705 AND WHAT OF THE FUTURE?
Films Incorporated, 1981
40 min.; J-H
Will the recent developments in electronic microcircuitry result in a better or worse life for the average person? Will people lose jobs once thought secure? Will the technology be used to replace people on monotonous or dangerous jobs? Visits to the Washington D.C. Metro (subway), a Dallas supermarket, and a Scottish hospital illustrate the benefits and problems.

7724 THE COMPUTER AND YOU - AN INTRODUCTION
Handel Film Corporation, 1983
16 min.; E-J
A primer for computer operations designed for audiences who have no prior knowledge in this field. The computer terms come to life by watching a student developing a program about the states in the USA and the provinces of Canada.

6702 COMPUTER COLOR GENERATIONS
United States Department of Energy, 1972
23 min.; J-H C
Discusses new techniques in computer technology which virtually eliminate the extra cost of color in computer displays. Includes research on thermonuclear problems, lasers, engineering and three dimensional problems.

6703 COMPUTER FLUID DYNAMICS
United State Department of Energy, 1969
24 min.; J-H C
Demonstrates the power of today's giant electronic computers for solving problems that previously were impractical to undertake. presents a wide range of fluid flow problems, shows several examples of fluid flow calculations, and describes how computer calculations are accomplished.

7940 COMPUTER: TOOL FOR THE FUTURE
National Geographic, 1984
23 min.; J-H T
The film begins with the human need to compute, surveying several computing devices that preceded the chip and focusing on significant computer applications. Computer careers are considered--everything from the military to music. This film stresses the importance of computers in our modern society.

7682 COMPUTERS AND THE FUTURE
Time-Life Media, 1982
30 min.; J-H
Combining documentary techniques with vignettes, the film explores our growing relationship with communications technologies such as interactive computers, cable television and video discs. The program explores the effect of this new media form on the way we live, work and play. Futurologist Peter Schwartz is host.

7798 COMPUTERS: THE FRIENDLY INVASION
Walt Disney Educational Media Company, 1982
20 min.; E-H
Computer graphics and scenes from the Disney feature "Tron" illustrate some computer applications in an entertaining film that introduces students to a future resource. They are introduced to how computers work, the many tasks they can perform, and the opportunities they offer in science and the arts.

7668 COMPUTERS: TOOLS FOR PEOPLE
Churchill Films, 1983
22 min.; E-H T
Shows how computers are used in many ways: for file management; control of other machines; support of creative work; and for mathematical tasks including modeling. Demonstrates how applications are developed through research, flowcharting, programming and debugging. Emphasizes the human responsibility for computer performance and the excitement of people creating their own tools.

7922 DON'T BOTHER ME, I'M LEARNING:
ADVENTURES IN COMPUTER EDUCATION:
MGHT, 1981
24 min.; E-H T
This motivating film demonstrates uses of a computer in a classroom. Teachers, parents and students all eagerly discuss the vast uses of the computer.

7473 MIND MACHINES, THE PARTS I & II
Time-Life Media, 1979
57 min.; H C
The controversy surrounding artificial intelligence is examined. Computer fundamentals are explained and compared to human intelligence. Limitations of computers to memory and calculations functions are used to argue the nature of human intelligence which includes judgement, common sense, etc.

7707 NOW THE CHIPS ARE DOWN, PARTS I & II
Films Incorporated, 1981
50 min.; J-H C A T
Microprocessor smaller than a postage stamp have the power of room-sized computers of a generation ago. We hear a machine

that can read aloud, see a driverless tractor and a warehouse that needs no staff among the samples of the wonders created by cheap computer power. We also learn how micro-computers are made, and hear predictions of the future changes.

7929 ROBOT REVOLUTION, THE
EBEC, 1984
19 min., J-H C
This probing look at robots--their capabilities and their limitations--explores their potential for improving the quality of life and their threat the labor force as they enter the workplace. Shows the effects of using computers and robots in medicine, research, business and industry.

7591 ROBOTS - INTELLIGENT MACHINES SERVING MANKIND
Pacific Resources, Inc., 1981
14 min.; J-H
The film presents a report of an army of "intelligent machines" taking over more and more jobs that were previously performed by workers. Benefits derived by this major revolution in computer technology are: safer working conditions, high quality products and more efficient use of resources. This report includes robots with limited touch, sight and judgement ..first steps in the mechanical evolution.

6858 TIC - INDEX TO ENERGY
United States Department of Energy, 1977
6 min.; H C A
Describes the Technical Information Center (TIC) of the Department of Energy at Oak Ridge, Tennessee. The computerized facility gathers, abstracts and catalogues technical reports and published scientific papers from sources around the world. This material is evaluated and part of it becomes a permanent part of the data bank of technical and scientific energy information.

7901 WELCOME TO THE FUTURE: COMPUTERS IN THE CLASSROOM:
FI, 1982
28 min., C T
In plain language, this film introduces teachers to computer literacy: programming languages, software and the variety of ways computers can be used in schools, such as computer assisted instruction. This film helps demystify computers and shows how teachers and students can become friends with a machine.

TECHNICAL ASSISTANCE CENTER
3645 Waialae Avenue, Room B-6
Honolulu, HI 96816

Ph: 735-2825

Videotapes

R199-1 BEYOND THE PROGRAM
Great Plains National, 1980
20 mins., Color (Business Computing...Cut Down to Size); A
Outlines elements of data reliability and accuracy and stresses the need for safeguards. LOAN ONLY. NOT FOR CATV USE. NOT AVAILABLE TO PUBLIC LIBRARIES.

R197-1 COMMUNICATING WITH YOUR COMPUTER
Great Plains National, 1980
27 min., Color (Business Computing...Cut Down to Size); A
Introduces and compares elements of programming languages. LOAN ONLY. NOT FOR CATV USE. NOT AVAILABLE TO PUBLIC LIBRARIES.

0890-1 COMPUTER COLOR GENERATIONS
ERDA, 1972
23 mins., Color; J-H C
Discusses new techniques in computer technology which virtually eliminate the extra cost of color in computer displays. Includes research on thermonuclear problems, laser, engineering and three dimensional problems.

0911-1 COMPUTER FLUID DYNAMICS
ERDA, 1969
24 mins., Color; J-H C
Demonstrates the power of today's giant electronic computers for solving problems that previously were impractical to undertake. Presents the wide range of fluid flow calculations and describes how computer calculations are accomplished.

0815-2 COMPUTER FRIEND
WPBT Public Television, 1976
30 mins., Color (Que Pasa, USA?); H A
Carmen fills out an application for a computer program that matches up people of similar interests and family backgrounds. Spanish/English program.

1768-1 COMPUTER SHOW #1, THE
Oceanic Cablevision, Inc., 1984
27 min., Color (The Computer Show); J-H A
In a magazine format: computer applications in the travel industry; tutorial on the components functions and operation of a microcomputer; care and maintenance of computers; introduction to programming in Logo.

1768-2 COMPUTER SHOW #2, THE
Oceanic Cablevision, Inc., 1984
30 min., Color (The Computer Show); J-H A
Continuation of show #1 with emphasis on the care and maintenance of computers, use of word processors and printers.

1804-1 COMPUTER SHOW #3, THE
Oceanic Cablevision, Inc., 1984
30 min., Color (The Computer Show); J-H A
David Kobashigawa of Radio Shack demonstrates the use of a computer spread sheet. The film defines some computer language, gives computer care tips and describes various types of printer papers.

1854-1 COMPUTER SHOW #4, THE
Oceanic Cablevision, Inc., 1984
30 min., Color (The Computer Show); J-H A
Demonstrates computer programming in BASIC and explains some of its terms. Describes what computers can do and how they work. Explores the serious problem of software piracy.

1854-2 COMPUTER SHOW #5, THE
Oceanic Cablevision, Inc., 1984
30 min., Color (The Computer Show); J-H A
Briefly demonstrates features of a computer operating system designed for multi-user business applications, the Northstar "Dimension" system; this is followed by a demonstration of software called "Color Paint." Both programs are designed for IBM-PC computers.

1851-2 COMPUTER SHOW #6, THE
Oceanic Cablevision, Inc., 1984
30 min., Color (The Computer Show); J-H A
Minidocumentaries in this program feature computers: computerized music, computers in designing and manufacturing, a young science fair winner who is a computer whiz, a new way of notating dance, and the work of robots, present and future.

1282-1 COMPUTERS
Hawai'i Public Television, 1980
60 mins., Color (Dialog); H C A
Presents a group of computer experts who discusses the use of computers, their advantages and possible disadvantages. The question is--what is the future of computers, will they compete with people for jobs? NOT FOR CATV USE.

1278-4 COMPUTERS
Hawai'i Public Television, 1980
10 mins., Color (Dialog); H C A
Edited version of "Computers" without the panel discussion. Shows only the mini-documentary of the topic up for discussion.

0112-1 COMPUTERS
Hawai'i Public Television, 1982
59 mins., Color (Dialog); H C A T
This program examines the numerous functions and disadvantages of having personal computers. It also describes the different brands of computers and their most effective use, especially by the average person. NOT FOR CATV USE.

0088-2 COMPUTERS
Hawai'i Public Television, 1982
6 min., Color (Dialog); H C A T
Edited version of "Computers" without the panel discussion. Shows only the mini-documentary of the topic up for discussion.

1756-1 COMPUTERS
WETA-TV, Washington, D.C., 1983
26 min., Color (Spaces); J-H
Minidocumentaries in this program feature computers: computerized music, computers in designing and manufacturing, a young science fair winner who is a computer whiz, a new way of notating dance, and the work of robots, present and future.

R129-1 COMPUTERS AND THE FUTURE
Time-Life Video, 1982
30 mins., Color; J-H A
Combining documentary techniques with vignettes, the film explores our growing relationship with communications technologies such as interactive computers, cable television and media forms on the way we live, work and play. Futurologist Peter Schwartz is host. LOAN ONLY. NOT FOR CATV USE. NOT AVAILABLE TO PUBLIC LIBRARIES.

1664-2 DATA PROCESSING
Kapi'olani Community College, 1983
12 mins., Color (A Career in Focus); J-H
In the business world, computers play a major role in data processing accounting, and record keeping. This program describes the duties and work of computer operators, computer programmers, data entry clerks and control clerks. KCC offers a two-year course in computer education.

EVOLUTION: COMPUTERS, YESTERDAY AND TODAY
BNA Communications, Inc., 1983
30 min.; J-H A
This film presents the history of four generations of computers. Included are the people and the companies that developed them

R196-1 FITTING OUT
Great Plains National, 1980
15 mins., Color (Business Computing...Cut Down to Size); A
Offers guidelines on determining the capabilities of computer systems (size, storage maintenance). LOAN ONLY. NOT FOR CATV USE. NOT AVAILABLE TO PUBLIC LIBRARIES.

R195-1 MEASURING UP
Great Plains National, 1980
15 mins., Color (Business Computing...Cut Down to Size); A
Details applications and types of small computers and their integration into a business. LOAN ONLY. NOT FOR CATV USE. NOT AVAILABLE TO PUBLIC LIBRARIES.

1593-1 TIC - Index to Energy
U.S. Department of Energy, 1977
6 min., Color; C A
Describes the Technical Information Center (TIC) of the Department of Energy at Oak Ridge, Tennessee. The computerized facility gathers, abstracts and catalogues technical reports around the world. This material is evaluated and becomes a permanent part of a data bank of technical and scientific energy information.

R198-1 UNDERSTANDING SOFTWARE
Great Plains National, 1980
16 mins., Color (Business Computing...Cut Down to Size); A
Discusses types, applications and the choosing of software. LOAN ONLY. NOT FOR CATV USE. NOT AVAILABLE TO PUBLIC LIBRARIES.

1745-1 WHY IN THE WORLD #245
WNET & Satellite Education Services, Inc., 1984
30 min., Color (Why in the World); J H A
Topic: Computers and the changes they bring to America---how people live and work. Guest: John F. Akers, President of IBM Corporation.