

COMPUTER LITERACY LEVEL OF SENIORS
AT SIDNEY SENIOR HIGH SCHOOL

by

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A paper submitted in partial fulfillment
of the requirements for the degree

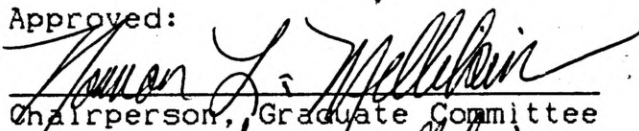
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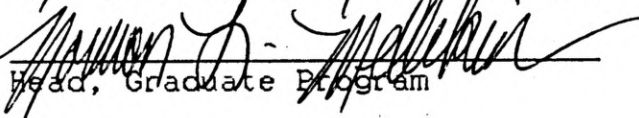
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TABLE OF CONTENTS

CHAPTER	PAGE
I. INTRODUCTION	1
Problem Statement	2
Limitations	3
Need for the Study	3
Definition of Terms	5
Organization of Study	6
II. LITERATURE REVIEW	8
Computer Literacy	8
Guidelines	13
Measurement Tools	25
Summary	35
III. PROCEDURES	36
Sources of Data	36
Development of Definition	37
Development of Guidelines	38
Development of Measurement Tool	38
Administration of Measurement Tool	39
Analysis of Data	39
IV. FINDINGS	41
V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS	44
Summary	44
Conclusions	44
Recommendations	46
VI. BIBLIOGRAPHY	48
VII. APPENDIX A	
Guidelines	50
VIII. APPENDIX B	
Measurement Tool	52

LIST OF TABLES

TABLE	PAGE
1. Number of Seniors Completing Measurement Tool	39
2. Results of Measurement Tool	41

CHAPTER I

INTRODUCTION

The proliferation of computers in our society today appears to mark the dawn of a new era--the microelectronics age--and with it comes a demand from industry, government, and parents for computer literate high school graduates.

Computers are making strong inroads into nearly every aspect of life. Some find the prospect exciting--others find it unnerving. The fact is that the ability to use a computer is rapidly becoming a job requirement.

For example, about 75 percent of all jobs in the United States within the next two years will involve computers. In other countries similar shifts to computerization are expected.

Computers are being invited into the home, under the guise of video games or budget planners. They may serve to monitor a domestic security system, turn on the coffee pot, regulate the thermostat or manage the business portfolio.

Not only do computers help regulate air traffic, navigate spacecraft and manufacture automobiles, they now forecast weather and monitor your bank balance

Whether you live in South Africa, Switzerland or the South Pacific, computers probably make transactions quick, convenient and reliable, every time you place a travel reservation, buy clothing at a department store or food at a grocery market. (Zhorne, 1983:22)

With basic computer skills being in such great demand today in all walks of life, it is understandable

that educational institutions are expected to provide those skills. "If public education is to meet its obligations to the taxpayers who support it, then computer literacy must be a top priority throughout the 1980s." (Muscat/Lorton, 1982:7) Therefore, secondary schools should develop computer literacy requirements for graduating students.

Problem Statement

This particular study will identify the computer literacy level for the senior class at Sidney Senior High School.

It was the intent of this study to review and arrive at an acceptable definition of computer literacy, to adapt or develop an acceptable set of guidelines for obtaining computer literacy, and to develop or adapt an appropriate tool to measure the attained computer literacy level for high school seniors. Major questions to be answered by this study include:

1. What constitutes an acceptable definition of computer literacy for graduating seniors at Sidney Senior High School?
2. What information should be contained in acceptable guidelines for obtaining computer literacy at the high school level?
3. What constitutes an appropriate measuring tool to ascertain the computer literacy level for high school seniors?

Limitations

This study was limited by the following factors: The review of literature was restricted to books, journals, and other materials available at Roland R. Renne Library, Montana State University, at the Montana State Department of Public Instruction, and the writer's private professional library. The data gathered were limited to the 1986-87 senior class of Sidney Senior High School, Sidney, Montana.

Need for the Study

"No one disputes that today's students must become computer literate." (Muscat/Lorton, 1982:6) Computer basics for everybody is definitely the wave of the future. According to Downing, (1981:5), "In schools, the computer age has arrived already." David Cossey of University of Pennsylvania's Wharton School indicates that more than half the workforce is involved in pushing information around and that you can almost guarantee that when a person gets a job, he will have some kind of interaction with computers. (Johnson, 1982:29) Computer literacy is the fourth basic skill, says one innovative school superintendent, who wants his students to be as comfortable using the computer as their parents are using pencils, paper, and books. (Zhorne, 1983:24-25)

A compelling need exists for all students to know what a computer is and how it works, to be able to discuss the social impact of computers on individual's daily lives, to have the ability to read and understand computerized reports and/or oral presentations, to develop a computer vocabulary, to be aware of data processing careers, and to be able to do computing using the BASIC language.

Sidney Senior High School has had computer classes for a number of years. The fact is, however, that too many students have been unable to gain access to hands-on experience in a computer class, and a computer literate competency requirement has not been established to encompass all graduating seniors. Computer literacy classes should be taught in business education and other departments--as well as in the math and science departments--to enable all students to become computer literate. An appropriate definition of computer literacy should be established, an acceptable set of guidelines should be adapted to obtain this literacy, and a suitable evaluation tool should be developed to determine the competency level for all graduating students.

Educators have an obligation to their students, the taxpayers, the communities in which they live, industry, and to themselves to assist in the

understanding of the new world by hands-on experience with a "user-friendly" computer. (Merchant, 1982:30) Published results from this study could do much to enhance public relations with the school, but even more important, the results could provide an acceptable definition for computer literacy, provide the basis for establishing guidelines for obtaining that literacy, and provide an instrument suitable for measuring the computer literacy level for graduating seniors at the high school level. In addition, the study could also provide a guideline for curriculum changes that might be necessary to improve computer literacy for those students who plan to continue their education at a higher level, as well as helping students become more comfortable with computers on the job. Hopefully, too, this study may be of benefit to other schools who are searching for answers to the same questions that prompted this research.

Definition of Terms

For the purpose of this paper, the term computer literacy is considered to mean possessing a familiarity with the background of the computer including its early history and development, terminology relevant to the computer and its parts, operational functions of the computer, rules and regulations governing use of the

computer and copyrighted software, and the relevancy of the computer today and in the future--with special emphasis on understanding the concepts of computer functions.

Organization of Study

Chapter I--Introduction which includes the problem statement, major questions to be answered by the study, limitations, need for the study, and definition of terms.

Chapter II--Review of Literature which includes numerous examples of definitions of computer literacy from which an acceptable definition for computer literacy was developed, numerous examples of suggested guidelines for obtaining computer literacy from which an acceptable set of guidelines were developed, and various measurement tools from which an appropriate tool was developed to measure the attained computer literacy level for high school seniors at Sidney Senior High School.

Chapter III--Summary pertaining to the procedures used in the study which includes sources of data, development of computer literacy definition, development of guidelines, and development of the measurement tool. Also included is a description of the analysis of data and a summary.

Chapter IV--Presentation which includes the analysis and interpretation of data received from the 1986-87 graduating seniors of Sidney Senior High School.

Chapter V--Summary, conclusions, and recommendations as a result of the study are presented.

CHAPTER II

LITERATURE REVIEW

A review of literature was done to provide background information in the following areas:

1. Development of a definition of computer literacy
2. Development or adaptation of set of guidelines for obtaining computer literacy
3. Development or adaptation of an appropriate tool to measure the attained computer literacy level for graduating seniors at Sidney Senior High School

Computer Literacy

According to one writer, (Brechtner, 1983:6) computer literacy is perhaps the most important phase of the current Information Age, and is one of the top social issues being discussed today. Brechtner states, "We all must accept computers as one of the most beneficial pieces of machinery ever developed. We, and especially our young people, must grow up with computers, learn about them and work with them so that their full benefits can be realized." Brechtner's broad definition of computer literacy--"whatever you need to

know to function in an information-based society" tends to point out a need for further research to establish a more acceptable and understandable definition of computer literacy. Examples of this research are as follows:

Zhorne (1983:24-25) believes that to be computer literate one must "Learn enough about a programming language to write a simple program, be able to do word processing (edit, move and print out text), draft a simple budget using calculation-type software and know the principles behind the terms such as magnetic tape, compiler, CRT, disk drives, terminals, hardware, memory and others." He further elaborates that computer literacy means ". . . being able to use a computer as an everyday tool to solve problems and to do the tasks that help you the most. It should mean being comfortable with a computer keyboard." In addition, Zhorne describes computer literacy as ". . . being knowledgeable about the computer world . . ." and feels that it is definitely the "fourth basic skill."

Johnson (1982:28) contends that computer literacy includes "The general education or knowledge which precedes computer professional literacy and implies an understanding of basic computer concepts which are business data processing fundamental concepts." To Johnson, a knowledge of basic concepts represents

"...the state of being literate or insightful about the characteristics of computer hardware, computer software, data, computer personnel, and systems procedures utilized in processing data."

Rohm (1982:4) states that computer literacy includes "the ability to communicate with company programmers, to feel comfortable with the computer, to enter data into a computer program . . . a new important, and serious goal in a new era of communication."

Muscat (1982:9) simply states that computer literacy should definitely be considered "a survivor skill."

Muscat, in conjunction with Lorton (1982:6-7) further contends that computer literacy should include a ". . . possession of computer skills including keyboarding, hardware and software overview, business application, word processing skills, career awareness, social implications, future trends, history of computers, and basic programming concepts."

Wood (1983:231) states that computer literacy is "the broad, general understanding of data processing history, applications, equipment, systems, people, and procedures."

Stubbe (1982:4) sees computer literacy as ". . . the ability to manipulate a computer with a pre-established program to perform desired tasks."

According to Moursund (1983:3), a distinguished group of "national experts" met in Washington, D.C. in January, 1983, to express their opinions on ideas going into the development of the definition of computer literacy and measurement instruments thereof. The following is a description of their feelings at that time:

The group of nine national experts seemed to divide into two camps. One camp essentially thinks of computer literacy as a talking-level of knowledge. This includes knowing some computer history; knowing definitions of computer-related words; knowing some applications of computers in business, government and industry; knowing about social and ethical issues; and so on. Of course this talking-level-of-knowledge camp wants students to have some hands-on computer experience and hence a modest level of skill in actually using a computer.

The second group admits that the ideas of the first group are important, but insists that the most important aspect of computer literacy is being able to make a computer do things. This group then is further divided as to what this might mean. Does it mean being able to program in Logo, BASIC or Pascal, or does it mean knowing how to use a word processor, an information retrieval system and an electronic spreadsheet?

Moursund's own feelings are that each group is correct, but he most strongly supports the "doing" parts of a definition of computer literacy. (1983:3)

"Within that group, Moursund added, "I am moderately supportive of the "'traditional language computer programming'" subgroup and very strongly supportive of students learning to use applications packages." Moursund believes that the progress of computers in education will receive a substantial setback if the "talking-knowledge" definition wins out. Moursund's contention is that the key to computer literacy is a "doing" level of knowledge, with this knowledge integrated into the totality of a student's knowledge and performance. "I believe that it is essential that those who would define and measure computer literacy see that this is where we are headed and that this must be a significant part of any modern definition of computer literacy." (1983:4)

Computer literacy to Vockell and Rivers (1983:61), means "reduced anxiety around computers, knowledge of what problems could and could not be solved by the computer, familiarity with computer terminology, etc." Vockell and Rivers are adamant about their feelings that "Although there may be some topics about which one can best become "'literate'" by listening to lectures, by participating in discussions or by reading, computer literacy is not one of these topics."

According to William J. Zachmeier, Acting Superintendent of the Cupertino Union School District,

Cupertino, California (1983:7), computer literacy is: "the ability to function in a computer and technology oriented society. Students will understand computers and their applications in the world around them. They will develop the skills necessary to communicate with computers and recognize the computer's capabilities and limitations."

The Human Resources Research Organization (HumRRO) defines computer literacy as "what a person needs to know and do with computers in order to function competently in our society." (Molnar, 1980:71)

Guidelines

According to one school district (Billings Public Schools, 1982) guidelines for obtaining computer literacy should include the following:

Grades K-6--All students should have experienced some computing by the time they have completed grade six. Minimally the experience should include one or two hours of accumulated "hands on", "logged on" time in association with a microcomputer or full scale computer (possibly by remote terminal) involving both drill and practice activities in at least two disciplines and simulation activities.

Grades 7-9--All students who complete grade nine should minimally be able to flow chart simple

situations, be able to write and run simple introductory programs in the BASIC language, be able to read and understand simple BASIC programs, have "hands on", "logged on" time on a computer, understand that the computer is a multi-disciplinary tool, and study some of the current impacts of computers on society.

Grades 10-12--All students who complete grade 12 should minimally have "hands on", "logged on" time on a computer, and understand that the computer is a multi-disciplinary tool.

Minimal guidelines for a first semester computer programming course in the BASIC language include machine familiarity, getting started in programming, data entry, introduction to looping and output, decision making and flowcharting, controlled loops, for next loops, nested for/next loops, and one dimensional array.

Suggestions for a second semester computer programming course in the BASIC language include strings, two dimensional arrays, formatted output, functions, file management, applications, and individual projects.

The Albany Unified School District (Fisher, 1983:52-58) has developed a computer-use plan that could be summarized as providing for "Computer Awareness" at the elementary level, "Computer Literacy"

with an introduction to programming at the middle school level, and a variety of electives for further study at the high school level. The guidelines for obtaining computer literacy in Grades 6-8 are as follows:

Learning to Use Computers

Appropriate use of keyboard and functions

Programming

Continue basic programming

Instructional Uses

Reinforcing skills

Remediation

Problem-solving/logical thinking

Simulation

Tool to help in written work (word processing)

Computer Parts and Functions

Identify specific parts and their function

Vocabulary

Careers in Computers/Impact on Society

Vocational impact of computers on careers

Computer-related jobs

The guidelines for grades 9-12 are as follows:

Learning to Use Computers

(a) Data Base

(b) Word Processing

Programming

Teach BASIC and other language

Instructional Uses

Simulations

Tutorials

Computer Parts and Functions

Network block

Diagram logic operations

Careers in Computers/Impact on Society

Social question

Work style

Marketing

Abuses

Consumer

Artificial Intelligence

Spencer (1981:29-30) recommends the following guidelines for plotting a computer literacy course:

Computer vocabulary

Computer anatomy

Computer capabilities and limitations

Computer applications

Scientific method of problem solving

Flowchart

Computer programming

Introduction to basic language

Computer career education

Social implications

Futuristics

Muscat and Lorton, Jr. (1982:6-7) designed the following guidelines for obtaining computer literacy at the high school level:

History of computing to help students understand the rapid escalation of computer use from the 1950s to the present.

Hardware overview to familiarize students with the nomenclature of current information processing equipment.

Software overview to help students acquire an understanding of the role of software in any information processing system.

Business applications to acquaint students with an automated information system in some detail.

Introduction to programming to assure students they do not have to be programmers to be computer literate, but they need to understand basic concepts of programming.

Introduction to word processing because these skills will help both business majors and nonmajors in

their educational, occupational, and personal pursuits.

Career awareness to show students the value of a personal computer in any enterprise matched by an appreciation of the wide range of computer-related employment opportunities in both small and large businesses.

Social implications to advise students of the issues of privacy and home computer use.

Future trends to help students recognize how technology is continually evolving thereby enforcing need for continuing education.

Computer literacy curriculum guidelines as established by Cupertino Union School District (Zachmeier, Barram, Hall, Halstead, Harrison, McKinley, 1983:7-10) are as follows:

Computer Awareness

- Recognize makeup of a computer
- Describe how computers affect our lives
- Trace the history of computers
- Understand the moral issues involved with
computer use

Computer Interaction Skills

- Develop keyboard skills
- Demonstrate general uses of the computer
- Demonstrate specific uses of the computer

Know basic programming strategies

Computer Programming Skills

Perform basic programming skills

Perform specific programming skills

Perform simple tasks using the language LOGO

Perform simple tasks using the language,

PILOT

Perform simple tasks using the language BASIC

The following is a set of guidelines established for a nine-week course in computer literacy by Bangasser (1983:66-67):

Identify the five major components of a computer: input, control, memory, arithmetic unit and output.

Identify the basic operations of a computer system:

Input of data or information

Processing of data or information

Output of data or information

Recognize that a computer needs instructions to operate.

Recognize that a computer gets instructions from a program written in a code called a programming language and that many languages have been developed.

Write simple programs in the BASIC program.

Follow and give the correct output for a BASIC program.

Modify a program to accomplish a new, but related, task.

Correct errors in an improperly functioning program.

Recognize specific uses of computers in education, business, government and services.

Recognize that alleged "computer mistakes" are usually mistakes made by people.

Feel confident about his or her ability to use and control a computer.

Enjoy and desire work or play with a computer.

Spend some free time using a computer if given the opportunity.

The final set of guidelines researched was developed by Wood (1983:231-33) and is also the more detailed:

I. The Development of Data Processing

A. Systems for Handling Data

Manual

Mechanical

Electromechanical

Electronic

B. The Computer Today

Large Computers

Minicomputers

Microcomputers

C. Use of the Computer

Business

Science

Personal/Home

Social

II. Types of Computers

A. Analog

B. Digital

III. The Storage of Data for Reuse

A. Hollerith Code

B. Binary Coded Decimal

Core Storage

The Silicon Chip

C. Magnetic Tape

D. Disk Storage

IV. Computer Systems

A. People

B. Equipment

C. Systems

Central Processors

Remote Terminals

Freestanding Systems

V. The Data Processing Cycle--An Overview

- A. Source Docement
- B. Input
- C. Processing
- D. Output
- E. Use of Output

VI. The Data Processing Cycle--In Detail

A. Source Documents

Defined

Types

Creation

Uses

Caution

Accuracy

Legibility

B. Input Systems

Need for Accuracy

Direct Keyboard Entry

Punch Card

Punched Paper Tape

Magnetic Tape

Disk Storage

Hard Disk

Floppy Disk

Cassette

Optical Character Recognition

Magnetic Character Ink

Recognition

Electronic Data Transmission

Optical Price Strips

C. Processing Data

Types of Applications

Systems Design

Block Flow Charting

Symbolic Flow Charting

Programming

Computer Equipment

Input Devices

The Central Processor

Arithmetic and Logic

Control

Primary Storage

D. Data Output

Output Devices

Forms of Output

Output as Input/Input as Output

Magnetic Tape

Disk Storage

Printed Forms and Reports

Electronic Data Transmission

Video Screen

Voice

E. Use of Output

As Input to Other Systems

Storage

Business Documents

VII. Careers in the Computer World

A. Business Uses, 80-90%

B. Scientific Uses, 10-20%

C. Other

D. Occupational Titles

Data Entry Operator

Computer Operator

Programmer

Systems Designer

Manager

VIII. Tomorrow's Computers

A. Size and Cost

B. Uses

Research

Learning Tool

Robots

Business Applications

Home and Personal Uses

C. Social Impact

D. A Better Life

Measurement Tools

Tools to measure the attained computer literacy level of students were very difficult to research. One example, compiled by Joiner, Vensel, Ross and Silverstein (1982:26-28), consisted of the following questions:

(True or False)

1. Computers cannot be used to assist in teaching English grammar.
2. People often use computers to store large amounts of information that they wish to use over and over again.
3. Computers help people make decisions by providing correct answers to any question.
4. Computers help people make decisions by telling them if their problem is important.
5. Use of computers in education always results in less personal treatment of students.
6. Privacy is an issue whenever there are files containing personal information about people.
7. The increased use of computers in our society both eliminates and creates jobs.
8. Using computers can free one to do more creative tasks, but this may lead to more dependence upon machines.
9. In order to use a computer, a person must know how to program.

(Multiple choice)

10. Computers are not good for tasks that require:
 - a. speed
 - b. accuracy

- c. intuition
 - d. something to be done over and over again
 - e. I don't know
11. If your charge account bill has an error, it was probably caused by:
- a. breakdown of the computer
 - b. mistakes made by people
 - c. poor design of the computer
 - d. general weaknesses of machines
 - e. I don't know
12. The main duty of a computer programmer is to:
- a. operate a computer
 - b. prepare instructions for a computer
 - c. schedule jobs for a computer
 - d. design computers
 - e. I don't know
13. Which of the following is a limiting consideration for using computers?
- a. cost
 - b. software availability
 - c. storage capacity
 - d. all of the above
 - e. I don't know
14. In order to program a computer, a person:
- a. can use any English language words
 - b. can use any English or foreign language words
 - c. must use programming language numbers, not words
 - d. must use the words from a programming language
 - e. I don't know
15. A computer program is a:
- a. course on computers
 - b. set of instructions to control the computer
 - c. computer generated presentation
 - d. piece of computer hardware
 - e. I don't know
16. Choose the correct output for the computer program shown below:
- ```
10 LET C = 6
20 LET D = 8
30 LET E = C+D+2
40 PRINT E
END
```
- Output
- a. 6

- b. 14
  - c. 8
  - d. 16
  - e. I don't know
17. Computer software is a term describing:
- a. computer programs
  - b. electronic components encased in soft plastic or rubber
  - c. people who work with computers
  - d. mechanical and electronic parts of a computer system
  - e. I don't know
18. When in operation, a computer:
- a. follows a set of instructions written by people
  - b. thinks just like a person
  - c. recalls answers from memory
  - d. translates data from digital to analog code
  - e. I don't know
19. What is the main purpose of the following program:
- ```

10 INPUT A, B, C, D, E
20 LET S = A+B+C+D+E
30 LET M = S/ 5
40 PRINT S,M
50 END

```
- a. store A, B, C, D, and E in the computer
 - b. print the letters S and M
 - c. print the sum and average of five numbers
 - d. calculate large sums
 - e. I don't know
20. The computer must have two types of information to solve a problem:
- a. the problem and the answer
 - b. the name of the program and user number
 - c. the data and the instructions
 - d. the name of the program and your name
 - e. I don't know

One of the more comprehensive measurement tools for computer literacy appears to be a series of unit tests designed by Dublin and Kelman (1986:59, 107, 223, 309, 385) and is reproduced as follows:

Match each type of computer with its approximate cost.

- | | |
|--|-------------------------------|
| 1. microcomputer | a. over \$20 million |
| 2. supercomputer | b. over \$1 million |
| 3. minicomputer | c. \$10,000-\$300,000 |
| 4. mainframe computer | d. \$100-\$10,000 |
| 5. Which of the following would not contain a computer? | |
| a. clock | b. traffic light |
| c. textbook | d. typewriter |
| 6. From what other machine did Babbage get his idea for using punched cards in his mechanical calculating machine? | |
| a. weaving loom | c. Adding and Listing machine |
| b. cash register | d. mail postmarker |
| 7. A word processor is what type of computer? | |
| a. mainframe | b. silicon |
| c. compatible | d. dedicated |

Indicate whether each statement is T true or F false.

8. The first real calculating tool was the slide rule.
9. Organizing information helped businesses grow.
10. Hollerith's Statistical Tabulating Machine was electromechanical and used punched cards.
11. Relay calculators depended on mechanical gears.
12. The introduction of the microcomputer did the most to change people's views of computers as "giant brains."

Write the word(s) that correctly complete each sentence.

13. A ____ computer can do many different tasks.
14. The possibility of ____ is a more serious problem with computers than are electrical problems.

15. The first machine designed to make printed information available to many people was the ____.
16. The first generation of electronic computers was made possible by the invention of the ____.
17. Second generation computers used ____ to control the flow of electricity.
18. An ____ circuit built on a single silicon chip was the beginning of third generation computers.
19. The fourth generation used mass production of chips containing hundreds of components, a breakthrough called ____.
20. The form of AI in which computers apply rules to a knowledge base to give the user suggestions is called an ____.

Match each computer term with an example.

- | | |
|-------------------------|---------------------------|
| 1. application software | a. floppy disk |
| 2. mass storage device | b. keyboard |
| 3. operating system | c. dot matrix printer |
| 4. input device | d. electronic spreadsheet |
| 5. output unit | e. MS-DOS, UNIX, or CP/M |

Choose the best answer.

6. Which term is used to describe computer memory?
a. REM b. RIM c. RAM d. ROME
7. Which term describes a kind of printer?
a. mouse b. ink jet c. copy utility d. CAD/CAM
8. Which of the following is a function of application software?
a. data processing c. booting
b. cursor movement d. line feeding

Indicate whether each statement is T true or F false.

9. The main difference between RAM and ROM is that RAM cannot be changed by the computer user and ROM can.

10. Hard disks hold less information than floppy disks do.
11. "Pushing it to its limits" is a good test of software.

Write what each abbreviation stands for.

- | | | |
|---------|---------|---------|
| 12. CPU | 15. RAM | 18. DOS |
| 13. ALU | 16. CRT | 19. VDT |
| 14. ROM | 17. CMI | 20. CAI |

Write the word(s) that correctly complete each sentence.

21. Four basic functions of hardware are input, processing, ____, and output.
 22. The ____, or "brains," in a microcomputer is contained on a single microprocessor chip.
 23. Because an original disk can be lost or damaged, it is very important to keep a ____ copy of it.
 24. The two main types of output devices are the video screen and the ____.
 25. People's ability to transfer information from one computer to another is limited because different machines are ____.
- 1-6 Order the steps for writing a report on a word processor.
- a. typing source notes onto the computer
 - b. brainstorming topics to select among
 - c. searching for and replacing misspelled words
 - d. formatting the final document (margins, spacing)
 - e. using the tab key to indent sub-idea notes
 - f. writing to your outline

Choose the best answer.

7. During which activity with a DBMS would you be arranging your records in alphabetical order?
 - a. entering b. storing c. searching d. sorting
8. What feature does a spreadsheet provide that makes it a good tool for forecasting the effects of certain changes?
 - a. accurate recording keeping

- b. automatic recalculations
- c. professional looking charts
- d. truncated labels

9. Which word is necessary in the description of how a computer places computer graphic images on the screen?
a. pixel b. modem c. mouse d. coupler
10. Computer communications by telephone are described as:
a. fast, cheap b. slow, expensive c. difficult
d. boring

Indicate whether each statement is T true or F false.

11. Spelling checkers can find mistakes like writing by for bye.
12. In an open-loop system, human operators are informed by the computer of problems with the manufacturing process.
13. Music synthesizers make full-length animated films possible.

Write the word(s) that correctly complete each sentence.

14. An activity called ____ allows you to put information from a data base into a letter done on a word processor.
15. A disadvantage of computer ____ is expensive of installation.
16. The U.S. ____ is the biggest computer user in the world.
17. Computers will never replace teachers because such a step would eliminate an important part of education, namely ____.
18. Software that combines applications such as word processing, data base systems, and spreadsheets is called ____.
19. Clear, detailed graphics are called ____ resolution.

Match each step in writing a program with its main purpose.

- | | |
|-------------------------|-------------------------------|
| 1. analyze problem | a. to check for errors |
| 2. develop algorithm | b. to help others use it |
| 3. code program | c. to consider all issues |
| 4. debug program | d. to see if it really works |
| 5. run finished program | e. to stepwise refine modules |
| 6. document program | f. to identify solution steps |

Choose the best answer.

7. Which number system is not used to represent data in machine language?
a. binary b. decimal c. octal d. hexadecimal
8. In BASIC, the computer recognizes an instruction as a statement when it starts with which of the following?
a. dollar sign b. semicolon c. letter d. number
9. What are modules called in BASIC?
a. functions b. strings c. subroutines d. arguments
10. Which does not let you input data into a BASIC program?
a. LET b. READ c. REM d. INPUT

Indicate whether each statement is T true or F false.

11. The ASCII code uses eight bits, and a group of eight bits is called a byte.
12. The disadvantage of a user language is that a programmer is needed to help the computer understand it.
13. The BASIC command to erase a program in memory is END.
14. When two FOR...NEXT loops are nested, the second NEXT relates to the second FOR.

15. The order of words and numbers in DATA statements is important.

Write the word(s) that correctly complete each sentence.

16. The language that the CPU understands is called ____.
17. With structured coding, all steps in a program can be written as a linear sequence, a branch, or a loop, determining how ____ are entered or exited.
18. The most important parts of your program documentation are the ____ statements within the program itself.
19. ____ errors are the most difficult to find and to fix.
20. Most students will use ____ to write game programs.

Mark whether each of the following is more descriptive of an (IND) industrial society or an (INF) information society.

1. more products manufactured for consumers than for commerce
2. more working time with hands than with minds
3. much more time spent working than on leisure activities
4. working to improve one's lifestyle
5. In which careers are computers likely to be least used?
a. arts b. manufacturing c. law d. medicine
6. Which of these is a technique for computer system security?
a. sabotage b. firmware c. embezzlement
d. encryption

Choose the best answer.

7. Which problem with computers most concerns educators?
a. piracy b. inequities c. automation d. fraud

8. Which of these is a possible way to increase computer speed?
- | | |
|------------------------|-------------------------|
| a. circular processing | b. inference processing |
| c. word processing | d. parallel processing |

Indicate whether each of the following is T true or F false.

9. In many careers people choose, they must use computers.
10. Computer criminals may face prosecution, fines, or prison.
11. Software theft is one reason that software is so expensive.
12. Use of computers in courts should speed up trial dates.
13. In the future, people may be more productive in fewer hours.

Write the word(s) that correctly complete each sentence.

14. The use of electrical or mechanical devices to operate a machine or to control a job is called ____.
15. The most common computer crime is ____ theft.
16. Ways of stealing money by computer are called fraud and ____.
17. Some criminals use ____ lines to access others' computers.
18. People think and make mistakes; ____ do not.
19. If you are careful to whom you give information about yourself, you are guarding your right to ____.
20. The ____ will almost certainly play a role in your life.

Summary

Recent literature indicates a strong need for every student to be computer literate and offers many ideas and/or methodology for obtaining such literacy. Students and teachers should interact by reading, listening, writing, observing, and discussing computers and data processing as well as having hands-on experience.

Computer technology has had a vast impact on education at all levels and is constantly changing and advancing at a rapid rate. Therefore, it is imperative that teachers realize the importance of computer literacy and what it entails, that suitable guidelines are established for appropriate levels of instruction, and that measurement tools adequately reflect attained knowledge of computer literacy.

CHAPTER III

PROCEDURES

This study was conducted to determine an acceptable definition for computer literacy, to help develop or adapt an acceptable set of guidelines to obtain that literacy, and to help develop or adapt an appropriate tool to measure the attained computer literacy level for high school seniors at Sidney Senior High School. The procedures followed in organizing the background for the study, the definition arrived at for computer literacy, the design of the guidelines, the design and administration of the measurement tool, and the method of data analysis are discussed in this chapter.

Sources of Data

Chapter II, Review of Literature, was based on information in the Roland R. Renne Library, Montana State University, in the library/resource rooms of the Business Education and Office Systems Department, Montana State University, at the Montana State Department of Public Instruction, and the writer's private professional library. Most of the information

was found in Business Education journals, such as The Balance Sheet, The Business Education Forum, The Computing Teacher, and The Journal of Business Education.

The data used in determining the results of the measurement tool were obtained through administering the measurement tool to the graduating seniors at Sidney Senior High School.

Development of Definition

The definition for computer literacy was developed through the review of literature. Research clearly indicated that the basics of computer literacy for high school graduates include competency in the following areas: background of the computer including its early history and development, terminology relevant to the computer and its parts, operational functions of the computer, rules and regulations governing use of the computer and copyrighted software, and the relevancy of the computer today and in the future. Special emphasis was placed on understanding the concepts of computer functions and hands-on experience.

Development of Guidelines

The guidelines were based on the material discovered through the review of literature. The following areas provided the foundation for the guidelines:

1. Computers yesterday and today
2. The computer system
3. Using software tools
4. Computer programming
5. Computers and society

(See Appendix for completed guidelines.)

Development of Measurement Tool

The measurement tool was designed to measure the students' comprehension of the material covered in the guidelines for obtaining computer literacy.

The measurement tool was evaluated by members of the Computer Science Department, Business Education Department, and the Vice Principal of Sidney Senior High School. The tool was also reviewed by the Graduate Committee Chairperson at Montana State University. (See Appendix for completed measurement tool).

Administration of Measurement Tool

The measurement tool was administered to the graduating seniors at Sidney Senior High School in May 1987. The following table indicates the number of seniors completing the measurement tool.

Table 1.
Number of Seniors Completing Measurement Tool

=====		
<u>Number of</u> <u>Seniors</u>	<u>Total Number</u> <u>Measured</u>	<u>Percent</u> <u>Measured</u>
84	76	90.5%
=====		

Analysis of Data

The following six types of questions were used in the measurement tool:

1. Matching--each type of computer was to be matched with its approximate cost and each computer term was to be matched with an example.

2. Identifying--each given abbreviation was to be identified.

3. Organizing--steps for writing a report on a word processor were to be placed in the proper order.

4. Multiple choice--the correct and/or best answer(s) were to be selected.

5. True or False--whether each statement was true or false was to be indicated.

6. Completion--the word(s) to correctly complete each sentence were to be written.

After the data were gathered and graded, a table was set up to summarize the results. The table shows the number and percentage of students at the various grading levels. (See FINDINGS, page 41). The data gathered were limited to the 1986-87 senior class of Sidney Senior High School, Sidney, Montana.

Chapter IV

FINDINGS

In this chapter the results of the measurement tool are presented. The measurement tool was administered to 76 of the 84 graduating seniors at Sidney Senior High School. Therefore, the results apply to 90.5 percent of the graduating seniors.

To summarize the results, Table 2 shows the number and percentage of students at the various grading levels.

Table 2. Results of Measurement Tool

Grading level	Number of Students	Percentage of students
A = 90-100	1	1.3
B = 80- 90	1	1.3
C = 70- 80	2	2.6
D = 60- 70	8	10.5
F = 50- 60	7	9.2
40- 50	24	31.6
30- 40	12	15.8
20- 30	11	14.5
10- 20	7	9.2
0- 10	3	3.9

According to the results of the measurement tool used in this research, 15.8 percent of the students measured were computer literate.

In addition to the results of the measurement tool as illustrated in Table 2, several general observations were made as a result of this research:

History--the majority of students measured were not really aware of the early history and development of the computer. Students should be more aware of computer differences as to size, cost, and power, and should have a knowledge of the growth of computer technology.

Terminology--many of the students measured did not appear to have a "talking" knowledge of computer terms. They do not need to be technical experts to be computer literate, but they should be knowledgeable enough to read and understand the more common terms.

Languages--only a small portion of the students measured appeared to have knowledge of the various computer languages. In addition to BASIC, students should be aware of the other languages although they may not use them in a computer literacy class.

Functions--most students measured appeared to understand what the major peripheral devices were, but they did not indicate an understanding of the functions as to input, processing, storage, and output.

Legal implications--very few students demonstrated a knowledge of computer-related crimes. Since many computer criminals tend to be teenage "hackers" or well

educated, technically skilled young people the students should be more aware of this situation. Students did not appear to regard copying software as a crime.

Future--nearly all of the students measured indicated an understanding of the importance of the computer in the future, in their personal lives, in education, and in their careers.

It should also be noted here that the measurement tool was administered to the students during their last formal week of school and interest was not at its highest level. A better time for administration of the tool might be at the beginning of the last month of instruction for the seniors.

A very small percentage of the students measured did not have any computer experience, about thirty percent of the students had been enrolled in a computer literacy class, and most of them had had some hands-on experience in learning to operate the Apple computer and/or by using computer assisted instructional packages in various classes.

In addition, it appears that one instructional unit on computer literacy is not enough--repetition is needed to assure that graduating seniors become more computer literate.

Chapter V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to determine an acceptable definition for computer literacy, to help develop or adapt an acceptable set of guidelines to obtain that literacy, and to help develop or adapt an appropriate tool to measure the attained computer literacy level for high school seniors at Sidney Senior High School. Another major area of interest was the end result of the measurement tool--the computer literacy level of the graduating seniors.

The measurement tool was administered to the graduating seniors during their final week of school. Seventy-six of the eighty-five seniors responded to the tool. A sample of the measurement tool can be found in Appendix B.

Conclusions

At the time the review of literature was completed, the definition determined for computer literacy was most acceptable. However, since computer technology has advanced at such an unprecedented pace

it is apparent that the definition for computer literacy should be amended to include an introduction to word processing, data base, spread sheets, and graphics.

The guidelines for obtaining computer literacy and the measurement tool therefor were deemed most acceptable also. However, to follow through on the expanded definition for computer literacy, the guidelines for obtaining computer literacy should be amended to include an introduction to word processing, data base, spread sheets, and graphics. The measurement tool, therefore, should also be expanded to measure the added material.

Results of the measurement tool appear to indicate a need for a more serious approach to learning the fundamentals of computer literacy. However, since computer literacy is a relatively new area of study in the schools it is assumed that the results of the measurement tool will improve each year as the study of computer literacy is filtered down and expanded upon in the middle and elementary schools. A gradual repetition of facts and increased hands-on experience should make each year's graduating seniors more computer literate.

Recommendations

The educators at all levels who reviewed the definition for computer literacy, the guidelines for obtaining that literacy, and the measurement tool for measuring that literacy were in agreement that all the material was very satisfactory. However, due to the escalation of computer technology and the results of the measurement tool, the following recommendations are submitted:

1. The definition for computer literacy should be expanded to include an introduction to word processing, data base, spread sheets, and graphics.

2. The guidelines for obtaining computer literacy should be expanded to include an introduction to word processing, data base, spread sheets, and graphics.

3. The measurement tool for measuring the computer literacy level for graduating seniors should be expanded to measure the addition of introduction to word processing, data base, spread sheets, and graphics.

4. Guidelines established previously for K-8 for the Sidney schools (not included in this study) should be reviewed, followed, and/or updated.

5. All students should be made more aware of the early history and development of the computer, computer

terminology, operational functions of the computer, and an understanding of those functions.

6. As computer operators become more sophisticated, more emphasis should be placed on understanding the rules and regulations governing copyrighted software and use of the computer.

7. For a combination of strong technical background with practical classroom experience, Macmillan Computer Literacy offers a comprehensive introduction to computer literacy for a broad range of students. As a result of this research, this text is highly recommended for a computer literacy course at the high school level. The comprehensive content of this text and the way that it is organized to introduce students to the history of computers, hardware, software, terminology, applications, programming, and the impact of computers in the world today provide support for this recommendation.

8. Due to the rapid escalation of computer technology, it is strongly recommended that all school personnel be made aware of the need for articulation in the computer program and that the program be reviewed and updated annually.

9. It is recommended that all students at the high school level be required to successfully complete a structured course covering the elements of computer literacy.

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APPENDIX A

GUIDELINES FOR OBTAINING COMPUTER LITERACY

I. COMPUTERS YESTERDAY AND TODAY

- A. Computers are Everywhere
 - 1. Obvious and not so obvious computers
 - 2. Careers--computer operator
 - 3. Powers and limitations of computers
 - 4. Selecting a computer
- B. Problem Solving Before Computers
 - 1. Calculating tools
 - 2. Writing and organizing tools
 - 3. Careers--electronic mail specialist
 - 4. Work tools
- C. Brief History of Computers
 - 1. Mechanical calculating devices
 - 2. Electromechanical calculating devices
 - 3. The first electronic computers
 - 4. Careers--computer design engineer
 - 5. Third-generation computers
 - 6. Fourth generation computers
 - 7. The next computer generation

II. THE COMPUTER SYSTEM

- A. Hardware
 - 1. Input
 - 2. Processing
 - 3. Careers--data entry operator
 - 4. Storage
 - 5. Output
 - 6. Using Hardware
- B. Software
 - 1. System software
 - 2. Application software for work
 - 3. Careers--computer sales
 - 4. Application software for education
 - 5. Application software for entertainment
 - 6. Evaluating software

III. USING SOFTWARE TOOLS

- A. Computer Tools in Society
 - 1. Computers in business and industry
 - 2. Careers--technical writer
 - 3. Computers in science and engineering
 - 4. Computers in government and politics
 - 5. Computers in education
 - 6. Computers in health

7. Computers in arts, leisure, and religion
8. Computers in transportation and agriculture

IV. COMPUTER PROGRAMMING

- A. Computer Languages
 1. Machine language
 2. Careers--systems programmer
 3. Programming languages
 4. User languages

V. COMPUTERS AND SOCIETY

- A. Changes in the Workplace
 1. Changing nature of work
 2. Jobs with and without computers
 3. Computers and elimination of jobs
 4. Careers--computer service technician
 5. Computers and new jobs for people
- B. Computers and the Law
 1. Computer crimes
 2. Careers--security analyst
 3. How computer crimes are committed
 4. Software theft
 5. Computers fighting crime
- C. Computers and Social Uses
 1. Computers and you
 2. Attitudes toward computers
 3. Careers--computer musician
 4. Computers and equity
 5. Computers and privacy
- D. The Future
 1. Future of hardware
 2. Careers--robot technician
 3. Future of software
 4. Home of the future
 5. Information society of the future

APPENDIX B

COMPUTER LITERACY COMPETENCY
LEVEL FOR GRADUATING SENIORS

Please answer the questions on the accompanying Answer Sheet.

I. MATCHING

Match each type of computer with its approximate cost.

- | | |
|------------------|-----------------------|
| 1. microcomputer | a. over \$20 million |
| 2. supercomputer | b. over \$1 million |
| 3. minicomputer | c. \$10,000-\$300,000 |
| 4. mainframe | d. \$100-\$10,000 |

Match each computer term with an example.

- | | |
|-------------------------|---------------------------|
| 5. application software | a. floppydisk |
| 6. mass storage device | b. keyboard |
| 7. operating system | c. dot matrix printer |
| 8. input device | d. electronic spreadsheet |
| 9. output unit | e. MS-DOS, UNIX, or CP/M |

II. ABBREVIATIONS

Write what each abbreviation stands for.

1. CPU
2. RAM
3. DOS
4. VDT

III. ORGANIZING

Order the steps for writing a report on a word processor.

1. Typing source notes onto the computer.
2. Brainstorming topics to select among.
3. Searching for and replacing misspelled words.
4. Formatting the final document (margins, spacing).
5. Using the tab to indent sub-idea notes.
6. Writing to your outline.

IV. MULTIPLE CHOICE

Choose the correct answer.

1. Which of the following would not contain a computer?
a. clock b. traffic light c. textbook d. typewriter
2. From what other machine did Babbage get his idea for using punched cards in his mechanical calculating machine?
a. weaving loom c. adding and listing machine
b. cash register d. mail postmarker
3. A word processor is what type of computer?
a. mainframe b. silicon c. compatible d. dedicated

1

-

V. TRUE OR FALSE

Indicate whether each statement is T (true) or F (false)

1. The first real calculating tool was the slide rule.
2. Organizing information helped businesses grow.
3. Hollerith's Statistical Tabulating Machine was electromechanical and used punched cards.
4. Relay calculators depended on mechanical gears.
5. The introduction of the microcomputer did the most to change people's views of computers as "giant brains."

6. The main difference between RAM and ROM is that RAM cannot be changed by the computer user and ROM can.
7. Hard disks hold less information than floppy disks do.
8. "Pushing it to its limits" is a good test of software.
9. Spelling checkers can find mistakes like writing by for bye.
10. The disadvantage of a user language is that a programmer is needed to help the computer understand it.
11. A disadvantage of computer cable is expense of installation.
12. Computer criminals may face prosecution, fines, or prison.
13. Software theft is one reason that software is so expensive.
14. Use of computers in courts should speed up trial dates.
15. In the future, people may be more productive in fewer hours.

COMPLETION

Write the word(s) that correctly complete each sentence.

1. A _____ computer can do many different tasks.
2. The possibility of _____ is a more serious problem with computers than are electrical problems.
3. The first machine designed to make printed information available to many people was the _____.
4. The first generation of electronic computers was made possible by the invention of the _____.
5. Second generation computers used _____ to control the flow of electricity.
6. An _____ circuit built on a single silicon chip was the beginning of the third generation of computers.
7. The fourth generation used mass production of chips containing hundreds of components, a breakthrough called _____.
8. Four basic functions of hardware are input, processing, _____, and output.
9. The _____, or "brains," in a microcomputer is contained on a single micro-processor chip.
10. Because an original disk can be lost or damaged, it is very important to keep a _____ copy of it.
11. The two main types of output devices are the video screen and the _____.
12. People's ability to transfer information from one computer to another is limited because different machines are _____.

COMPLETION CONTINUED

13. The U.S. _____ is the biggest computer user in the world.
14. Computers will never replace teachers because such a step would eliminate an important part of education, namely _____.
15. Software that combines applications such as word processing, data base systems, and spreadsheets is called _____.
16. The language that the CPU understands is called _____ language.
17. The most common computer crime is _____ theft.
18. Ways of stealing money by computer are called fraud and _____.
19. Some criminals use _____ lines to access others' computers.
20. People think and make mistakes; _____ do not.
21. The _____ will almost certainly play a role in your life!

ANSWER SHEET

I. MATCHING

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____

II. ABBREVIATIONS

1. _____
2. _____
3. _____
4. _____

III. ORGANIZING

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

IV. MULTIPLE CHOICE

1. _____
2. _____
3. _____
4. _____
5. _____
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9. _____
10. _____
11. _____
12. _____
13. _____
14. _____

V. TRUE OR FALSE

1. _____
2. _____
3. _____
4. _____
5. _____

TRUE OR FALSE CONTINUED

6. _____
7. _____
8. _____
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VI. COMPLETION

1. _____
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