COLLEGE FRESHMAN LEVEL COMPUTER LITERACY TEACHING OBJECTIVES AS STATED IN PERIODICAL LITERATURE: 1980-2002

by

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COLLEGE FRESHMAN LEVEL COMPUTER LITERACY TEACHING

OBJECTIVES AS STATED IN PERIODICAL LITERATURE:

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ABSTRACT

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Purpose of the Study: The major purpose of this investigation is to prepare a recent chronological history and analysis of the objectives for teaching computer literacy in the colleges and universities of the United States during the period 1980-2002 as reflected by objective statements in articles from selected professional periodicals.

Procedure: The 1980-2002 period was divided into two subperiods on the basis of major historical events. Selected professional periodicals were searched for statements of objectives of college freshman-level computer literacy teaching. These statements were cataloged into Knowledge, Process, Attitude and Interest, or Cultural Awareness categories. The resulting data were classified within and across the two subperiods according to the frequency of occurrence, category, authorship, and year.

Findings: The major findings of this investigation included the following:

1. The number of articles relating to objectives for teaching College Freshman-level Computer Literacy decreased during the time of this study.

2. There were approximately four times as many research-oriented articles as non-research oriented articles in the two subperiods.

3. Authors in Higher Education produced the most articles and the most statements in each subperiod of the study. Secondary Education authors produced the least articles and statements in the two subperiods.

4. Statements in the Attitude and Interest category were most frequent in the two subperiods.

5. During both subperiods, the most important objectives for College Freshman-level Computer Literacy instruction were Attitudes and Appreciations (from the Attitude and Interest category), and Processes, skills, and techniques (from the Process category). The third most important objective during the first subperiod was Major facts, principles, or fundamentals (from the Knowledge category). During the second subperiod, the third most important objective was Philosophical, sociological, and political aspects (from the Cultural Awareness category)

6. Aesthetic aspect objectives were consistently ranked as least important throughout the study.

7. Authors in Higher Education were responsible for most of the research-oriented articles and statements throughout the study. Secondary Education authors were responsible for the least.

8. The emphasis placed upon partnership and balance between computer science professionals, end users, and computer educators was evident in the drastic increase of multiple author articles during the course of the study.

Conclusions: Based on the findings of this investigation, the following conclusions were made:

1. The objectives for teaching College Freshman-level Computer Literacy were influenced by historical events, especially the implementation of SDI, the Cold War, the U.S. Space Program, the rapid innovations in the computer industry – especially the microcomputer industry segment, and the explosive growth of the Internet.

2. Authors in Higher Education wrote more articles about the objectives for the teaching of College Freshman-level Computer Literacy than those in the other categories. This was probably a reflection of the "publish or perish" environment in many colleges and universities.

3. The most important objectives for College Freshman-level Computer Literacy teaching were Attitudes and Appreciations, Processes, skills, and techniques, Major facts, principles, or fundamentals, and Philosophical, sociological, and political aspects. The preponderance of these objectives is most likely a result of the rapid growth of the microcomputer hardware and software industry during this period.

4. Some authors pointed out in specific statements of objectives that College Freshman-level Computer Literacy courses should be service courses designed to teach the student how to use computers to do well in other courses. Other authors saw College Freshman-level Computer Literacy courses as unique courses with their own content. (McLean and Kappleman, 1992, p. 153)

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CONTENTS

CHAPTER 1

INTRODUCTION

The year was 1970. Three astronauts were 200,000 miles away from Earth and had recently completed a live television broadcast when an oxygen tank exploded. Immediately after the explosion, the command module of Apollo 13 lost its normal supply of light, electricity, and water. Commander James A. Lovell radioed, "Houston, we have a problem here" (Cortright, 1975, p. 55). This was just the beginning of a series of problems and a terrifying experience for the Apollo 13 astronauts, NASA personnel in Houston and other locations, and the entire population of the world. When he radioed his message to Houston, little did Lovell realize that the ultimate survival of his three man crew would depend upon a small device embedded within the re-entry computer of his Command Module. This device was called a microprocessor chip, named the "4Pi" (IBM, 2005, p. 2) by its developer International Business Machines (IBM), and was specifically developed for use in both "the computer systems of the Apollo Command Module and of the B-52 Stratofortress" (Jenkins, 2001, Para. 3). The fact that the computer system in the Command Module withstood the sub-zero temperatures of outer space thoroughly demonstrated both the viability and durability of the microprocessor chip. It also inspired a group of young computer scientists to embark on a journey that would forever change the look, shape, and availability of computers.

Soon after Apollo 13 safely returned to Earth, a brand new company named Intel was incorporated and "successfully marketed [its] first microprocessor" (Intel, 2005, Para. 1). By 1974, Intel's 8080 microprocessor became an integral part of the first commercially available microcomputer – the Altair. Other versions of the chip were developed and successfully used

by other microcomputer manufacturers throughout the United States. The continued success of Intel's microprocessor chips coupled with the growing sales of microcomputers during the late 1970s led IBM to enter the microcomputer market with its "IBM-PC (an abbreviation of IBM Personal Computer) in 1981" (IBM, 2005, p. 14).

By 1980, personal computers were beginning to appear in homes across the United States. As a result of the increased availability of microcomputers in the homes of average citizens, colleges and universities realized a need to broaden their computer course offerings by adding instruction in microcomputers. Most often this instruction was added to an existing freshman level course in Data Processing entitled *Introduction to Data Processing*. This course later evolved into the *Introduction to Computer Science, Computers and Society,* or *Computer Literacy* courses prevalent today. It is within this framework of increased use of microcomputers by the citizenry of the United States that this study of computer literacy objective statements was proposed.

In 1972, Ogden began a series of studies to develop a history of science teaching in the United States based on objective statements found within articles from selected periodical literature. Ogden began with a study of secondary school chemistry (1972). Since then, similar investigations have expanded and enhanced the study to include biology by Ogden and Jackson (1974), physical education by Lock (1975), high school home economics by Vance (1976), high school foreign language by Huddleston (1976), high school reading by Fulton (1977), earth science by Roy (1979), college biology by Rand (1984), secondary school mathematics by McConnell (1986), college freshman English composition by Mills (1990), college music by Timberlake (1993), physics by Sehr (1993), secondary school science by Hemby (2000) and secondary school physical

education by Huff (2002). The major purpose of the above investigations was to identify and classify stated objectives that could have been operating guidelines for teachers of college freshman level subjects during the period 1918-1992. Since Computer Science has emerged as an academic field of study and Computer Literacy has evolved as an educational aim over the past twenty years, there has not been a similar study attempting to delineate objectives for the teaching of college freshman introductory level computer literacy, also referred to as Introduction to Computer Science.

Statement of the Problem

The major problem of this study was an examination of publications attempting to delineate objectives for the teaching of computer literacy for any period of time. In order to develop a recent history of computer literacy teaching in the United States, there is a need for current data. This study is a continuation of the series of studies by Ogden, Jackson, Lock, Roy, Mills, Sehr, Hemby, Huff, and others, but focuses only on selected periodical literature for the period 1980-2002.

Purposes of the Study

The major purpose of this investigation was to prepare a recent chronological history and analysis of the objectives for teaching computer literacy in the colleges and universities of the United States during the period 1980-2002 as reflected by objective statements in articles from selected professional periodicals. Data were catalogued according to the following criteria:

1) Frequency of articles;

2) Frequency of statements in articles;

3) Number and percentage of statements; and

4) Specific type of objective.

Additionally, statements were further catalogued into one of the following categories:

1) Knowledge;

2) Process;

3) Attitude and Interest; and

4) Cultural Awareness.

The resulting data were categorized across and within subperiods according to:

1) Frequency of occurrence;

2) Category;

3) Authorship; and

4) Year.

Research Questions

Data obtained from professional periodicals was analyzed, tabulated, and evaluated in an attempt to answer the following questions:

1. What is the frequency of articles concerned with the objectives of teaching college freshman level computer literacy found in selected periodical literature categorized according to year and authorship within each subperiod and across all subperiods?

2. What is the frequency of statements concerned with the objectives of teaching college freshman level computer literacy found in selected periodical literature categorized according to year and authorship within each subperiod and across all subperiods?

3. What are the frequency, rank, and percentage of statements concerned with the objectives of teaching college freshman level computer literacy found in selected periodical literature categorized according to year, category, and authorship within each subperiod and across all subperiods?

4. What is the rank and frequency of each Knowledge statement concerned with the teaching of college freshman level computer literacy found in selected periodical literature, categorized according to year and type within each subperiod and across all subperiods?

5. What is the percentage of Knowledge statements concerned with the teaching of college freshman level computer literacy found in selected periodical literature categorized according to type and authorship within each subperiod and across all subperiods?

6. What are the frequency and rank of each Process statement concerned with the teaching of college freshman level computer literacy found in selected periodical literature categorized according to year and type within each subperiod and across all subperiods?

7. What is the percentage of Process statements concerned with the teaching of college freshman level computer literacy found in periodical literature categorized according to type and authorship within each subperiod and across all subperiods?

8. What are the frequency and rank of each Attitude and Interest statement concerned with the teaching of college freshman level computer literacy found

in selected periodical literature categorized according to year and type within each subperiod and across all subperiods?

9. What is the percentage of Attitude and Interest statements concerned with the teaching of college freshman level computer literacy found in periodical literature categorized according to year and type and authorship within each subperiod and across all subperiods?

10. What is the rank and frequency of each Cultural Awareness statement concerned with the teaching of college freshman level computer literacy found in selected periodical literature categorized according to year and type within each subperiod and across all subperiods?

11. What is the percentage of Cultural Awareness statements concerned with the teaching of college freshman level computer literacy found in periodical literature categorized according to type and authorship within each subperiod and across all subperiods?

12. What is the rank of each type of objective statement concerned with the teaching of college freshman level computer literacy found in selected periodical literature categorized according to frequency, percentage of occurrence, and authorship within each subperiod and across all subperiods?

Significance of the Study

This investigation parallels and broadens a series begun by Ogden in chemistry (1972), Ogden and Jackson in biology (1974), Roy in earth science (1979), Sehr in physics (1993), and Hemby in secondary science (2000). These studies developed a synopsis of secondary school science instruction in the United States by classifying

autogenous objective statements from selected periodical literature over selected time periods from 1918-1992. Lock (1975), Vance (1976), Huddleston (1976), Fulton (1977), Woodard (1982), Rand (1984), Garin (1984), McConnell (1986), Mills (1990), Timberlake (1993), and Huff (2002) used similar procedures and methodology to analyze other areas of academic curriculum instruction. Although the proposed study closely parallels that of the other authors, it focuses on objective statements pertaining to college freshman level computer literacy instruction during the time period 1980 - 2002.

Method of Procedure

This study will identify and classify goals, aims, or objectives for teaching college freshman level computer literacy using the method of content analysis. All issues of the selected journals were examined for articles discussing college freshman level computer literacy teaching. Articles containing such information were re-examined by applying the article/objective selection criteria. Articles meeting the criteria were referenced on a classification sheet designed and used by Roy (1979) and successfully utilized by others since its development. Articles were classified according to the author's occupation, objective class, and subperiod. The objective statements were quoted on the classification sheet. One classification sheet was completed for each article selected. The data were classified, tabulated, and analyzed across the two subperiods according to the dictates of each study question. The results are presented in both written analysis and table formats.

Definition of Terms

Except for those listed below, all of the terms used in this investigation adhere to their generally accepted meanings.

Authorship

This term refers to an occupational classification of the authors of articles obtained. The major groupings are those used by Hemby (2000), Huff (2002), Mills (1990), Ogden (1972), Ogden and Jackson (1974), Rand (1984), Roy (1979), Sehr (1993), and Woodard (1982).

Category

This term refers to any one of the four objective statement groups defined by Hemby (2000, p. 12), Huff (2002, p. 9), Mills (1990, p. 18), Ogden (1972, p.16), Ogden and Jackson (1974, p.12-16), Ogden and Pella (1974, p.474-477), Rand (1984, p.8), Roy (1979, p.13), Sehr (1993, p.13), and Woodard (1982, p.14) as:

1. Knowledge objectives;
2. Process objectives;
3. Attitude and interest objectives; and
4. Cultural awareness objectives.

College Freshman-level

This term describes that part of the college and university curriculum that is planned for pupils in their first year of post-secondary education.

Computer Literacy

The term computer literacy has been attributed to Andrew Molnar, director of the Office of Computing Activities at the National Science Foundation in 1972. (Houghton Mifflin Company, 2005) Computer literacy includes an understanding computers and related systems. It also includes a working vocabulary of computer and information system components, the fundamental principles of computer processing

and a perspective for how non-technical people interact with technical people. It does not deal with how the computer works (digital circuits), but does imply knowledge of how the computer does its work (calculate, compare and copy). It requires a conceptual understanding of systems analysis & design, application programming, systems programming and datacenter operations. It also implies hands-on ability to work the operating system (Windows, Mac, Linux) and common applications such as spreadsheets, word processors, database programs, personal information managers (PIMs), e-mail programs and Web browsers. To be a computer literate, you must be able to define information requirements effectively and have an understanding of decision support tools, such as query languages, report writers, spreadsheets and financial planning systems.

Course in Computer Literacy

Computer literacy includes those courses taught at the college freshman level that are entitled "Introduction to Computer Science," "Computers and Society," "Computer Literacy," "Computing Fundamentals," "Microcomputer Applications," or any other course in which the fundamentals of computer literacy, as previously defined, are taught.

Most Important Objectives

These objectives are those indicated by a minimum of 12.5% appearance in periodical literature during any one subperiod (Hemby 2000, p. 12-13; Huff, 2002, p.10; Huddleston, 1976, p.10; Mills, 1990, p.19; Ogden, 1972, p. 27; Ogden and Pella, 1974, p.477; Rand, 1984, p.8; Roy, 1979, p.13; Sehr 1993, p.13; Vance, 1976, p.12; Woodard, 1982, p.14). The figure represents 1.5 times the 8.33% figure that would be

observed if all twelve objectives were cited with equal frequency. The intention in designating a group of objectives as "most important" is to allow the convenience of discussing those objectives most frequently found during any one subperiod.

Objectives

Objectives are the stated outcomes, goals, or aims of instruction put forward by the authors of selected articles (Hemby, 2000, p. 13; Huddleston, 1976, p.10; Huff, 2002, p.10; Mills, 1990, p. 19; Ogden, 1972, p.16; Ogden, 1974, p.182; Ogden and Jackson, 1974, p.17; Ogden and Pella, 1974, p.477; Rand, 1984, p.9; Roy, 1979, p.14; Sehr, 1993, p.13; Vance, 1976, p.11; Woodard, 1982, p.15).

Period

Refers to the aggregate time span included in this study and is understood to be the years from 1980 through 2002, inclusively.

Subperiod

Represents either of the two overlapping time units within the period defined in this study and marked by selected events in the social, political, or educational history of the United States. The subperiods are 1980-1995 and 1993-2002.

Type

This term refers to any of the 12 subcategories of objective statements as defined by Ogden (1972, p.17-26), Ogden and Jackson (1974, p.13-16), Ogden and Pella (1974, p.474-477), Roy (1979, p.15), Woodard (1982, p.16), Mills (1990, p. 21), Sehr (1993, p.15), Hemby (2000, p.14-15), and Huff (2002, p.11-12).

Selected Journals

The following journals were utilized as data sources for the proposed study:

1. *T.H.E. Journal*;
2. *Computing*;
3. *IEEE Annals of the History of Computing*;
4. *IEEE Transactions on Computers*;
5. *Journal of Information Systems*;
6. *Journal of Organizational Computing & Electronic Commerce*;
7. *Journal of the ACM* (Formerly *Journal of the Association for Computing Machinery*);
8. *Journal on Computing*; and
9. *MIS Quarterly*.

Limitations and Delimitations

The limitations and delimitations of the investigation are as follows:

1. The study was confined to the years 1980 to 2002 inclusively;
2. The study examined objectives for teaching college freshman level computer literacy only;
3. The study utilized only selected computer-related periodical literature written between 1980 and 2002 in a search for answers to questions posed by the investigator;
4. The study was not intended to be a complete history of college freshman level computer literacy or even computer literacy education;
5. The study reflected the natural bias of the editors of the respective journals in their selection of articles for publication; and
6. The study did not include letters to the editor found in the selected periodicals.

Assumptions

For purposes of this study, these assumptions are made:

1. That the use of the periodical literature selected furnishes a relatively accurate representation of the opinions held concerning the objectives for teaching college freshman level computer literacy;

2. That the writers who express themselves with regard to the teaching of college freshman level computer literacy are qualified and knowledgeable enough to do so; and

3. That other teaching professionals could replicate the study.

Organization of the Remainder of the Study

The major purpose of this study was to prepare a chronological history and analysis of the objectives for teaching college freshman level computer literacy in the United States during the period 1980 through 2002 as reflected by objective statements in articles from selected professional periodicals. The results are reported in the chapters of the dissertation in the form of narrative and accompanying tables. Chapter One provides an overview of the study. Chapter Two outlines the procedure of the study. Chapters Three and Four report the results of the investigation for each of the subperiods. Chapter Five consists of a complete summary and findings of the data collected for the 1980-2002 period.

CHAPTER 2

REVIEW OF THE LITERATURE

College Freshman-Level Computer Literacy: Historical Perspective

Introduction – Computing Before 1600

In order to fully understand the emergence of College Freshman-Level Computer Literacy courses in the United States, one must first understand the debate over the history of computers and the emergence of computing as a field of study. Modern computing developed from three different disciplines – mathematics, science (especially Astronomy), and business/accounting. Some of the earliest references to computing can be found in Rawlinson's 1994 translation of the Greek writer Herodotus. Herodotus attributed the rise of geometry to the Egyptian's need to resurvey their lands every year after the Nile flood to determine the taxes to be levied. "From this practice, I think, geometry first came to be known in Egypt, whence it passed into Greece" (Rawlinson, 1994, Para. 22). Others such as Price (1959, p. 60-67; 1961, p. 12) claim that arithmetic computing "arose out of the practical needs of the very mercantile-oriented Babylonians." Price expands his position by citing the discovery of an ancient Greek navigational computer by sponge divers working off the coast of the Aegean island of Antikythera in 1900. Price believed that this discovery (dated to approximately 65 BCE) proved his contention that computing arose from the need to navigate as well as the need to fully account for business transactions. The mathematical origins of computers can be traced to Baron von Napier, the Laird of Merchiston. Cajori (1893) was the first to acknowledge von Napier's 1614 invention of logarithms – a pillar of mathematics and, in later years, computer programming. This development, as described by Diderot (1967), was followed by the famous mathematician

Blaise Pascal's invention of the first mechanical calculating machine for addition and subtraction in 1642. Archibald (1941) documented Gottfried Leibniz's expansion of Pascal's work when he developed the Leibniz wheel. This invention surpassed Pascal's because it could fully compute addition, subtraction, multiplication and division automatically. Archibald (1941, p. 28) also noted that Leibniz's believed his wheel would "free men from slavery by the automation of dull but simple tasks." Additionally, Goldstine (1972, p. 7) noted that the Leibniz wheel was "still in use in some machines" in the early 1970s. Unfortunately, with the exception of Leibniz, the work of these pioneers as well as that of ancient peoples has largely been ignored.

The Building Blocks 1600 - 1930

In his comprehensive examination of the history of the computer, Goldstine (1972) selected 1600 as a starting point for the history of the modern computer, thus ignoring the efforts discussed above. Other authors such as Martin and Norman (1970, p. 6), Frates and Moldrup (1983, p. 14-15), Parker (1984, p. 16) and Moschovitis et al. (1999, p. 2) adopted Goldstine's excuse "that to say more on these earlier periods would add very little to our total knowledge of the electronic computer." Therefore, most modern computer literacy texts pay only lip service to earlier computing pioneers, credit Charles Babbage with the creation of the idea for both the difference engine (in 1823) and the analytical engine (in 1827), and declare that although these engines were never built to full scale they are the first modern computing machines. Morrison and Morrison (1961, p. 75) noted that Babbage was one of the "founding members of the Royal Astronomical Society" and later was named "Lucasian Professor of Mathematics at Cambridge." Thus, Babbage represented both the science and the mathematic divisions of early computer development.

Moseley (1970, p. 156-170) provided a detailed account of a colorful figure in the career of Charles Babbage, Augusta Ada Byron, daughter of the poet Lord Byron, and later the Countess of Lovelace. During an early visit to Babbage, she "observed Babbage's Analytical Engine." Although quite young, she understood how it worked and, according to Bowden and Bowden (1971, p. 20), "saw the great beauty of the invention." Moseley (1970, p. 156) also noted that "at age 27 she had become a close friend and associate of Babbage." At that time, she translated an account of Babbage's work written by Italian General Luigi Menabrea. During this translation effort, she expanded the original account to twice its original length by adding her own extensive notes. Her mathematical knowledge and instruction set skills added to the viability of Babbage's Analytical Engine efforts. Parker (1984, p. 22) stated "she has been called the first programmer because of her work on the kinds of instructions that would have been fed into the analytical engine to make it work."

Goldstine (1972, p. 65) noted that the next milestone in the development of the modern computer occurred "in 1889 when Herman Hollerith patented his census tabulating machine". The U.S. Government purchased this machine for use in tabulating the 1890 census. The machine was unique because it used both punched cards and electricity to perform its operations. Later, Hollerith formed the Tabulating machine Company to produce punched-card equipment for sale to both government and businesses. Belden and Belden (1962, p. 52) observed that "Thomas J. Watson joined Hollerith's company in 1914 and under his masterful leadership transformed the company into the International Business Machines Corporation" (hereinafter IBM) in 1924. Belden and Belden (1962, p. 79-93)

further describes the "rapid development of IBM's leadership" in the punched-card business equipment industry during the 1920-1940 period.

Early Acceptance and Wartime Advances – 1930 - 1950

Although punched-card computing devices were originally marketed to businesses, Howard Aiken of Harvard University obtained a $500,000 grant from IBM to develop a general-purpose computer that could be used by the scientific community. The result of Aiken's research was both the formation of the Harvard Computation Laboratory and the development of the Mark I computer, which both Belden and Belden (1962, p. 111) and Parker (1984, p. 23) described as a "gargantuan machine." Smith (1959, p. 202) noted that the Harvard Computational Laboratory under Aiken's leadership "introduced many new components and methods of design" as well as the development of a laboratory at Harvard where students could be given academic training in circuit and component design for electronic digital computers.

Similar punched-card computing devices were obtained from IBM for a joint project between the U.S. Army Ordnance Center and School at the Aberdeen, Maryland Proving Ground and the Moore School of Electrical Engineering at the University of Pennsylvania. The goal of this project was to create firing and bombing tables for the U.S. Army on the eve of World War II. Weik (1961) stated that the development of these tables required vast number of arduous calculations. To hasten the table development process, Physicist John Maulchy and Electrical Engineer John Presper Eckert developed the Electronic Numerical Integrator and Calculator. This machine, called the ENIAC for short, was the first large-scale general-purpose electronic computer. The U.S. Army used the ENIAC to successfully develop bombing and artillery tables in 1946. This one device

was able to do in seconds what would have taken 200 people 6 months to complete manually. The Achilles heel of the ENIAC was, as Parker (1984, p. 24) stated, the fact that "every time the operators wanted to do a new series of computations, they had to rewire it and reset switches – a process that could take several hours to complete."

While Aiken was working at Harvard and Mauchly and Eckert were working at the Aberdeen Proving Grounds, Atanasoff and Berry developed and patented a computing machine for the solution of linear algebraic equations at Iowa State University in 1937. Von Neumann and Goldstein (1947, p. 1061) credit Atanasoff and Berry with storing electrical charges in a circuit by using Leyden jars – thus creating the first electronic digital computer. This early work was used by von Neumann to develop his own ideas about storing programs within a computer. In recounting this development, Bell (1971, p. 92) noted that a series of reports von Neumann wrote and sent to the Library of Congress served in many ways as the blueprint for the modern computer. Bell (1971, p. 99) also noted that these reports included a very detailed discussion of how a computer should be organized and built as well as how to program it. Paul Armer (Feigenbaum and Feldman, 1963, p. 9) was the first person to credit von Neumann with developing the stored-program concept – thus software was born. As this period ended, computers had become generally accepted as essential tools for both government and civilian use.

Emergence from the Shadows – 1950-1960

As the decade of the 1950s dawned, public awareness of computers was crystallizing. Belden and Belden (1962, p. 199) noted that by 1953 the IBM 650 had sold over 1000 units, thus making it "the first widely used computer system." Additionally, Goldstine (1972, p. 330-331) noted "prior to this system [the 650] universities built their

own machines, either as copies of someone else's or as novel devices." After the 650 was mass marketed, the existence of such a large group of computers made it desirable to have common programs and programming techniques. Fortunately, Grace Hopper had already laid most of the groundwork for these common programs and programming techniques in her legendary "The Education of a Computer" which was published in 1952 [hereinafter Hopper (1952)]. By considering the concept of reusable software, Hopper (1952, p. 245) described how programming a computer with symbolic notation instead of machine language could allow the porting of programs to multiple platforms. Belden and Belden (1962, p. 204) said that in early 1953 John Backus and others at IBM developed the IBM *Speedcoding* system based partially on Hopper's model. By early summer 1954, Sammet (1969, p. 132) indicates that Backus and another IBM team began work on a Formula Translating System (later shortened to FORTRAN). This programming language was introduced in 1957 and soon became the most widely used higher level programming language within the scientific and mathematics community. This, according to Sammet (1969, p. 302-304), was quickly followed by the introduction of a Common Business-Oriented Language [hereinafter COBOL] in 1960. Rothman and Mosmann (1972, p. 105) discussed the fact that COBOL was "designed by a committee made up of representatives of manufacturers and users." Parker (1984, p. 33) brought to light the fact that "Grace Hopper headed the committee that developed COBOL" and that COBOL was the first programming language to "use English-like phrases", thus making it "the most widely used programming language for business."

Unfortunately, this decade also saw the first job losses created by the computer. As manual tasks were automated, many people began to fear the installation of computers in

companies. These attitudes were used by the writers of the 1957 movie *Desk Set* to establish the conflict between the two leading characters: Richard Sumner (Spencer Tracy) and Bunny Watson (Katherine Hepburn). Watson was afraid that Sumner's Emirac electronic brain was going to replace her. After some clever sabotage in the climax of the movie, Sumner reveals the fact that the computer is designed to assist rather than replace the personnel in Watson's department. Fortunately, public mistrust of computers was overshadowed by the flight of a small satellite named *Sputnik* on October 4, 1957. As Cortright (1975, p. 6) so eloquently phrased it "Sputnik I put a new sense of value and urgency" on the U.S. Space Program. An integral component of the ultimate success of this program was the computer and the computer scientists who ran the calculations. Therefore, by the end of the decade computers had become an integral component of national security as well as every day business life.

The Making of a Discipline – 1960 - 1970

As the 1960s began, the United States was on the verge of major changes. The success of the Russian space program and the election of John F. Kennedy as the 35th President of the United States would have a profound impact upon the country as a whole and computing in particular. The impact was illustrated by the failure of early NASA rocket tests. Cortright (1975, p. 7) explained that the nation needed more, newer, and faster computers to "get the rockets off the ground." Rapid advances in computer software, hardware, and infrastructure allowed NASA to overcome these early setbacks and ultimately launch Alan Shepard's sub-orbital flight on May 5, 1961. During his May 25, 1961 address to the nation twenty days after Shepard's flight, President Kennedy spoke the immortal words "I believe that this nation should commit itself to achieving the goal,

before this decade is out, of landing a man on the Moon and returning him safely to Earth." Shortly thereafter, the Congress funded the Moon program. With this huge increase in funding, NASA began purchasing the newest, fastest computers available on the market. As the Mercury, Gemini, and Apollo programs matured, they required more and more computing power. Fortunately, because of the groundwork laid in previous years, these needs were successfully met. Hopper and Mandell (1984, p. 39) explained the huge of expansion of the use of computers during this period by the development of the integrated circuit by Jack Kilby of Texas Instruments. Hopper and Mandell (1984, p. 19) also attributed the growth to the IBM System/360. This computer system was the first computer to store its controlling circuitry on chips within the computer. IBM's invention was also the "first family of compatible machines, merging science and business [computer] lines."

Unfortunately, the increased use of computers also had a negative side that emerged during this period. On April 5, 1968, computer crime made headlines in *The Wall Street Journal.* The article discussed a programmer "electronic[ally] siphon[ing] money from [a] brokerage firm by program[ing] the computer to transfer money to . . . his and his wife's accounts." Thefts of this sort rose rapidly during the 1960s as more and more businesses became computerized. Another incident that sparked a hue and cry from the public was the *Ruggles Report* of April 1965. Martin and Norman (1970, p. 304) noted that this report urged the "Bureau of Budget, in view of its responsibility for the Federal statistical program, immediately take steps to establish a Federal Data Center. Martin and Norman (1970, p. 305) also indicated that the *Ruggles Report* made "virtually no mention of privacy." Additionally, Martin and Norman (1970, p. 307) also indicated that idea of a

"National Data Center" touched off a wave of general public privacy concerns and resulted in several Congressional hearings spearheaded by Senator Edward V. Long of Missouri. Rothman and Mosmann (1972, p. 1) noted that student protests of the late 1960s included "attack[s] and bomb[ings of] computer centers." The computer was also "seen by major writers to be the center of the threat to privacy and an important weapon in the abuse of political power."

It was during this period of rapid expansion of computer use and increasing public distrust of computers that the first computer literacy courses were begun in the colleges and universities of the United States. Stanley Rothman, a Sociology and Public Policy Professor at the University of California at Irvine, started one of the first courses of this nature. During his Computers and Society course, and resulting book by the same name, Rothman and Mosmann (1972, p. 3-6) repeatedly remarked "the social implication of computers is not a discipline." Furthermore, he stated "we . . . need a course that presents the basic facts of [computer technology] and then constructs and analysis of the social issues on this technological foundation." He also said "[i]n some institutions, departments are emerging where this course fits naturally." He was referring to the emergence of the department of Computer Science.

Additional impetus for such courses also came from the Science Advisory Committee to the President of the United States. One of the major conclusions of their 1967 report Computers in Higher Education was that in the near future "almost all undergraduates will use computers profitably if adequate computing facilities are available." (p. 22) The report continued: "we believe that undergraduate college education without computing is deficient education, just as undergraduate education without library

facilities would be deficient education." (p. 22-23) On pages 32-33, the report indicated that 35% of undergraduates made "substantial use of computers" and another 40% made "medium use" of computers during the period 1963-64. These data were based upon Bachelor's degrees conferred during the 1963-64 period. The report recommended a course on the philosophy of computing methods for all students would prove worthwhile. One of the authors of the report, Professor of Philosophy H. W. Johnstone, Jr., of Pennsylvania State University (United States President's Science Advisory Committee, 1967, p. 77-78) concluded:

> Scientific method, in the form which is sometimes a required course (or part of one) for all or most undergraduates, is a liberal study. Its purpose is to acquaint the student with the nature of scientific thinking, so that he will see science not as a kind of familiar magic that he takes for granted, but rather as a human achievement. In my view, a similar liberal course ought to be given on computers. The emphasis would be upon the concept of a computer and upon the general methods of using computers. The student who had been exposed to such a course would see the computer as a human achievement rather than as a black box to be taken for granted. He would see how the possibility of using computers to solve problems has revolutionized the ways in which we think about the problems. A person for whom the computer is merely something to be used gains from his contact with it no appreciation of the nature of the contemporary world. Such appreciation presupposes a certain awareness of the nature and method of the computer as such—an awareness that is quite different from the knack

> of programming. The use of the computer has all at once spread to all aspects of our culture. It is this that struck me as being of primary philosophical relevance. What is relevant is the way the computer has changed the quality of contemporary life—not so much in satisfying our material needs as in causing us to think about ourselves in a new way.

By the end of the decade, Rothman and Mosmann (1972, p. 2) indicated introductory computer courses (*Computer Literacy, Introduction to Computers, Computers and Society, etc.)* were being taught at several colleges and leading universities on both coasts and at leading universities in the Midwest. The explosive growth of computer literacy courses accompanied a substantial decrease in the size of computer systems and a parallel increase in instructions per second. Martin and Norman (1970, p. 10-11) explained the revolution in logic circuitry and increased speed by saying "[i]n 1955 about 100,000 program instructions could be executed for one dollar. In 1960 the same dollar bought 1 million, and in 1970 about 100 million." He also documented the huge increase in data storage capacity that occurred in the 1960s.

Finally, it must be noted that four incidents occurred during the last half of this decade that would change the world of computing forever. Parker (1984, p. 34) extolled the virtues of "the world's first minicomputer . . . Digital Equipment Corporation's PDP-8." "At $20,000, this rugged machine represented a small fraction of the cost of mainframes of its day, and it could be installed almost anywhere." Additionally, as a result of "IBM's unbundling of software from its hardware" (Johnson, 1998, p. 37) in 1968, the Computer Science Corporation became the first software company listed on the New York Stock Exchange. Hopper and Mandell (1984, p. 227) indicated that this listing "inspired

other software companies" to become publicly listed. IBM, responding to pressure from the rest of the computer industry and some governmental agencies in early 1969, announced that some of its software would be priced separately from the computer hardware. Hopper and Mandell (1984, p. 227-228) remarked "this unbundling allowed many software firms to emerge in the computer industry." And finally the ARPANET, predecessor of the Internet, was established in 1969.

Recognition and Growth – 1970 - 1980

By successfully landing men on the Moon and returning them safely to Earth in 1969, NASA's confidence was running high as the 1970s dawned. Large Scale Integration (LSI) chips such as IBM's 4Pi were quickly incorporated into the computers of the Apollo Command Module. As Burton (1976, p. xv-xvi) explained, "while computer chips produced in 1965 contained approximately 1000 circuits, [the LSI] chips of 1970 contained as many as 15,000." The events of Apollo 13 proved the ruggedness and durability of the 4Pi microprocessor and inspired a revolution that Parker (1984, p. 35) dubbed "the microcomputer revolution." On November 15, 1971, *Electronic News* carried the first advertisement for the 4004 processor, which was made by the fledgling Intel Corporation. The advertisement boasted 2,250 transistors within the processor with the processor itself was the size of Lincoln's head on a penny. By early 1972, Intel's 8080 microprocessor chip was marketed (Intel, 2005, Para. 3). Hopper and Mandell (1984, p. 148) indicated this was "the first device capable of supporting a complete computer system." Soon after the introduction of Intel's 8080 microprocessor, a small firm named Micro Instrumentation and Telemetry Systems (MITS) in Albuquerque, NM began marketing the world's first microcomputer – the Altair 8800 – for $400. Parker (1984, p. 35) noted that although the

Altair 8800 initially had "no keyboard, no monitor, no permanent memory, and no software . . . over 4,000 orders were taken within the first three months." Parker (1984, p. 36) indicated "[t]he 8800 was a very crude device. Users had to be knowledgeable enough to build it themselves from a kit . . . and then code their own programs in machine language." From resulting user feedback, MITS subsequently hired a Harvard Freshman named Bill Gates to "install the BASIC programming language on the 8800" (Parker, 1984, p. 36). This first successful foray into the world of computers led Gates to "drop out of Harvard and form the Microsoft Corporation" (Parker, 1984, p. 37).

By 1976, Steve Wozniak and Steve Jobs had successfully built and marketed the Apple Computer. Parker (1984, p. 37) noted that the "Apple I, priced at $666.66, consisted of a single board with 4KB RAM. Although [it] was less powerful than the Altair 8800, it was less complicated" to operate. According to Hopper and Mandell (1984, p. 146, 161), the successor product, the Apple II was "adopted by elementary, high schools, and colleges for many students. For many students, the Apple II [was their] first contact with the world of computers." Sales of the Apple II were further bolstered by the 1978 introduction of *VisiCalc*, the world's "first spreadsheet package." Parker (1984, p. 38) indicates the "availability of spreadsheets [provided a] compelling reason [for] businesspeople (who routinely prepare time-consuming budgets and profit-and-loss statements) [to purchase] microcomputers."

The explosive growth in the popularity and affordability of microcomputers had an impact upon education in the 1970s. In 1972, the Carnegie Commission on Higher Education published a report named *The Fourth Revolution*. Molnar (1973, p. 277) indicated that the title was derived from Eric Ashby's observation that there have been four

great educational revolutions. The first revolution occurred when "education shifted from parents teaching children in the home to teachers [teaching] children in a school." The second occurred when "the written word was adopted as a tool." The third revolution was when the "printing press was invented." The fourth revolution was created by "electronics, in particular, the development of radio, television, and computers." This fourth revolution was both lauded and vilified as the general public attempted to grasp the impact of computers upon society.

By the end of the decade, it was generally agreed that computer literacy courses were "justified by the contributions computers have made and are capable of making to education" (Worthy, 1977, p. 77). Additionally, the commonly held view that "a fairly rudimentary understanding of data banks, programming, and information retrieval systems will make it far less likely that educated men and women will, in the future, be over-awed and cowed into intellectual submission by mere printouts" (Sawhill, 1980, p. 20). Moreover, by 1980 the capability of the average person to make rapid computations led to computers representing the new way to reason, recall, amend, explore and create as an integral part of every day life. As Molnar said in 1979: "[t]here is a need to foster computer literacy . . . A nation concerned with its social needs and economic growth cannot be indifferent to the problems of literacy. If we are to reap the benefits of science-driven industries, we must develop a computer literate society" (p. 277).

Procedures of the Study

The major goal of this study was to identify and classify objectives for teaching college freshman-level computer literacy in colleges and universities in the United States during the period 1980-2002 as reflected by objective statements in articles from selected

professional periodicals. These procedures were used throughout the course of the research to achieve the goal of this study:

1. Selection of subperiods,
2. Sources of data,
3. Categories and objective types,
4. Cataloguing system,
5. Treatment of the data

Selection of Subperiods

The 1980-2002 period was divided into two subperiods on the basis of selected events in the social, economic, political, or educational history of the United States. Significant discoveries or inventions in the field of college freshman-level computer literacy are also discussed in each subperiod. As in the previous studies in this chronological series, some overlapping of the two subperiods was planned to allow for the gradual transformation characteristic of historical change between the subperiods. The subperiods for this study were as follows:

1. Subperiod 1 (1980-1995)

   The first subperiod begins in 1980 with the election of Ronald Reagan as President of the United States. It ends in 1995 with the release of the *Windows 95* Operating System by the Microsoft Corporation.

2. Subperiod 2 (1992-2002)

   The second subperiod begins with the end of George H. W. Bush's presidential term in 1992. It ends in 2002 with the passage of the Homeland Security Act by the U.S. Congress.

Sources of Data

To obtain a representative view of the stated aims or objectives for the teaching of college freshman-level computer literacy, nine professional journals were utilized. The journals and their dates of publication are stated below.

1. *T.H.E. Journal (1980-2002)*;
2. *Computing (1980-2002)*;
3. *IEEE Annals of the History of Computing (1980-2002)*;
4. *IEEE Transactions on Computers (1980-2002)*;
5. *Journal of Management Information Systems (1984-2002)*;
6. *Journal of Organizational Computing & Electronic Commerce (1991-2002)*;
7. *Journal of the ACM* (Formerly *Journal of the Association for Computing Machinery*) *(1980-2002)*;
8. *Journal on Computing (1989-2002)*; and
9. *MIS Quarterly (1980-2002).*

These journals were selected on the basis of their wide library availability, circulation, and readership among college freshman-level computer literacy teachers in colleges and universities.

T.H.E. Journal provides articles, special reports, thematic issues, commentary, software and courseware reviews, product reviews and news on all aspects of using technology in education aimed at professionals in education, computing, industry training and manpower development.

Computing presents the latest research results from computer science & numerical computation.

IEEE Annals of the History of Computing covers the breadth of computer history. Featuring scholarly articles by leading computer scientists and historians, as well as firsthand accounts by computer pioneers. It also is the primary publication for recording, analyzing, and debating the history of computing.

IEEE Transactions on Computers contains articles for researchers, developers, technical managers and educators in the computer field. It publishes papers, brief contributions, and comments on research in areas of current interest to the readers. These areas include, but are not limited to, the following: a) computer organizations and architectures; b) computing systems, software systems, and communication protocols; c) real-time systems and embedded systems; d) digital devices, computer components, and interconnection networks; e) specification, design, prototyping, and testing methods and tools; f) performance, fault tolerance, reliability, security, and testability; g) case studies and experimental and theoretical evaluations; and h) new and important applications and trends.

The *Journal of Management Information Systems* is a widely recognized and top-ranked forum for the presentation of research that advances the practice and understanding of organizational information systems. It serves those investigating new modes of information delivery and the changing landscape of information policy making, as well as practitioners and executives managing the information resource. A vital aim of the quarterly is to bridge the gap between theory and practice of management information systems.

The *Journal of Organizational Computing & Electronic Commerce* publishes research articles concerned with the impact of computer & communication technology on organizational design, operations & performance.

The *Journal of the ACM* (Formerly Journal of the Association for Computing Machinery) provides coverage of the most significant work going on in computer science by publishing original research papers of lasting value in computer science. To be accepted, a paper must be judged to be truly outstanding in its field and to be of interest to a wide audience. The editors of this publication are particularly interested in work at the boundaries, both the boundaries of sub disciplines of computer science and the boundaries between computer science and other fields.

The *Journal on Computing* publishes papers in the intersection of operations research and computer science. Areas include computational probability; design and analysis of algorithms; heuristic search and learning; high performance computation; knowledge and data management.

The *MIS Quarterly* contains articles of either practice or theory of information management of use for managerial purposes and the management of information technology for both academics and those applying information systems to organizational problems.

It is believed that these periodicals are representative of the leading national organizations concerned with the teaching of college freshman-level computer literacy.

Categories and Objective Types

The following categories and objective types paralleling those of Hemby (2000, p. 21-25), Huff (2002, p. 17-21), Mills (1990, p. 23-35), Ogden (1972, p. 16-19), Ogden and

Jackson (1974, p. 13-16), Roy (1979, p. 19-27), Sehr (1993, p. 18-21), and Woodard (1982, p. 20-28), were identified:

1. Knowledge objective statements are those that advocate student attainment of factual or conceptual material for its own sake or for its functional value and those which stress knowledge and skills basic to the study of college freshman-level computer literacy. Types of objectives in this grouping are listed as follows:

A. Major facts, principles, concepts or fundamental objective statements that stress knowledge for the sake of knowledge or its relation to the understanding of college freshman-level computer literacy. Examples of objective statements that fall in this type of category include getting at a body of knowledge embracing the fundamental facts (Morgan, 1969, p. 163), and knowledge of principles as a prerequisite to the successful practice of "enquiry" (Gagne, 1963, p. 149).

B. Application of college freshman-level computer literacy to daily life objective statements tie the application or use of major facts, principles, concepts, or fundamentals of computer literacy to real life situations. Emphasis is placed upon the utility of the knowledge for its own sake. Examples of the application function include emphasizing affective as well as cognitive features of computer literacy; learning computer software packages and achieving effectiveness by using them in every day life; and the ability to use the major generalizations of computer literacy to make rapid computations, reason, recall, amend, explore, and create. (Taylor, 1981, p. 8).

C. Study skill objectives accent knowledge and skills necessary for the study of computer literacy and successful completion of other college level courses. This includes nomenclature, vocabulary, logical reasoning ability, mathematical ability, keyboarding

skill, and study habits. Objectives that fit into this category include the ability to read analytically, to communicate clearly, and solving simple logic problems.

2. Process objectives are those that convey an understanding and use of the methods and techniques of college freshman-level computer literacy. Statements such as these focus upon critical thinking, problem solving, classification, logic, application of programming methodology, experimentation, and life-long learning. Types of objectives in this grouping are as follows:

A. Methods of thinking objective statements stress the development of critical thinking and problem solving activities. They do not identify the various processes involved but do state, in general, that critical thinking and problem-solving abilities are the desired results. Objectives include observing, using space-time relationships, using objective data for the solution of computer related problems, and translating data into information (Schouest and Thomas, 1978) and (Mason and Blanchard, 1979).

B. Process, skills, and techniques objectives are much more specific than those mentioned in the previous grouping. They deal specifically with the various techniques involved in employing the processes and methods of computer programming, computer based research, and applications software usage. Examples include the ability to analyze the steps in the programming method, the ability to keyboard at least thirty words per minute, evaluating and interpreting Internet search results, and understand the various processes required for college freshman-level computer literacy.

C. Research and creativity objective statements deal with developing the capacity to do research. They focus upon the student in an attempt to take students into situations that expand their intellectual powers and promote originality. Examples that fit into this

group include acquiring clear ideas about the role of observations, the use of creativity in decisions, and utilizing computer-based research techniques. (Sawhill, 1980, p. 14)

3. Attitude and interest objective statements are those concerned with developing an appreciation for the contributions and nature of the computer industry, desirable attitudes involving computer literacy, and lasting professional and vocational interest in students. Types of objectives in this grouping are listed below.

A. Attitudes and appreciation objective statements convey a willingness of the individual to use a scientific method of solving problems in everyday life. They focus upon the formation of good thinking habits, including the ability and inclination to recognize a problem, consider evidence, suspend judgment, and change an opinion. Examples of objectives illustrating this type grouping include the development of skills, attitudes, and habits of mind that promote an understanding of the societal impact of computers and potential abuses of increased data storage capacity (Logsdon, 1980).

B. Interest and career development objective statements involve the development of both career and non-career interest. Pursuits of this type reflect a willingness to read about developments in computer literacy, encourage hobbies and leisure time activities, and open new areas of interest. Examples include the use of end-user computing to stimulate interest (Andersen Consulting, 1989, p. 30), and awareness of the many aspects of computer literacy – both as a vocation and in vocations (Pyburn, 1986, p. 51).

C. The nature of computer literacy and computer science professionals objective statements are concerned with the attainment of a realistic concept of the nature of computer literacy and computer science professionals. Central to this objective type are statements concerning the ethics and standards of the computer industry and those who

make it function. Examples in this category include an understanding of the role of the computer industry, computer systems personnel, the contributions of computer educators, and how the computer fits into the organization as a whole (McLean & Kappelman, 1992, p. 149).

4. Cultural awareness objective statements deal with the inner workings of computer literacy and society or the cultural implications of computer literacy for society. They differ from Attitude and Interest objectives in that they deal with cultural groups rather than individuals as independent entities. Objective types within this category are listed below.

A. Aesthetic aspect statements express the human, creative, cultural, and social networking aspects of computer literacy. Examples of this objective type include how organizations and individuals use computers, and the resulting impact upon workflow and leisure time. (Rothman and Mossman, 1972, p. 180-181)

B. Philosophical, sociological, and political objective statements deal with the impact of society on computer literacy and how governmental policy affects computer usage. Examples which fit into this grouping include helping students further their development of basic life philosophies and values and the potential social, legal, and political impact of the ever evolving use of computers in society.

C. Economic aspect objective statements show how advances in computer efficiency and usage influence economic development. Statements focus upon the economic implications of discoveries and innovations in computer literacy, the improvement of the standard of living, and the possibility of a fuller, richer, and more comfortable life through the impact of computer literacy on society.

Cataloguing System

The time period 1980-2002 was divided into two subperiods, and throughout both subperiods the study classified the articles and statements as follows:

I. All articles: research and nonresearch-oriented

A. Frequency of articles

1. By year

2. By author

B. Frequency of statements in articles

1. By year

2. By author

C. Percentage of statements

1. By type

2. By author

3. By rank

D. Specific type of objective

1. Knowledge objectives

a. By year

b. By author

c. By frequency

2. Process objectives

a. By year

b. By author

c. By frequency

3. Attitude and interest objectives

a. By year

b. By author

c. By frequency

4. Cultural awareness objectives

a. By year

b. By author

c. By frequency

II. Research-oriented Articles

A. Frequency of articles

1. By year

2. By author

B. Frequency of statements in articles

1. By year

2. By author

C. Percentage of statements

1. By type

2. By author

3. By rank

D. Specific type of objective

1. Knowledge objectives

a. By year

b. By author

c. By frequency

2. Process objectives

a. By year

b. By author

c. By frequency

3. Attitude and interest objectives

a. By year

b. By author

c. By frequency

4. Cultural awareness objectives

a. By year

b. By author

c. By frequency

Treatment of Data

The treatment applied to the data derived from this investigation paralleled, for the most part, that employed by Hemby (2000, p. 28-32), Huddleston (1976, p. 21-24), Huff (2002, p. 23-27), Mills (1990, p. 38-43) Ogden (1972, p. 40-43), Ogden and Jackson (1974, p. 11-12), Rand (1984, p. 20-24), Roy (1979, p. 33-35), Sehr (1993, p. 25-29), Vance (1976, p. 22-23), and Woodard (1982, p. 32-34). In this respect, treatment of the data included their collection, classification, and analysis.

Selection of Data

Following the pattern established by Roy (1979), all issues of the preceding journals were read for relevant articles dealing with statements of college freshman-level computer literacy. Articles were selected for inclusion on the basis of the following criteria:

1. It is an expression of opinion or the result of formal research activity (Roy, 1979, p. 34).

2. The objective statements are stated explicitly and not implied; they are readily apparent (Roy, 1979, p. 34).

3. The article is concerned with computer literacy instruction at the college freshman-level.

4. The article is not an editorial, letter to the editor, book review, or a convention report (Roy, 1979, p. 34).

5. The article is not a committee report or a critique of a committee report (Sehr, 1993, p. 26).

These criteria were those chosen by Hemby (2000), Huff (2002), Mills (1990), Ogden (1972), Ogden and Jackson (1974), Roy (1979), and Sehr (1993) in their studies. Articles not meeting all criteria were excluded from this investigation. Articles that met all criteria were read carefully and the statements obtained were duplicated in the author's exact wording on page 2 of the classification sheet that has been duplicated in the Appendix. Other specific information recorded includes the following: (a) name of author(s), (b) title of article, (c) name of publication, (d) volume number of publication, (e) issue number or month of publication, (f) page reference of article, (g) date (year) of publication, (h) categorization of author(s), (i) categorization of subperiod(s), (j)

categorization as research or nonresearch-oriented, (k) catalog of objective category, and (l) catalog of objective type.

Classification of Statements

As in the previous studies mentioned, the selected journals were read and the identified objective statements were examined with regard to their general purpose. They were then catalogued according to any or all four broad categories. Within these major categories, the statements were further catalogued into category types as defined on pages 33 - 37 of this investigation. To avoid conflict in word meanings across time, the author's intent was catalogued rather than the investigator's interpretation.

Surviving articles were catalogued further according to author's occupation. Major groupings used were those used in the previous studies of Hemby (2000), Huff (2002), Mills (1990), Ogden (1972), Ogden and Jackson (1974), Roy (1979), and Sehr (1993). The major groupings are identified as follows:

1. "Higher Education," which includes college or university teachers, college or university administrators, junior college teachers, retired members of the above, and students seeking to obtain a doctoral degree;

2. "Secondary Education," which contains classroom teachers, school administrators, subject matter supervisors, consultants, retired members of the above, and students seeking to obtain Master's degrees;

3. "Miscellaneous," which encompasses all authors identified as holding occupations other than those listed in the previous categories at the time of publication or those for whom no occupation is given.

Analysis of Data

The data obtained were tabulated and analyzed using the method of content analysis in an attempt to answer the questions within and across both subperiods that were presented in this study. In summary, these questions were answered:

1. What were the frequencies of articles and statements?
2. What was the distribution of objectives within each category?
3. Which objectives were "most important"?
4. What major educational groups, i.e. authorship, were involved with the writing of articles concerned with the objectives of college freshman-level computer literacy teaching, and did those groups agree or disagree in their outlook as indicated by frequency rankings?

The final results of the analysis were presented by means of table format and narrative description. The format used for the presentation of tables conformed to that developed by Ogden (1972) and modified by Hemby (2000), Huddleston (1976), Huff (2002), Mills (1990), Ogden and Jackson (1974), Rand (1984), Roy (1979), Sehr (1993), Vance (1976), and Woodard (1982).

Summary

This chapter has presented the procedures used in the study of the objectives for teaching college freshman-level computer literacy in the United States during the 1980-2002 period. Chapters 3 and 4 report the results of the investigations for each of the subperiods. Chapter 5 consists of a tabular summary and findings with regard to the data collected for the total study.

CHAPTER 3

SUBPERIOD ONE, 1980-1995

After two decades of protests, *sit in*s on campuses across the nation, attacks on computer installations, foreign policy failures, and political unrest, the American people elected Ronald Reagan to become the 40th President in a landslide victory over incumbent Jimmy Carter. Upon taking office on January 20, 1981, President Reagan pledged to launch an era of national renewal, military expansion, additional space exploration, and government deregulation. Soon thereafter, Reagan proposed the *Strategic Defense Initiative* (hereinafter SDI), a plan to protect the United States from Russian nuclear missiles via a space-based interception system. The money expended to develop SDI program, expand the Space Shuttle program, renew and equip the U.S. military, and Reagan's laissez-faire economic policies spurred economic growth in many areas of the economy but especially in the computer industry (Moschovitis, et al. 1999, p. 96).

During the period 1980-1995 the computer industry grew in two major but parallel areas – software and hardware. As Johnson (1998, p. 36-43) noted, in the late 1960s "IBM's unbundling [of software from its hardware] helped to legitimize the concept of paying for software." The effects of this unbundling effort were felt throughout the 1970s as more and more development companies emerged to meet the needs of mainframe, minicomputer, and microcomputer users. Grad (2002, p. 64) noted that by the 1980s "many software companies had entered the [fledgling] PC market." A major boost to the microcomputer industry occurred in 1981 with IBM's entry into the market.

In 1976, Dolotta, et al. (p. 61) had observed:

> "[t]he general idea of providing home data processing capabilities to the general public has been a topic of speculation for several years. The social value of home data processing is potentially enormous in terms of education applications alone; if entertainment, games, and other applications are also considered, this social value is augmented by commercial desirability."

By 1981, the social and commercial desirability of microcomputers was evident as the industry racked up sales and companies like Apple Computer Corporation rapidly expanded. Parker (1996) noted that IBM's Personal Computer (PC) was a "highly successful product [that] immediately cut into sales of the Apple II" and other popular microcomputers (SOC 2-43). Parker (1996) also stated that "[m]any people attribute the PC's success to the fact that many businesspeople suddenly took microcomputers seriously when IBM . . . became a player" in the microcomputer market (SOC 2-43).

As more and more people discovered the utility of microcomputer and as microcomputers became more affordable, the demand for software increased drastically. Firms such as Lotus Development Corporation, WordPerfect Corporation, and Microsoft Corporation worked diligently to develop software for the microcomputer market. McLean and Kappelman (1992) noted a sharp "rise in the [use of computers] by end users" from 1980-1990 (p. 146). McLean and Kappelman (1992) also observed that by 1990 businesses were reporting "significant contributions from spreadsheet, office automation, personal support, and communications-type applications" (p. 150). Furthermore, as Cortada (1996) suggested "new uses for computers appeared as technology improved" (p. 19). Additional developments in the PC networking arena led

to the development of networking software that enabled PC's to communicate and share data. As Moschovitis, et al. (1999) stated "[i]n 1985 Novell introduced its Netware 2.0, which set the standard for network operating systems" (p. 98). The advent of PC networking allowed more and more people to link systems than ever before. Moschovitis, et al. (1999) indicated that during the late 1980s and early 1990s "more and more regular people [were able to] get online – through BBSs, online services, and other virtual communities" (p. 121). As with any large group of people, subgroups of PC users began to emerge. One such entity was a group of educators who championed the use of PC's for educational purposes and increased computer literacy among the citizens of the United States.

Bitter and Camuse (1984) espoused the belief that "[c]omputers are a vital part of our society . . . and promise to become even more pervasive in the years ahead" (p. 18). In the early part of this subperiod, battles raged between people who believed computer literacy was essential to the future of the country and those who were not convinced. For instance, Bitter (1983) believed "computer literacy has to be included in teacher certification requirements" (p.22). Additionally, Molnar (1979) argued that "[t]here is a national need to foster computer literacy . . . A nation concerned with its social needs and economic growth cannot be indifferent to the problems of literacy. If we are to reap the benefits of science-driven industries, we must develop a computer literate society" (p. 283). Others such as Davis (1983, p. 59) argued:

> Mandates for [computer literacy] courses often ambiguously include both awareness of the role of computers in society and skill in basic programming. The vacuousness of the mandates is matched only by the

exaggeration of their need. Surely, everyone need *not* learn to program a computer in order to use a computer or be aware of its uses."

By 1984, most people on both sides of the issue agreed with Gillespie's (1981) three categories for computing competency. Gillespie believed:

1. All students [should have] a basic understanding of computers and how to use them;
2. Industrial training in conjunction with university curricula [is critical] to meet the growing demand for competent personnel in all aspects of computing; and
3. Computer literacy for the general public [should] include assessing the computer's impacts on society.

As a result of these arguments, computer literacy courses were developed to provide knowledge and understanding of computer systems. According to Biermann (1990, p. xiii), Frates and Moldrup (1983, p. 7-8), and Hopper and Mandell (1984, p. 4), this knowledge included:

1. Computer organization (Hardware concepts).
2. Procedures and algorithms for processing information.
3. Capabilities and limitations of computers.
4. A history of computing and computers.
5. A hands-on experience.
6. The potential threat of computer abuse.
7. A perception of the societal impact of computers.
8. Both current and future uses of computers.

The adoption of these guidelines accelerated the growth of computer literacy courses and resulted in additional educational innovations.

One such innovation was the use of electronic communication devices in education. Swartz, et al. (1984) discussed the educational use of "modems, . . . microcomputers, . . . and electronic communication networks through which [students] can tap into large scale information banks, electronic mail, and teleconferencing systems" (p. 40-41). Swartz was an early proponent of the use of electronic computer networks in education and one of the early adopters of the Bitnet system. The Bitnet system was an early "academic network based on IBM computers" (Grier and Campbell, 2000, p. 32). Early educational computing networks such as Bitnet, Listserv, and the Defense Department's ARPANET led to the formation of the Internet in the early 1990s. By the end of this subperiod in 1995, Moschovitis, et al. (1999) noted that "over 25 million [people were using] the Internet and [usage was] doubling every year and a half" (p. 154).

Analysis of Data

Question 1. What is the frequency of articles concerned with the objectives of teaching college freshman level computer literacy found in selected periodical literature categorized according to year and authorship within this subperiod?

An analysis of Table 1 shows that 542 articles concerned with the objectives for teaching college freshman-level computer literacy were written during the years 1980-1995 with an average of 36.14 articles per year for the 15 years. The yearly range or articles varied from a low of 18 in 1983 to a high of 47 in 1991.

Authors in Higher Education contributed the most articles followed by the Miscellaneous authors and then the Secondary Education Authors. Higher Education and Secondary Education authors co-authored 43 articles, whereas 39 articles were co-authored by Higher Education and Miscellaneous authors. One article was written Secondary Education and Miscellaneous authors. One article was co-authored by at least one author in each of the three categories of authorship.

Question 2. What is the frequency of statements concerned with the objectives of teaching college freshman level computer literacy found in selected periodical literature categorized according to year and authorship within this subperiod?

Table 2 indicates a total of 1999 statements of objectives were found in the 542 articles written during the subperiod. The mean number of statements per article was 3.68. During the 15 years of the subperiod, the mean number of objective statements by the combined authorship was 133.27 statements per year.

Authors in Higher Education contributed 1570 statements (78.6%) with authors in the Miscellaneous category contributing 216 (10.8%). Authors in the Secondary Education category contributed 213 statements (10.6%). Higher Education and Secondary Education authors co-authored 145 statements. Higher Education and Miscellaneous authors co-authored 119 statements. Secondary Education and Miscellaneous writers wrote four statements. Three statements were co-authored by at least one author in each of the three categories of authorship.

Question 3. What are the frequency, rank, and percentage of statements concerned with the objectives of teaching college freshman level computer literacy found in selected

periodical literature categorized according to year, category, and authorship within this subperiod?

Table 3 organizes statements of objectives of College Freshman-level computer literacy according to year, category, and authorship. Statements in the Attitude and Awareness category were most frequent with a total of 582, or 29%. These were followed closely by 540 Process statements, which represented 27% of the total. There were also 456 Knowledge statements (23%) and 421 Cultural Awareness statements (21%).

Of the 1570 statements attributed to Higher Education authors, 452 were Process statements (29%), 442 were Attitude and Interest statements (28%), 360 were Knowledge statements (23%), and 316 were Cultural Awareness statements (20%). Authors in the Miscellaneous category favored Attitude and Interest statements, with a total of 64 (30%) of their total of 216 statements. These were followed by 55 Knowledge statements (25%), 51 Process statements (24%), and 46 Cultural Awareness statements (21%). Secondary Education authors contributed 213 statements. Attitude and Interest statements were the most common with 76 (36%) followed by 59 Cultural Awareness statements (28%). Knowledge statements were mentioned 41 times (19%), and Process statements were mentioned 37 times (17%).

Questions 4 and 5. What is the Rank, Frequency, and Percentage of each Knowledge statement concerned with the teaching of college freshman level computer literacy found in selected periodical literature, categorized according to year, type, and authorship within this subperiod?

Tables 4 and 5 are numerical and percentage classifications of 456 Knowledge objectives for the first subperiod. The three types of Knowledge objectives are: Major Facts, Principles, or Fundamentals; Application of Computer Literacy to Daily Life; and Study Skills. The most frequently cited objective was Major Facts, Principles, and Fundamentals with 202 objective statements (44%). The next most frequently mentioned objective was Applications of Computer Literacy to Daily Life with 175 statements (38%). The objective cited most infrequently was Study Skills with only 79 statements (17%). Higher Education authors contributed the bulk of the Knowledge statements (79%). Miscellaneous authors contributed 12% and Secondary Education authors contributed 9%. Higher Education and Secondary Education authors co-authored 83 statements, whereas 52 statements were co-authored by Higher Education and Miscellaneous authors.

Questions 6 and 7. What are the frequency, rank, and percentage of each Process statement concerned with the teaching of college freshman level computer literacy found in selected periodical literature categorized according to year, authorship, and type within this subperiod?

Tables 6 and 7 are numerical and percentage classifications of 540 Process objective statements. Process objectives are divided into three types: Methods of Thinking; Processes, Skills, and Techniques; and Research and Creativity. The most frequently cited objective was Processes, Skills, and Techniques with 306 statements (57%). The next objective most often cited was Methods of Thinking with 137 statements (25%). There were only 97 Research and Creativity statements (18%). Again, authors in Higher Education made the most statements with 452 (84%).

Miscellaneous authors contributed 51 statements (9%) and Secondary Education authors contributed 37 statements (7%). Higher Education and Secondary Education authors co-authored 36 statements, whereas 23 statements were co-authored by Higher Education and Miscellaneous authors. One statement was co-authored by Secondary Education and Miscellaneous authors.

Questions 8 and 9. What are the frequency, percentage, and rank of each Attitude and Interest statement concerned with the teaching of college freshman level computer literacy found in selected periodical literature categorized according to year, authorship and type within this subperiod?

Tables 8 and 9 are numerical and percentage classifications of 582 Attitude and Interest objective statements. Attitude and Interest objectives are divided into three types: Attitudes and Appreciations; Nature of Computer Literacy and Computer Literacy Professionals; and Interest and Career Development. The most frequently cited objective was Attitudes and Appreciations with 311 statements (53%). The next objective most often cited was Nature of Computer Literacy and Computer Literacy Professionals with 147 statements (25%). There were 124 Interest and Career Development statements (21%). Again, authors in Higher Education made the most statements with 442 (76%). Secondary Education authors contributed 76 statements (13%) and Miscellaneous authors contributed 64 statements (11%). Higher Education and Miscellaneous authors co-authored 12 statements, whereas 31 statements were co-authored by Higher Education and Secondary Education authors. In a collaborative effort, three statements were co-authored by authors from each of the three categories. One statement was co-authored by Secondary Education and Miscellaneous authors.

Questions 10 and 11. What is the rank, percentage, and frequency of each Cultural Awareness statement concerned with the teaching of college freshman level computer literacy found in selected periodical literature categorized according to year, authorship and type within this subperiod?

Tables 10 and 11 are numerical and percentage classifications of 421 Cultural Awareness objective statements. Cultural Awareness objectives are divided into three types: Aesthetic Aspects; Philosophical, Sociological, and Political Aspects; and Economic Aspects. With 178 statements (42%), Economic Aspects were the most frequently cited objectives. The next objective most often cited was Philosophical, Sociological, and Political Aspects with 167 statements (40%). There were 76 Aesthetic Aspect statements (18%). Again, authors in Higher Education made the most statements with 316 (75%). Secondary Education authors contributed 59 statements (14%) and Miscellaneous authors contributed 46 statements (11%). Higher Education and Secondary Education authors co-authored 14 statements, whereas 13 statements were co-authored by Higher Education and Miscellaneous authors. Two statements were co-authored by Secondary Education and Miscellaneous authors.

Question 12. What is the rank of each type of objective statement concerned with the teaching of college freshman level computer literacy found in selected periodical literature categorized according to frequency, percentage of occurrence, and authorship within this subperiod?

An examination of Tables 12 and 13 reveals the objective statement mentioned most often was Attitudes and Appreciations with 311 of the 1999 total statements (15.56%). Second most mentioned was Processes, Skills, and Techniques with 306 of the

1999 total statements (15.31%). The third most mentioned objective type was Major Facts, Principles, or Fundamentals with 202 statements (10.11%). Higher Education authors ranked Methods of Thinking as their first objective statement. Secondary Education and Miscellaneous authors ranked the Attitudes and Appreciations objective statement as their first choice.

Subperiod Summary

The period from 1980 through 1995 saw major advances in computer usage brought about by the successful manufacturing and sale of microcomputers. As microcomputer prices dropped, increased in speed, functionality, and user-friendliness more and more people began using microcomputers on a daily basis. New methods of communication were invented and successfully used in homes throughout the United States.

During this subperiod, 542 articles containing 1999 objective statements were published concerning college-level computer literacy. Of these, 408 were research-oriented with 1127 objective statements. Higher Education authors contributed the most articles (77%) during this time. Miscellaneous authors were responsible for 216 statements (12%). Secondary Education authors contributed 213 statements (11%). Higher Education authors ranked Methods of Thinking as their first objective statement. Secondary Education and Miscellaneous authors ranked the Attitudes and Appreciations objective statement as their first choice.

Table 1

Numerical Classification of 542 Articles Concerned with the Objectives of College Freshman-level Computer Literacy Found in the Periodical Literature Catalogued by Year and Authorship: 1980-1995

Year	Number of Articles	By Higher Education	By Secondary Education	By Miscellaneous
1980	20	19	2	0
1981	19	14	3	5
1982	22	19	1	2
1983	18	17	1	1
1984	34	29	2	5
1985	38	35	4	5
1986	44	38	4	7
1987	42	40	6	10
1988	41	36	4	5
1989	44	40	8	5
1990	39	34	3	7
1991	47	44	6	4
1992	40	37	8	9
1993	25	24	3	2
1994	35	33	6	3
1995	34	33	4	3
Total	542	492*	65*	73*

NOTE: Difference is a function of split authorship.

Table 2

Numerical Classification of 1999 Statements Concerned with the Objectives of College Freshman-level Computer Literacy Found in the Periodical Literature Catalogued by Year and Authorship: 1980-1995

Year and Authorship	Higher Education	Secondary Education	Miscellaneous	Total*
1980	60	5	0	65
1981	47	8	15	70
1982	46	2	4	52
1983	46	1	3	50
1984	88	6	13	107
1985	109	14	11	134
1986	131	15	24	170
1987	128	22	27	177
1988	108	9	15	132
1989	117	24	11	152
1990	86	9	17	112
1991	140	19	11	170
1992	127	26	32	185
1993	84	15	9	108
1994	126	20	12	158
1995	127	18	12	157
Total*	1570	213	216	1999

* Difference is a function of split authorship

Table 3

Numerical and Percentage Classification of Statements of Objectives of College Freshman-level Computer Literacy Found in the Periodical Literature Catalogued According to Category, Year, and Authorship: 1980-2002

		Authorship																			
		Higher Education					Secondary Education					Miscellaneous					All Authors				
	Category	Knowledge	Process	Attitude	Cultural	Total	Knowledge	Process	Attitude	Cultural	Total	Knowledge	Process	Attitude	Cultural	Total	Knowledge	Process	Attitude	Cultural	Total
Year	1980	11	22	19	8	60	2	1	2	0	5	0	0	0	0	0	13	23	21	8	65
	1981	9	14	16	8	47	0	3	4	1	8	3	3	7	2	15	12	20	27	11	70
	1982	12	16	13	5	46	1	1	0	0	2	1	1	2	0	4	14	18	15	5	52
	1983	11	13	17	5	46	1	0	0	0	1	0	1	1	1	3	12	14	18	6	50
	1984	21	29	20	18	88	1	2	1	2	6	2	4	4	3	13	24	35	25	23	107
	1985	29	31	29	20	109	5	3	2	4	14	1	4	3	3	11	35	38	34	27	134
	1986	30	36	40	25	131	4	3	4	4	15	6	4	9	5	24	40	43	53	34	170
	1987	32	34	35	27	128	3	4	10	5	22	11	3	6	7	27	46	41	51	39	177
	1988	22	33	34	19	108	1	4	2	2	9	5	4	3	3	15	28	41	39	24	132
	1989	26	40	33	18	117	7	6	9	2	24	1	1	6	3	11	34	47	48	23	152
	1990	19	25	20	22	86	1	0	4	4	9	4	3	5	5	17	24	28	29	31	112
	1991	29	41	40	30	140	3	3	8	5	19	2	3	3	3	11	34	47	51	38	170
	1992	30	28	42	27	127	5	4	9	8	26	10	12	6	4	32	45	44	57	39	185
	1993	18	23	20	23	84	2	1	5	7	15	3	2	3	1	9	23	26	28	31	108
	1994	32	27	35	32	126	4	1	7	8	20	3	3	3	3	12	39	31	45	43	158
	1995	29	40	29	29	127	1	1	9	7	18	3	3	3	3	12	33	44	41	39	157
Percent**		18%	23%	22%	16%	**79%**	2%	2%	4%	3%	**11%**	3%	3%	3%	2%	**11%**	23%	27%	29%	21%	**100%**
Grand Total*		360	452	442	316	1570	41	37	76	59	213	55	51	64	46	216	456	540	582	421	1999

*Difference is a function of Split Authorship

** Difference is a function of rounding

Table 4

Numerical Classification of 456 Statements of Knowledge Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type and Year: 1980-1995

Rank	1	2	3	
Statement	Major Facts, principles, or fundamentals	Application of computer literacy to daily life	Study skills	Total
1980	8	4	1	13
1981	4	8	0	12
1982	7	4	3	14
1983	5	3	4	12
1984	13	8	3	24
1985	17	12	6	35
1986	20	15	5	40
1987	23	15	8	46
1988	14	10	4	28
1989	17	12	5	34
1990	8	11	5	24
1991	17	13	4	34
1992	15	21	9	45
1993	9	7	7	23
1994	13	18	8	39
1995	12	14	7	33
Grand Total	202	175	79	456

Table 5

Numerical and Percentage Classification of 456 Statements of Knowledge Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type and Authorship:1980-1995

	All Authors		Higher Education		Secondary Education		Miscellaneous	
Objective Type Statement	Total	Percentage of 456	Total	Percentage of 360	Total	Percentage of 41	Total	Percentage of 55
Major Facts, principles, or fundamentals	202	44%	164	46%	13	32%	25	45%
Application of computer literacy to daily life	175	38%	131	36%	24	59%	20	36%
Study skills	79	17%	65	18%	4	10%	10	18%
Total	456	100%	360	100%	41	100%	55	100%

Table 6

Numerical Classification of 540 Statements of Process Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type and Year: 1980-1995

Rank	1	2	3	
Statement	Processes, Skills, and Techniques	Methods of Thinking	Research and Creativity	Total
1980	14	6	3	23
1981	15	2	3	20
1982	12	3	3	18
1983	8	4	2	14
1984	23	7	5	35
1985	21	7	10	38
1986	20	13	10	43
1987	22	11	8	41
1988	25	10	6	41
1989	24	16	7	47
1990	18	7	3	28
1991	27	13	7	47
1992	28	9	7	44
1993	11	9	6	26
1994	19	7	5	31
1995	19	13	12	44
Grand Total	306	137	97	540

Table 7

Numerical and Percentage Classification of 540 Statements of Process Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type and Authorship:1980-1995

	All Authors		Higher Education		Secondary Education		Miscellaneous	
Objective Type Statement	Total	Percentage of 540	Total	Percentage of 452	Total	Percentage of 37	Total	Percentage of 51
Processes, skills, and techniques	306	57%	254	56%	23	62%	29	57%
Methods of Thinking	137	25%	115	25%	11	30%	11	22%
Research and Creativity	97	18%	83	18%	3	8%	11	22%
Total	540	100%	452	100%	37	100%	51	100%

Table 8

Numerical Classification of 582 Statements of Attitude and Interest Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type and Year: 1980-1995

Rank	1	2	3	
Statement	Attitudes and appreciations	Nature of computer literacy education and computer science professionals	Interest and career development	Total
1980	9	7	5	21
1981	14	8	5	27
1982	7	6	2	15
1983	10	5	3	18
1984	16	4	5	25
1985	14	9	11	34
1986	30	16	7	53
1987	26	14	11	51
1988	22	10	7	39
1989	25	9	14	48
1990	15	7	7	29
1991	30	10	11	51
1992	29	15	13	57
1993	15	6	7	28
1994	28	10	7	45
1995	21	11	9	41
Grand Total	311	147	124	582

Table 9

Numerical and Percentage Classification of 582 Statements of Attitude and Interest Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type and Authorship: 1980-1995

	All Authors		Higher Education		Secondary Education		Miscellaneous	
Objective Type Statement	Total	Percentage of 582	Total	Percentage of 442	Total	Percentage of 76	Total	Percentage of 64
Attitudes and appreciations	311	53%	235	53%	41	54%	35	55%
Nature of computer literacy education and computer science professionals	147	25%	114	26%	20	26%	13	20%
Interest and career development	124	21%	93	21%	15	20%	16	25%
Total	582	100%	442	100%	76	100%	64	100%

Table 10

Numerical Classification of 421 Statements of Cultural Awareness Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type and Year: 1980-1995

Rank	1	2	3	
Statement	Economic aspects	Philosophical, sociological, and political aspects	Aesthetic aspects	Total
1980	6	2	0	8
1981	8	2	1	11
1982	3	2	0	5
1983	3	3	0	6
1984	10	9	4	23
1985	11	12	4	27
1986	14	12	8	34
1987	8	18	13	39
1988	11	9	4	24
1989	14	6	3	23
1990	9	16	6	31
1991	23	11	4	38
1992	11	19	9	39
1993	7	15	9	31
1994	19	17	7	43
1995	21	14	4	39
Grand Total	178	167	76	421

Table 11

Numerical and Percentage Classification of 421 Statements of Cultural Awareness Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type and Authorship: 1980-1995

	All Authors		Higher Education		Secondary Education		Miscellaneous	
Objective Type Statement	Total	Percentage of 421	Total	Percentage of 316	Total	Percentage of 59	Total	Percentage of 46
Economic aspects	178	42%	139	44%	20	34%	19	41%
Philosophical, sociological, and political aspects	167	40%	119	38%	25	42%	23	50%
Aesthetic aspects	76	18%	58	18%	14	24%	4	9%
Total	421	100%	316	100%	59	100%	46	100%

Table 12

Statements of Objectives of College Freshman-level Computer Literacy Found in Periodical Literature According to Frequency of Occurrence: 1980-1995

Rank	Objective Type Statement	Total	Percentage
1	Attitudes and appreciations	311	15.56%
2	Processes, skills, and techniques	306	15.31%
3	Major Facts, principles, or fundamentals	202	10.11%
4	Economic aspects	178	8.90%
5	Application of computer literacy to daily life	175	8.75%
6	Philosophical, sociological, and political aspects	167	8.35%
7	Nature of computer literacy education and computer science professionals	147	7.35%
8	Methods of Thinking	137	6.85%
9	Interest and career development	124	6.20%
10	Research and Creativity	97	4.85%
11	Study skills	79	3.95%
12	Aesthetic aspects	76	3.80%
	Total	1999	100.00%

Table 13

Statements of Objectives of College Freshman-level Computer Literacy Found in Periodical Literature According to Frequency of Occurrence and Authorship: 1980-1995

	Higher Education		Secondary Education		Miscellaneous	
Objective Statement Type	**Rank**	**Percentage of 1544**	**Rank**	**Percentage of 213**	**Rank**	**Percentage of 216**
Major Facts, principles, or fundamentals	3	10.6%	9	6.1%	3	11.6%
Application of computer literacy to daily life	5	8.5%	3	11.3%	5	9.3%
Study skills	11	4.2%	11	1.9%	11	4.6%
Methods of Thinking	7	7.4%	10	5.2%	9	5.1%
Processes, skills, and techniques	1	16.5%	4	10.8%	2	13.4%
Research and Creativity	10	5.4%	12	1.4%	9	5.1%
Attitudes and appreciations	2	15.2%	1	19.2%	1	16.2%
Interest and career development	9	6.0%	7	7.0%	7	7.4%
Nature of computer literacy education and computer science professionals	8	7.4%	5	9.4%	8	6.0%
Aesthetic aspects	12	3.8%	8	6.6%	12	1.9%
Philosophical, sociological, and political aspects	6	7.7%	2	11.7%	4	10.6%
Economic aspects	4	9.0%	5	9.4%	6	8.8%
Total*		101.7%		100.0%		100.0%

*Difference a function of rounding and multiple authorship

CHAPTER 4

SUBPERIOD TWO, 1992-2002

The end of the 20th Century and the dawn of the 21st Century were exciting times to be alive. The start of this subperiod saw a generational shift in the Presidency – from the "Greatest Generation" (Brokaw, 2004, p. 2) represented by George H. W. Bush to the "Baby Boomer" (Gitman and McDaniel, 2005, p. 31) generation represented by Bill Clinton. Illustrating the degree to which the microcomputer had been "adopted by much of the general population" (Moschovitis, et al., 1999, p. 152) thus making "much more stored information freely and commercially available to the world" (Cohen, 2001, Para. 6). Moschovitis, et al. (1999) described the 1992 Presidential election as the "first election in history to make use of electronic computer networks for direct communication with voters" (p. 152). Trimble (2001) noted "data communication [had] evolved – from giving a commercial airline pilot a reel of [magnetic] tape to take [to another city], to direct communication between computers over telephone lines" (p. 58). This subperiod also saw a rise in "user-friendliness of PCs [sic] via the introduction of the Graphical User Interface by [both Apple computer's Macintosh computer and] the release of Windows 3.1" (Microsoft, 2005, Para. 17) by the Microsoft Corporation. Other releases of Graphical User Interface-driven operating systems by both Microsoft and Apple contributed to the ease of use of microcomputers during this subperiod. By 2001, Trimble (2001) also noted that typing on a "word processor on a PC [was being replaced by] voice dictation directly into the word processor" (p. 58).

The Clinton Administration's Escrowed Encryption Initiative raised privacy concerns during this period. This initiative was a "key-escrow system in which

encrypted messages could be decoded by a third party as well as the intended recipient" (Moschovitis, et al., 1999, p. 153). These early attempts by the Clinton Administration "ultimately translated into the 1996 Communications Decency Act, which was struck down by the Supreme Court [in 1997]" (Moschovitis, et al., 1999, p. 153). By 2002, the end of this subperiod, the Computer System Security and Privacy Advisory Board (2002) national priorities were "to secure shared systems, create a reinforcing economic and social fabric, and the development . . . of plans to secure cyberspace" (p.1).

In many ways, Computer Science (which includes a study of Computer Literacy) was finally recognized as an independent field of study. As Alavi and Carlson (1992) observed "[a]s fields of research or professional practice evolve, they become objects of interest and study themselves" (p. 46). Some authors such as Impagliazzo and Campbell-Kelly (1999) were extolling the virtues of "adding computing history" to computer literacy courses (p. 5). Impagliazzo and Campbell-Kelly (1999) added that "history [contributes] new dimensions to courses, forces students to reflect on past events, and conceptualizes their academic studies of computing" (p. 5). Other authors such as Gates (1996) were encouraging the creation of "Connected Learning Communities [so] schools [could] connect all the constituent groups [to assist] in the educational process" (p. 10). Others such as McLean and Kappelman (1992) called for "a partnership of information systems professionals, end users, researchers, and educators" (p. 154). By the end of this subperiod, Moschovitis, et al. (1999) indicated that "the explosive growth of the Internet . . . indicated a [need for a] balance between [technical systems] knowledge and management and organizational knowledge" (p. 277).

Analysis of Data

Question 1. What is the frequency of articles concerned with the objectives of teaching college freshman level computer literacy found in selected periodical literature categorized according to year and authorship within this subperiod?

An analysis of Table 14 shows that 437 articles concerned with the objectives for teaching college freshman-level computer literacy were written during the years 1992-2002 with an average of 29.13 articles per year for the 11 years. The yearly range or articles varied from a low of 25 in 1993 to a high of 50 in 2001.

Authors in Higher Education contributed the most articles followed by the Miscellaneous authors and then the Secondary Education Authors. Higher Education and Secondary Education authors co-authored 42 articles, whereas 40 articles were co-authored by Higher Education and Miscellaneous authors. Secondary Education and Miscellaneous authors wrote one article. Three articles were co-authored by at least one author in each of the three categories of authorship.

Question 2. What is the frequency of statements concerned with the objectives of teaching college freshman level computer literacy found in selected periodical literature categorized according to year and authorship within this subperiod?

Table 15 indicates a total of 1851 statements of objectives were found in the 437 articles written during the subperiod. The mean number of statements per article was 4.23. During the 11 years of the subperiod, the mean number of objective statements by the combined authorship was 168.30 statements per year.

Authors in Higher Education contributed 1434 statements (77%) with authors in the Miscellaneous category contributing 214 (12%). Authors in the Secondary Education

category contributed 203 statements (11%). Higher Education and Secondary Education authors co-authored 150 statements, whereas 137 statements were co-authored by Higher Education and Miscellaneous authors. Secondary Education and Miscellaneous writers wrote four statements and 14 statements were co-authored by at least one author in each of the three categories of authorship.

Question 3. What are the frequency, rank, and percentage of statements concerned with the objectives of teaching college freshman level computer literacy found in selected periodical literature categorized according to year, category, and authorship within this subperiod?

Table 16 organizes statements of objectives of College Freshman-level computer literacy according to year, category, and authorship. Statements in the Attitude and Awareness category were most frequent with a total of 505, or 27%. These were followed closely by 491 Cultural Awareness statements, which represented 26.5% of the total. There were also 450 Process statements (24%) and 405 Knowledge statements (22%).

Of the 1434 statements attributed to Higher Education authors, 354 were Process statements (25%), 394 were Attitude and Interest statements (27%), 316 were Knowledge statements (22%), and 370 were Cultural Awareness statements (26%). Authors in the Miscellaneous category favored Process statements, with a total of 57 (27%) of their total of 214 statements. These were followed by 56 Cultural Awareness statements (26%), 55 Attitude and Interest statements (26%), and 46 Knowledge statements (21%). Secondary Education authors contributed 203 statements. Cultural Awareness statements were the most common with 65 (32%) followed by 56 Attitude and Interest statements (28%).

Knowledge statements were mentioned 43 times (21%), and Process statements were mentioned 39 times (19%).

Questions 4 and 5. What is the Rank, Frequency, and Percentage of each Knowledge statement concerned with the teaching of college freshman level computer literacy found in selected periodical literature, categorized according to year, type, and authorship within this subperiod?

Tables 17 and 18 are numerical and percentage classifications of 405 Knowledge objectives for the second subperiod. The three types of Knowledge objectives are: Major Facts, Principles, or Fundamentals; Application of Computer Literacy to Daily Life; and Study Skills. The most frequently cited objective was Major Facts, Principles, and Fundamentals with 177 objective statements (44%). The next most frequently mentioned objective was Applications of Computer Literacy to Daily Life with 145 statements (36%). The objective cited most infrequently was Study Skills with 83 statements (20%). Higher Education authors contributed the bulk of the Knowledge statements (78%). Miscellaneous authors contributed 11% and Secondary Education authors contributed 11%. Higher Education and Secondary Education authors co-authored 33 statements. Higher Education and Miscellaneous authors also co-authored 33 statements. Secondary Education and Miscellaneous writers wrote one statement. Four statements were co-authored by at least one author in each of the three categories of authorship.

Questions 6 and 7. What are the frequency, rank, and percentage of each Process statement concerned with the teaching of college freshman level computer literacy found in selected periodical literature categorized according to year, authorship, and type within this subperiod?

Tables 19 and 20 are numerical and percentage classifications of 450 Process objective statements. Process objectives are divided into three types: Methods of Thinking; Processes, Skills, and Techniques; and Research and Creativity. The most frequently cited objective was Processes, Skills, and Techniques with 252 statements (56%). The next objective most often cited was Methods of Thinking with 110 statements (24%). There were only 88 Research and Creativity statements (20%). Again, authors in Higher Education made the most statements with 354 (79%). Miscellaneous authors contributed 57 statements (13%) and Secondary Education authors contributed 39 statements (9%). Higher Education and Secondary Education authors co-authored 38 statements, whereas 13 statements were co-authored by Higher Education and Miscellaneous authors. One statement was co-authored by Secondary Education and Miscellaneous authors. Four statements were co-authored by at least one author in each of the three categories of authorship.

Questions 8 and 9. What are the frequency, percentage, and rank of each Attitude and Interest statement concerned with the teaching of college freshman level computer literacy found in selected periodical literature categorized according to year, authorship and type within this subperiod?

Tables 21 and 22 are numerical and percentage classifications of 505 Attitude and Interest objective statements. Attitude and Interest objectives are divided into three types: Attitudes and Appreciations; Nature of Computer Literacy and Computer Literacy Professionals; and Interest and Career Development. The most frequently cited objective was Attitudes and Appreciations with 281 statements (56%). The next objective most often cited was Interest and Career Development with 123 statements (24%). There were

101 Nature of Computer Literacy and Computer Literacy Professionals statements (20%). Again, authors in Higher Education made the most statements with 394 (78%). Secondary Education authors contributed 56 statements (11%) and Miscellaneous authors contributed 55 statements (11%). Higher Education and Miscellaneous authors co-authored 44 statements, whereas 39 statements were co-authored by Higher Education and Secondary Education authors. In a collaborative effort, two statements were co-authored by authors from each of the three categories. One statement was co-authored by Secondary Education and Miscellaneous authors.

Questions 10 and 11. What is the rank, percentage, and frequency of each Cultural Awareness statement concerned with the teaching of college freshman level computer literacy found in selected periodical literature categorized according to year, authorship and type within this subperiod?

Tables 23 and 24 are numerical and percentage classifications of 491 Cultural Awareness objective statements. Cultural Awareness objectives are divided into three types: Aesthetic Aspects; Philosophical, Sociological, and Political Aspects; and Economic Aspects. With 213 statements (43%), Philosophical, Sociological, and Political Aspects were the most frequently cited objectives. The next objective most often cited was Economic Aspects with 197 statements (40%). There were 81 Aesthetic Aspect statements (16%). Again, authors in Higher Education made the most statements with 370 (75%). Secondary Education authors contributed 65 statements (13%) and Miscellaneous authors contributed 56 statements (11%). Higher Education and Secondary Education authors co-authored 40 statements, whereas 47 statements were co-authored by Higher Education and Miscellaneous authors. One statement was co-

authored by Secondary Education and Miscellaneous authors. Four statements were co-authored by at least one author in each of the three categories of authorship.

Question 12. What is the rank of each type of objective statement concerned with the teaching of college freshman level computer literacy found in selected periodical literature categorized according to frequency, percentage of occurrence, and authorship within this subperiod?

An examination of Tables 25 and 26 reveals the objective statement mentioned most often was Attitudes and Appreciations with 281 of the 1851 total statements (15.18%). Second most mentioned was Processes, Skills, and Techniques with 252 of the 1851 total statements (13.61%). The third most mentioned objective type was Philosophical, Sociological, and Political Aspects with 213 statements (11.51%). Higher Education authors ranked Attitudes and Appreciations as their first objective statement. Secondary Education authors listed Philosophical, Sociological, and Political Aspects as their first choice. Miscellaneous authors ranked the Processes, Skills, and Techniques objective statement as their first choice.

Subperiod Summary

The period from 1992 through 2002 saw major advances in computer usage brought about by the successful manufacturing and sale of microcomputers. As microcomputer prices dropped, increased in speed, functionality, and user-friendliness more and more people began using microcomputers on a daily basis. New methods of communication were invented and successfully used in homes and businesses throughout the United States.

During this subperiod, 437 articles containing 1851 objective statements were published concerning college-level computer literacy. Of these, 376 were research-oriented with 1332 objective statements. Higher Education authors contributed the most statements (79%) during this time. Miscellaneous authors were responsible for 214 statements (11%). Secondary Education authors contributed 203 statements (10%). Higher Education authors ranked Methods of Thinking as their first objective statement. Secondary Education authors ranked Philosophical, Sociological, and Political Aspects as their first objective statement. Miscellaneous authors ranked the Processes, Skills, and Techniques objective statement as their first choice.

Table 14

Numerical Classification of 437 Articles Concerned with the Objectives of College Freshman-level Computer Literacy Found in the Periodical Literature Catalogued by Year and Authorship: 1992-2002

Year	Number of Articles	By Higher Education	By Secondary Education	By Miscellaneous
1992	40	37	8	9
1993	25	24	3	2
1994	35	33	6	3
1995	34	33	4	3
1996	49	44	4	8
1997	40	39	5	6
1998	26	25	2	3
1999	49	48	6	5
2000	46	43	3	6
2001	50	46	7	9
2002	43	41	7	6
Total *	437	413	55	60

* NOTE: Difference is a function of split authorship.

Table 15

Numerical Classification of 1851 Statements Concerned with the Objectives of College Freshman-level Computer Literacy Found in the Periodical Literature Catalogued by Year and Authorship: 1992-2002

Year and Authorship	Higher Education	Secondary Education	Miscellaneous	Total*
1992	127	26	32	185
1993	84	15	9	108
1994	126	20	12	158
1995	127	18	12	157
1996	187	15	36	238
1997	151	23	21	195
1998	73	7	11	91
1999	170	24	17	211
2000	124	10	15	149
2001	134	22	28	184
2002	131	23	21	175
Total	1434	203	214	1851

* NOTE: Difference is a function of split authorship.

Table 16

Numerical and Percentage Classification of Statements of Objectives of College Freshman-level Computer Literacy Found in the Periodical Literature Catalogued According to Category, Year, and Authorship: 1992-2002

		Authorship																			
		Higher Education					Secondary Education					Miscellaneous					All Authors				
	Category	Knowledge	Process	Attitude	Cultural	Total	Knowledge	Process	Attitude	Cultural	Total	Knowledge	Process	Attitude	Cultural	Total	Knowledge	Process	Attitude	Cultural	Total
Year	1992	30	28	42	27	127	5	4	9	8	26	10	12	6	4	32	45	44	57	39	185
	1993	18	23	20	23	84	2	1	5	7	15	3	2	3	1	9	23	26	28	31	108
	1994	32	27	35	32	126	4	1	7	8	20	3	3	3	3	12	39	31	45	43	158
	1995	29	40	29	29	127	1	1	9	7	18	3	3	3	3	12	33	44	41	39	157
	1996	37	42	49	59	187	4	4	4	3	15	7	7	10	12	36	48	53	63	74	238
	1997	24	41	33	53	151	6	8	1	8	23	3	9	2	7	21	33	58	36	68	195
	1998	13	16	26	18	73	3	1	1	2	7	2	4	0	5	11	18	21	27	25	91
	1999	45	55	40	30	170	6	8	6	4	24	5	6	2	4	17	56	69	48	38	211
	2000	23	22	42	37	124	2	2	4	2	10	1	3	8	3	15	26	27	54	42	149
	2001	29	36	40	29	134	5	4	5	8	22	3	3	12	10	28	37	43	57	47	184
	2002	36	24	38	33	131	5	5	5	8	23	6	5	6	4	21	47	34	49	45	175
	Percent of Grand Total**	17%	19%	21%	20%	**77%**	2%	2%	3%	4%	**11%**	2%	3%	3%	3%	**12%**	22%	24%	27%	27%	**100%**
	Grand Total*	316	354	394	370	1434	43	39	56	65	203	46	57	55	56	214	405	450	505	491	1851

*Difference is a function of Split Authorship

** Difference is a function of rounding

Table 17
Numerical Classification of 405 Statements of Knowledge Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type and Year: 1992-2002

Rank	1	2	3	
Statement	Major Facts, principles, or fundamentals	Application of computer literacy to daily life	Study skills	Total
1992	15	21	9	45
1993	9	7	7	23
1994	13	18	8	39
1995	12	14	7	33
1996	20	17	11	48
1997	21	6	6	33
1998	11	5	2	18
1999	29	15	12	56
2000	13	11	2	26
2001	15	15	7	37
2002	19	16	12	47
Grand Total	177	145	83	405

Table 18

Numerical and Percentage Classification of 405 Statements of Knowledge Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type and Authorship: 1992-2002

	All Authors		Higher Education		Secondary Education		Miscellaneous	
Objective Type Statement	Total	Percentage of 405	Total	Percentage of 316	Total	Percentage of 43	Total	Percentage of 46
Major Facts, principles, or fundamentals	177	44%	135	43%	26	60%	16	35%
Application of computer literacy to daily life	145	36%	115	36%	12	28%	18	39%
Study skills	83	20%	66	21%	5	12%	12	26%
Total	405	100%	316	100%	43	100%	46	100%

Table 19

Numerical Classification of 450 Statements of Process Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type and Year: 1992-2002

Rank	1	2	3	
Statement	Processes, Skills, and Techniques	Methods of Thinking	Research and Creativity	Total
1992	28	9	7	44
1993	11	9	6	26
1994	19	7	5	31
1995	19	13	12	44
1996	23	15	15	53
1997	33	13	12	58
1998	14	4	3	21
1999	35	21	13	69
2000	18	5	4	27
2001	27	9	7	43
2002	25	5	4	34
Grand Total	252	110	88	450

Table 20

Numerical and Percentage Classification of 450 Statements of Process Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type and Authorship: 1992-2002

	All Authors		Higher Education		Secondary Education		Miscellaneous	
Objective Type Statement	Total	Percentage of 450	Total	Percentage of 354	Total	Percentage of 39	Total	Percentage of 57
Processes, skills, and techniques	252	56%	195	55%	24	62%	33	58%
Methods of Thinking	110	24%	88	25%	9	23%	13	23%
Research and Creativity	88	20%	71	20%	6	15%	11	19%
Total	450	100%	354	100%	39	100%	57	100%

Table 21

Numerical Classification of 505 Statements of Attitude and Interest Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type and Year: 1992-2002

Rank	1	2	3	
Statement	Attitudes and appreciations	Interest and career development	Nature of computer literacy education and computer science professionals	Total
1992	29	13	15	57
1993	15	7	6	28
1994	28	7	10	45
1995	21	9	11	41
1996	37	15	11	63
1997	19	11	6	36
1998	15	7	5	27
1999	22	15	11	48
2000	30	15	9	54
2001	33	13	11	57
2002	32	11	6	49
Grand Total	281	123	101	505

Table 22

Numerical and Percentage Classification of 505 Statements of Attitude and Interest Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type and Authorship: 1992-2002

	All Authors		Higher Education		Secondary Education		Miscellaneous	
Objective Type Statement	Total	Percentage of 505	Total	Percentage of 394	Total	Percentage of 56	Total	Percentage of 55
Attitudes and appreciations	281	56%	219	56%	31	55%	31	56%
Nature of computer literacy education and computer science professionals	101	20%	78	20%	10	18%	13	24%
Interest and career development	123	24%	97	25%	15	27%	11	20%
Total	505	100%	394	100%	56	100%	55	100%

Table 23

Numerical Classification of 491 Statements of Cultural Awareness Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type and Year: 1992-2002

Rank	1	2	3	
Statement	Philosophical, sociological, and political aspects	Economic aspects	Aesthetic aspects	Total
1992	19	11	9	39
1993	15	7	9	31
1994	17	19	7	43
1995	14	21	4	39
1996	31	29	14	74
1997	33	27	8	68
1998	13	11	1	25
1999	15	11	12	38
2000	15	21	6	42
2001	21	18	8	47
2002	20	22	3	45
Grand Total	213	197	81	491

Table 24

Numerical and Percentage Classification of 491 Statements of Cultural Awareness Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type and Authorship: 1992-2002

	All Authors		Higher Education		Secondary Education		Miscellaneous	
Objective Type Statement	Total	Percentage of 491	Total	Percentage of 370	Total	Percentage of 65	Total	Percentage of 56
Economic aspects	197	40%	153	41%	21	32%	23	41%
Philosophical, sociological, and political aspects	213	43%	158	43%	32	49%	23	41%
Aesthetic aspects	81	16%	59	16%	12	18%	10	18%
Total	491	100%	370	100%	65	100%	56	100%

Table 25

Statements of Objectives of College Freshman-level Computer Literacy Found in Periodical Literature According to Frequency of Occurrence: 1992-2002

Rank	Objective Type Statement	Total	Percentage
1	Attitudes and appreciations	281	15.18%
2	Processes, skills, and techniques	252	13.61%
3	Philosophical, sociological, and political aspects	213	11.51%
4	Economic aspects	197	10.64%
5	Major Facts, principles, or fundamentals	177	9.56%
6	Application of computer literacy to daily life	145	7.83%
7	Interest and career development	123	6.65%
8	Methods of Thinking	110	5.94%
9	Nature of computer literacy education and computer science professionals	101	5.46%
10	Research and Creativity	88	4.75%
11	Study skills	83	4.48%
12	Aesthetic aspects	81	4.38%
	Total	1851	100.00%

Table 26

Statements of Objectives of College Freshman-level Computer Literacy Found in Periodical Literature According to Frequency of Occurrence and Authorship: 1992-2002

	Higher Education		Secondary Education		Miscellaneous	
Objective Statement Type	**Rank**	**Percentage of 1434**	**Rank**	**Percentage of 203**	**Rank**	**Percentage of 214**
Major Facts, principles, or fundamentals	5	9.4%	3	12.8%	6	7.5%
Application of computer literacy to daily life	6	8.0%	7	5.9%	5	8.4%
Study skills	11	4.6%	12	2.5%	9	5.6%
Methods of Thinking	8	6.1%	10	4.4%	7	6.1%
Processes, skills, and techniques	2	13.6%	4	11.8%	1	15.4%
Research and Creativity	10	5.0%	11	3.0%	10	5.1%
Attitudes and appreciations	1	15.3%	2	15.3%	2	14.5%
Interest and career development	7	6.8%	6	7.4%	10	5.1%
Nature of computer literacy education and computer science professionals	9	5.4%	9	4.9%	7	6.1%
Aesthetic aspects	12	4.1%	7	5.9%	12	4.7%
Philosophical, sociological, and political aspects	3	11.0%	1	15.8%	3	10.7%
Economic aspects	4	10.7%	5	10.3%	3	10.7%
Total		100.0%		100.0%		100.0%

CHAPTER 5

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Findings Across Subperiods One And Two

The period of 1980-2002 was an eventful time for the computer science field. Both teachers of computer literacy and computer professionals continuously worked to define and refine an ever-evolving curriculum. An analysis of the results within and across the two subperiods reveals that the same four objective categories identified in the Hemby (2000) secondary school science study, the Huff (2002) secondary school physical education study, the Mills (1990) college freshman English study, the Ogden (1972) chemistry study, the Ogden and Jackson (1974) biology study, the Roy (1979) earth science study, the Sehr (1993) physics study, and the Woodard (1982) college freshman English study were found in the 1980 – 2002 computer literacy investigation. All objective categories were found across both subperiods. Research questions for each subperiod were analyzed across both subperiods.

Question 1: Frequency of Articles Catalogued by Subperiod and Authorship Across Subperiods

An examination of Table 27 indicates the number of articles generally decreased from Subperiod One through Subperiod Two. Higher Education authors consistently produced the most articles during both subperiods. The percentage of articles contributed by Higher Education authors increased from 90.77% in Subperiod One to 94.51% in Subperiod Two. Miscellaneous authors produced more articles than those in the Secondary Education category. The number of articles produced by all three groups decreased from Subperiod One through Subperiod Two. Articles by Secondary

Education and Miscellaneous authors changed by approximately one-half of 1% from Subperiod One through Subperiod Two.

Question 2: Frequency of Statements Catalogued by Subperiod and Authorship Across Subperiods

The data presented in Table 28 indicate that the most statements of objectives for teaching college freshman-level computer literacy occurred in Subperiod One. There was a decrease in the number of statements from Subperiod One through Subperiod Two. 1999 statements occurred during the first subperiod and 1851 statements occurred during the second subperiod.

Authors in Higher Education contributed the most statements in both subperiods. Miscellaneous authors contributed slightly more articles than Secondary Education authors in both subperiods. In both cases the statements made by authors in Higher Education were almost five times greater than the sum of the other two author groups.

Question 3: Frequency. Rank, and Percentage of Statements Catalogued by Subperiod, Category, and Authorship Across Subperiods

Tables 29 and 30 show that statements in the Attitude and Interest category were most frequent in subperiod one. In Subperiod two, both the Attitude and Interest objective statements and the Cultural Awareness statements tied for most frequently cited. The order of frequency for the first subperiod was Attitude and Interest, Process, Knowledge, and Cultural Awareness. In the second subperiod, the order was Attitude and Interest/Cultural Awareness, Process, and Knowledge. Across the subperiods, the greatest change among the categories was a 6% increase in Cultural Awareness objective statements. Attitude and Interest, Knowledge, and Process objective statements

decreased slightly from the first subperiod to the second subperiod. In Subperiod One, Secondary Education and Miscellaneous authors ranked Attitude and Interest objectives as most abundant, while Higher Education authors discussed Process objectives more frequently. In Subperiod Two, Miscellaneous authors discussed Process objectives more often, while Higher Education and Secondary Education authors cited Attitude and Interest objectives more frequently.

During the time of the study, Higher Education authors placed an increased importance upon Cultural Awareness objectives in their writings. Secondary Education authors increased their contributions of Knowledge, Process, and Cultural Awareness statements while their discussion of Attitude and Interest objectives decreased. Miscellaneous authors increased emphasis on Process and Cultural Awareness topics during the study. The greatest percentage change in a single category was the 8% decrease in Attitude and Interest by Secondary Education authors.

Questions 4 and 5: Rank Frequency and Percentage of Knowledge Statements Catalogued by Subperiod, Type, and Authorship Across Subperiods

Tables 31 and 32 indicate that within the Knowledge category the statement of Major Facts, Principles, or Fundamentals ranked the highest in both subperiods. The total number of Knowledge statements decreased by 51 between Subperiod One and Subperiod Two. Authors in the Higher Education categories consistently ranked Major Facts, Principles, or Fundamentals as most important during both subperiods. Authors in Secondary Education ranked Application of Computer Literacy to Daily Life as most important during the first subperiod and Major Facts, Principles, or Fundamentals as most important during the second subperiod. By ranking Major Facts, Principles, or

Fundamentals as most important during the first subperiod and Application of Computer Literacy to Daily Life as most important during the second subperiod, authors in the Miscellaneous category behaved just the opposite of their Secondary Education counterparts. All three author groups ranked Study skills last in both subperiods.

Questions 6 and 7: Rank. Frequency. and Percentage of Process Statements Catalogued by Subperiod, Type, and Authorship Across Subperiods

An analysis of Tables 33 and 34 reveals a similar shift in thinking among authors in all three authorship categories between the two subperiods. During the first subperiod, authors in all three categories wrote most about Methods of Thinking. During the second subperiod, authors in all three categories wrote most about Processes, Skills, and Techniques. Authors in Higher Education and Secondary Education consistently wrote about Research and Creativity the least. Miscellaneous authors decreased their comments about Research and Creativity during the second subperiod. Once again, Higher Education authors contributed more articles in both subperiods than the other two author groups combined.

Although there were huge swings in focus of article topics between the two subperiods, the percentage change in objective statements remained relatively constant throughout the two subperiods. Research and Creativity increased two percent between subperiods at the expense of a 1% decrease in each of the other two categories.

Questions 8 and 9: Rank, Frequency, and Percentage of Attitude and Interest Statements Catalogued by Subperiod, Type, and Authorship Across Subperiods

Analysis of Tables 35 and 36 indicates a consistent discussion of Attitudes and Appreciations in all author groups during both subperiods. Authors in Higher Education

and Secondary Education increased their discussion of Interest and Career Development from the first subperiod to the second subperiod at the expense of the Nature of Computer Literacy Education and Computer Science Professionals objective statements. Authors in the Miscellaneous category decreased their discussion of Interest and Career Development from the first subperiod to the second subperiod in favor of the Nature of Computer Literacy Education and Computer Science Professionals objective statements.

The greatest change in percentage across the two subperiods was in the Nature of Computer Literacy and Computer Science Professionals, with a 5% decrease. The largest percentage change for a single objective was the drop of 8% in the ranking of the Nature of Computer Literacy and Computer Science Professionals among Secondary Education authors.

Questions 10 and 11: Rank, Frequency. and Percentage of Cultural Awareness Statements Catalogued by Subperiod, Type, and Authorship Across Subperiods

An examination of Tables 37 and 38 indicates that the Aesthetic Aspects objective statements were the least likely to be discussed by authors in all author groups. Authors in Higher Education discussed Economic Aspects most frequently during the first subperiod, while authors in the other two authorship categories favored Philosophical, Sociological, and Political objective statements during the first subperiod. By the second subperiod, authors in Higher Education had shifted their focus to coincide with the focus of the other author groups by citing Philosophical, Sociological, and Political objective statements most frequently.

Authors in the Miscellaneous category discussed Economic Aspects consistently during both subperiods. The greatest increase occurred with a 9% rise in articles

concerning Aesthetic aspects written by Miscellaneous authors during the two subperiods. The greatest decrease occurred with an 8% drop in articles concerning Aesthetic aspects written by Secondary Education authors during the two subperiods.

Question 12: Rank of Statement Types Catalogued by Frequency, Percentage, and Authorship Across Subperiods

A thorough review of Tables 39 and 40 reveals that the Attitudes and Appreciations objective statements were the most frequently discussed by all authors throughout both subperiods. All authors also consistently discussed Processes, Skills, and Techniques as the second most frequently cited objective throughout both subperiods. Authors in all three categories shifted focus from Major Facts, Principles, or Fundamentals in the first subperiod to Philosophical, Sociological, and Political aspects during the second subperiod.

Table 27

Numerical and Percentage Classification of Articles Concerned with the Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Subperiod and Authorship: 1980-2002

	Subperiod 1		Subperiod 2	
Authorship	**Number of Articles**	**Percentage**	**Number of Articles**	**Percentage**
Higher Education	492	90.77%	413	94.51%
Secondary Education	65	11.99%	55	12.59%
Miscellaneous	73	13.47%	60	13.73%
Total*	542	100.00%	437	100.00%

*Difference is a function of split authorship

Table 28

Numerical Classification of Statements Concerned with the Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Subperiod and Authorship: 1980-2002

Subperiod and Authorship	1	2
Higher Education	1544	1434
Secondary Education	213	203
Miscellaneous	216	214
Total*	1999	1851

*Difference is a function of split authorship

Table 29

Numerical Classification of Statements of Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Subperiod, Category, and Authorship: 1980-2002

Subperiod		1	2
Authorship	Category		
Higher Education	Knowledge	360	316
	Process	452	354
	Attitude and Interest	442	394
	Cultural Awareness	316	370
	Total	1570	1434
Secondary Education	Knowledge	41	43
	Process	37	39
	Attitude and Interest	76	56
	Cultural Awareness	59	65
	Total	213	203
Miscellaneous	Knowledge	55	46
	Process	51	57
	Attitude and Interest	64	55
	Cultural Awareness	46	56
	Total	216	214
All Authors	Knowledge	456	405
	Process	540	450
	Attitude and Interest	582	505
	Cultural Awareness	421	491
	Total	1999	1851

Table 30

Percentage Classification of Statements of Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Subperiod, Category, and Authorship: 1980-2002

Subperiod		1	2
Authorship	Category		
Higher Education	Knowledge	23%	22%
	Process	29%	25%
	Attitude and Interest	28%	27%
	Cultural Awareness	20%	26%
	Total	100%	100%
Secondary Education	Knowledge	19%	21%
	Process	17%	19%
	Attitude and Interest	36%	28%
	Cultural Awareness	28%	32%
	Total	100%	100%
Miscellaneous	Knowledge	25%	21%
	Process	24%	27%
	Attitude and Interest	30%	26%
	Cultural Awareness	21%	26%
	Total	100%	100%
All Authors	Knowledge	23%	22%
	Process	27%	24%
	Attitude and Interest	29%	27%
	Cultural Awareness	21%	27%
	Total	100%	100%

Table 31

Numerical Classification of Statements of Knowledge Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type, Subperiod, and Authorship: 1980-2002

	Authorship							
	All Authors		Higher Education		Secondary Education		Miscellaneous	
Objective Type Statement	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2
Major Facts, principles, or fundamentals	202	177	164	135	13	26	25	16
Application of computer literacy to daily life	175	145	131	115	24	12	20	18
Study skills	79	83	65	66	4	5	10	12
Total	456	405	360	316	41	43	55	46

Table 32

Percentage Classification of Statements of Knowledge Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type, Subperiod, and Authorship: 1980-2002

	Authorship							
	All Authors		Higher Education		Secondary Education		Miscellaneous	
Objective Type Statement	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2
Major Facts, principles, or fundamentals	44%	44%	46%	43%	32%	60%	45%	35%
Application of computer literacy to daily life	38%	36%	36%	36%	59%	28%	36%	39%
Study skills	17%	20%	18%	21%	10%	12%	18%	26%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Table 33

Numerical Classification of Statements of Process Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type, Subperiod, and Authorship: 1980-2002

	Authorship							
	All Authors		Higher Education		Secondary Education		Miscellaneous	
Objective Type Statement	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2
Processes, skills, and techniques	306	252	115	195	11	24	11	33
Methods of Thinking	137	110	254	88	23	9	29	13
Research and Creativity	97	88	83	71	3	6	11	11
Total	540	450	452	354	37	39	51	57

Table 34

Percentage Classification of Statements of Process Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type, Subperiod, and Authorship: 1980-2002

	Authorship							
	All Authors		Higher Education		Secondary Education		Miscellaneous	
Objective Type Statement	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2
Processes, skills, and techniques	57%	56%	25%	55%	30%	62%	22%	58%
Methods of Thinking	25%	24%	56%	25%	62%	23%	57%	23%
Research and Creativity	18%	20%	18%	20%	8%	15%	22%	19%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Table 35

Numerical Classification of Statements of Attitude and Interest Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type, Subperiod, and Authorship: 1980-2002

	Authorship							
	All Authors		Higher Education		Secondary Education		Miscellaneous	
Objective Type Statement	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2
Attitudes and appreciations	311	281	235	219	41	31	35	31
Nature of computer literacy education and computer science professionals	147	101	114	78	20	10	13	13
Interest and career development	124	123	93	97	15	15	16	11
Total	582	505	442	394	76	56	64	55

Table 36

Percentage Classification of Statements of Attitude and Interest Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type, Subperiod, and Authorship: 1980-2002

	Authorship							
	All Authors		Higher Education		Secondary Education		Miscellaneous	
Objective Type Statement	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2
Attitudes and appreciations	53%	56%	53%	56%	54%	55%	55%	56%
Nature of computer literacy education and computer science professionals	25%	20%	26%	20%	26%	18%	20%	24%
Interest and career development	21%	24%	21%	25%	20%	27%	25%	20%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Table 37

Numerical Classification of Statements of Cultural Awareness Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type, Subperiod, and Authorship: 1980-2002

	Authorship							
	All Authors		Higher Education		Secondary Education		Miscellaneous	
Objective Type Statement	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2
Economic aspects	178	197	139	153	20	21	19	23
Philosophical, sociological, and political aspects	167	213	119	158	25	32	23	23
Aesthetic aspects	76	81	58	59	14	12	4	10
Total	421	491	316	370	59	65	46	56

Table 38

Percentage Classification of Statements of Cultural Awareness Objectives of College Freshman-level Computer Literacy Teaching Found in Periodical Literature Catalogued by Type, Subperiod, and Authorship: 1980-2002

	Authorship							
	All Authors		Higher Education		Secondary Education		Miscellaneous	
Objective Type Statement	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2	Subperiod 1	Subperiod 2
Economic aspects	42%	40%	44%	41%	34%	32%	41%	41%
Philosophical, sociological, and political aspects	40%	43%	38%	43%	42%	49%	50%	41%
Aesthetic aspects	18%	16%	18%	16%	24%	18%	9%	18%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Table 39

Numerical Ranking of Statements of Objectives of College Freshman-level Computer Literacy Found in Periodical Literature Catalogued by Type, Subperiod, and Authorship: 1980-2002

Rank by Subperiod		Objective Type Statement	Number of Articles by Subperiod	
1	2		1	2
1	1	**Attitudes and appreciations**		
		All Authors	311	281
		Higher Education	235	219
		Secondary Education	41	31
		Miscellaneous	35	31
2	2	**Processes, skills, and techniques**		
		All Authors	306	252
		Higher Education	254	195
		Secondary Education	23	24
		Miscellaneous	29	33
3	5	**Major Facts, principles, or fundamentals**		
		All Authors	202	177
		Higher Education	164	135
		Secondary Education	13	26
		Miscellaneous	25	16
4	4	**Economic aspects**		
		All Authors	178	197
		Higher Education	139	153
		Secondary Education	20	21
		Miscellaneous	19	23
5	6	**Application of computer literacy to daily life**		
		All Authors	175	145
		Higher Education	131	115
		Secondary Education	24	12
		Miscellaneous	20	18
6	3	**Philosophical, sociological, and political aspects**		
		All Authors	167	213
		Higher Education	119	158
		Secondary Education	25	32
		Miscellaneous	23	23

Table 39 (continues)

Rank by Subperiod		Objective Type Statement	Number of Articles by Subperiod	
1	2		1	2
7	9	**Nature of computer literacy education and computer science professionals**		
		All Authors	147	101
		Higher Education	114	78
		Secondary Education	20	10
		Miscellaneous	13	13
8	8	**Methods of Thinking**		
		All Authors	137	110
		Higher Education	115	88
		Secondary Education	11	9
		Miscellaneous	11	13
9	7	**Interest and career development**		
		All Authors	124	123
		Higher Education	93	97
		Secondary Education	15	15
		Miscellaneous	16	11
10	10	**Research and Creativity**		
		All Authors	97	88
		Higher Education	83	71
		Secondary Education	3	6
		Miscellaneous	11	11
11	11	**Study skills**		
		All Authors	79	83
		Higher Education	65	66
		Secondary Education	4	5
		Miscellaneous	10	12
12	12	**Aesthetic aspects**		
		All Authors	76	81
		Higher Education	58	59
		Secondary Education	14	12
		Miscellaneous	4	10

Table 40

Percentage Ranking of Statements of Objectives of College Freshman-level Computer Literacy Found in Periodical Literature Catalogued by Type, Subperiod, and Authorship: 1980-2002

Rank by Subperiod		Objective Type Statement	Number of Articles by Subperiod	
1	2		1	2
1	1	**Attitudes and appreciations**		
		All Authors	15.56%	15.18%
		Higher Education	14.97%	15.27%
		Secondary Education	19.25%	15.27%
		Miscellaneous	16.20%	14.49%
2	2	**Processes, skills, and techniques**		
		All Authors	15.31%	13.61%
		Higher Education	16.18%	13.60%
		Secondary Education	10.80%	11.82%
		Miscellaneous	13.43%	15.42%
3	5	**Major Facts, principles, or fundamentals**		
		All Authors	10.11%	9.56%
		Higher Education	10.45%	9.41%
		Secondary Education	6.10%	12.81%
		Miscellaneous	11.57%	7.48%
4	4	**Economic aspects**		
		All Authors	8.90%	10.64%
		Higher Education	8.85%	10.67%
		Secondary Education	9.39%	10.34%
		Miscellaneous	8.80%	10.75%
5	6	**Application of computer literacy to daily life**		
		All Authors	8.75%	7.83%
		Higher Education	8.34%	8.02%
		Secondary Education	11.27%	5.91%
		Miscellaneous	9.26%	8.41%
6	3	**Philosophical, sociological, and political aspects**		
		All Authors	8.35%	11.51%
		Higher Education	7.58%	11.02%
		Secondary Education	11.74%	15.76%
		Miscellaneous	10.65%	10.75%

Table 40 (continues)

Rank by Subperiod		Objective Type Statement	Number of Articles by Subperiod	
1	2		1	2
7	9	**Nature of computer literacy education and computer science professionals**		
		All Authors	7.35%	5.46%
		Higher Education	7.26%	5.44%
		Secondary Education	9.39%	4.93%
		Miscellaneous	6.02%	6.07%
8	8	**Methods of Thinking**		
		All Authors	6.85%	5.94%
		Higher Education	7.32%	6.14%
		Secondary Education	5.16%	4.43%
		Miscellaneous	5.09%	6.07%
9	7	**Interest and career development**		
		All Authors	6.20%	6.65%
		Higher Education	5.92%	6.76%
		Secondary Education	7.04%	7.39%
		Miscellaneous	7.41%	5.14%
10	10	**Research and Creativity**		
		All Authors	4.85%	4.75%
		Higher Education	5.29%	4.95%
		Secondary Education	1.41%	2.96%
		Miscellaneous	5.09%	5.14%
11	11	**Study skills**		
		All Authors	3.95%	4.48%
		Higher Education	4.14%	4.60%
		Secondary Education	1.88%	2.46%
		Miscellaneous	4.63%	5.61%
12	12	**Aesthetic aspects**		
		All Authors	3.80%	4.38%
		Higher Education	3.69%	4.11%
		Secondary Education	6.57%	5.91%
		Miscellaneous	1.85%	4.67%

Summary of Findings

Based on an analysis of the results across both subperiods, the major findings of this investigation included the following:

1. The number of articles relating to objectives for teaching College Freshman-level Computer Literacy decreased during the time of this study.

2. There were approximately four times as many research-oriented articles as non-research oriented articles in the two subperiods.

3. Authors in Higher Education produced the most articles and the most statements in each subperiod of the study. Secondary Education authors produced the least articles and statements in the two subperiods.

4. Statements in the Attitude and Interest category were most frequent in the two subperiods.

5. During both subperiods, the most important objectives for College Freshman-level Computer Literacy instruction were Attitudes and Appreciations (from the Attitude and Interest category), and Processes, skills, and techniques (from the Process category). The third most important objective during the first subperiod was Major facts, principles, or fundamentals (from the Knowledge category). During the second subperiod, the third most important objective was Philosophical, sociological, and political aspects (from the Cultural Awareness category)

6. Aesthetic aspect objectives were consistently ranked as least important throughout the study.

7. During the course of this study the author recognized a publishing trend in 1980-1983 of publications by students seeking master's degrees. Many of these students

also contributed articles during the period 1984-1987 but were listed as doctoral students during this later period.

8. Authors in Higher Education were responsible for most of the research-oriented articles and statements throughout the study. Secondary Education authors were responsible for the least.

9. The emphasis placed upon partnership and balance between computer science professionals, end users, and computer educators was evident in the drastic increase of multiple author articles during the course of the study.

Conclusions

Based on the findings of this investigation, the following conclusions were made:

1. The objectives for teaching College Freshman-level Computer Literacy were influenced by historical events, especially the implementation of SDI, the Cold War, the U.S. Space Program, the rapid innovations in the computer industry – especially the microcomputer industry segment – and the explosive growth of the Internet.

2. Authors from Higher Education wrote more articles about the objectives for the teaching of College Freshman-level Computer Literacy than those in the other categories. This was probably a reflection of the "publish or perish" environment in many colleges and universities as well as a reflection of the huge increase in computer course enrollment and the increased concern over computer literacy curriculum development during the period of the study.

3. The most important objectives for College Freshman-level Computer Literacy teaching were Attitudes and Appreciations, Processes, skills, and techniques, Major facts, principles, or fundamentals, and Philosophical, sociological, and political aspects. The

preponderance of these objectives is most likely a result of the rapid growth of the microcomputer hardware and software industry and the large influx of new computer students during this period.

4. Some authors pointed out, in specific statements of objectives, that College Freshman-level Computer Literacy courses should be service courses designed to teach the student how to use computers to do well in other courses. Other authors saw College Freshman-level Computer Literacy courses as unique courses with their own content. (McLean and Kappelman, 1992, p. 153)

Recommendations for Further Study

1. This study examined a variety of journals in a search for answers to questions concerning computer literacy posed by the investigator. It is recommended that journals utilized mainly by college freshman-level computer programming instructors, a subset of the broader computer literacy topic, be examined for more discipline specific objectives as those in this study. An example of such a study would be the use of COBOL, BASIC, Pascal, C, C++, and Java to teach college freshman and sophomore-level computer programming courses per the arguments of Nance (1994, p. 2): "computer programming is not computer literacy."

2. While researching this study it became evident that the names of the authors gradually shifted from Anglo-Saxon surnames to Oriental or Middle-East surnames. It is recommended that the authors of journal articles used by college freshman-level computer science instructors be compared to computer science personnel demographics to determine a possible link between authorship and demographics.

3. The preponderance of the evidence gleaned during the course of this study indicates a trend in the non-ACM and IEEE publications – as editorships changed, the objectives of the publication were modified or changed. It is recommended that a study of the editorial aims and objectives of the non-ACM and IEEE publications used in this study be examined to determine the influence of editors on the stated aims and objectives of college freshman-level computer literacy.

4. Letters to the editor, committee reports, editorials, book reviews, convention reports, and critiques of committee reports were beyond the scope of this study. The investigator recommends that they be examined to determine stated objectives for teaching college freshman-level computer literacy.

5. During the course of this study, the author noticed a preponderance shift from single author research articles in 1980 to multiple author research articles in 2002. It is recommended that a study of the impact of the evolution of team and group decision support systems environments in the computer industry on multiple author research articles be undertaken.

6. It is recommended that textbooks currently in use to teach college freshman-level computer literacy courses be examined to determine stated objectives.

7. It is recommended that articles about secondary school computer literacy courses be examined.

8. It is recommended that articles about college freshman-level computer literacy published in the period before this study be examined.

9. The plethora of articles written by teams of authors rendered the authorship study meaningless. It is recommended that the practice of tabulating authorship by

category be eliminated in future studies. Instead, a general comment about the background of authors in each category should be adopted.

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APPENDIX

ARTICLE CLASSIFICATION SHEET

Article/ Objective Selection Criteria	1. Article presents an expression of opinion and/or the result of formal research.	Yes No
	2. Objective statements are explicitly stated by author, not implied.	Yes No
	3. Article is concerned with teaching college freshman level computer literacy.	Yes No
	4. Article is not an editorial, letter to editor, book review, nor convention report.	Yes No
	5. Article is not a committee report nor a critique of a committee report.	Yes No

Name of Author: _____

Name of Article: _____

Title of Publication: _____

Volume; Issue number, or month of publication: _____

Year of Publication: _____ Page Numbers: _____

Authorship:

H: Higher Education: college or university teacher or administrator, junior college teacher, retired member of the above, and doctoral student.

S: Secondary Education: classroom teacher, school administrator subject matter supervisor or consultant, retired member of the above, and student seeking a master's degree.

M: Miscellaneous: All authors holding occupations other than those listed above. _____

Objective Class

R. Research-oriented: Objectives based on empirical evidence.

N. Non research-Oriented: Objectives based on author's opinion. _____

Objective Category and Type Given in Total Numbers

(1) Knowledge Objectives:
- (a) Major facts, principles, or fundamentals _____
- (b) Applications of computer literacy to daily life _____
- (c) Study skills _____

(2) Process Objectives:
- (a) Methods of thinking _____
- (b) Process skills and techniques _____
- (c) Research and creativity _____

(3) Attitude and Interest:
- (a) Attitudes and appreciations _____
- (b) Interest and career development _____
- (c) Nature of computer literacy education and computer science professionals _____

(4) Cultural Awareness Objectives:
- (a) Aesthetic aspects _____
- (b) Philosophical, sociological, and political aspects _____
- (c) Economic aspects _____

Objective Statements
Page/line _____

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VITA

Wade Tyler Graves was born in the Perrin Air Force Base Hospital near Denison, Texas, on December 11, 1964, the son of Capt. Frank E. Graves and Evelyn C. Graves. After graduating from Denison High School in Denison, Texas in May of 1983, this Eagle Scout enrolled at Grayson County College in Denison, Texas. After successfully completing an Associates of Business Administration two years later, he transferred to the University of North Texas in Denton, Texas, where he completed a Bachelor of Business Administration degree in 1987. During this time he was employed full time in the banking industry. In the fall of 1989, he entered the Accounting and Computer Consulting industry in Oklahoma City. During this time he enrolled in the Masters of Business Administration program at Oklahoma City University. In early 1992, he accepted a position at Grayson County College and transferred to the Masters of Business Administration program at East Texas State University in Commerce, Texas. As the result of evening, weekend, and summer studies he received a Masters of Business Administration degree from Texas A&M University–Commerce (formerly East Texas State University) in May of 1996. He was awarded the Doctor of Education degree from Texas A&M University–Commerce with a major in Supervision, Curriculum, and Instruction—Higher Education in December of 2005.

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