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A conceptual analysis of ‘computer literacy’

Merkle, Patricia Ann, Ph.D.
The Ohio State University, 1990
A CONCEPTUAL ANALYSIS OF
'COMPUTER LITERACY'

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of the Ohio State University

By

Patricia Ann Merkle, B.S. Ed., M.A.

*****

The Ohio State University
1990

Dissertation Committee:
Suzanne Damarin
Thomas Nelson
Richard Pratte
Gerald Reagan, Chairperson

Approved by

Gerald Reagan, Chairperson

Adviser
College of Education
In Memory of My Grandmother, Viola Belle Finkboner
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VITA

October 13, 1958 ............................................................ Born--Freeport, Illinois

1983 ................................................................. B.S.Ed., Illinois State University, Normal, Illinois

1983-1988 ............................................................ Graduate Teaching Associate, Educational Policy and Leadership, The Ohio State University, Columbus, Ohio

1985 ................................................................. M.A., The Ohio State University, Columbus, Ohio


1989-90 ............................................................. Lecturer, Educational Policy and Leadership, The Ohio State University, Columbus, Ohio

PUBLICATIONS


FIELD OF STUDY

Major Field: Philosophy of Education
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CHAPTER I
INTRODUCTION

Problem and Focus

'Computer literacy' (hereafter 'CL') is one of the educational buzzwords of the Eighties. And, as with most such terms, it has received wholehearted support despite a lack of clarity concerning its intended meaning. This has resulted in confusion regarding the purpose of and appropriate curriculum for CL programs among those charged with developing such programs. This dissertation is an attempt to reduce the confusion surrounding 'CL'. Three general questions will be addressed. The first is, "How is 'CL' defined?" The second is, "What are the assumptions underlying definitions of 'CL'?" and the third is, "Given the definitions of and underlying assumptions concerning the concept, should CL be taught?" The first two questions are prior questions, questions which must be considered in order to adequately deal with the matter of whether CL should be taught. While much attention has been given to defining 'CL', the assumptions underlying these definitions have not been adequately considered in the literature on CL, and thus, serious attempts to answer the third question are unlikely to be found. This is not to suggest that no one has thus far been concerned with what is supposed to constitute CL. A great deal has been written on the topic, with nearly as many definitions of 'CL' being suggested as there are authors writing about CL. But the focus has generally been on curricular concerns and not on the more fundamental meaning of the concept itself. The purpose of this dissertation is to bring to light definitions of 'CL' and the underlying assumptions so
that discussion of curricular concerns can be more informed and thus, more fruitful. This dissertation will be an exercise in analytic philosophy; investigation of empirical matters related to CL, while important, will not be pursued here.

Preliminary Remarks

While 1984 has come and gone without the realization of George Orwell's Big Brother, there are elements of the contemporary workplace which approach Orwell's 1984.1 Reading books such as John Naisbitt's Megatrends, Alvin Toffler's The Third Wave, and Daniel Bell's The Coming of Post-Industrial Society can easily call to mind Orwell's portrayal of the worker endlessly manipulating information.2

This manipulation of information has earned the latter part of the twentieth century the title of "Information Age." Paul Berg and William Bramble write:

There is a widespread perception that the technically advanced nations are undergoing a degree of change comparable to the transition from the pre-industrial to the industrial era . . . . This is a worldwide phenomenon as the advanced industrial nations undergo fundamental economic changes and restructuring of priorities. The current of change is affecting individuals as career roles disappear and new ones appear. Many institutions which were once the bulwarks of the industrial era are deeply affected by rapid technological change. There are many terms which have been presented to identify the new era, but the one most often encountered is the Information Age.3

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It is the computer which has made possible the handling of such massive amounts of information. Moreover, the computer is indispensable to enabling the worker to efficiently manipulate the mass of information. As Riley E. Moynes notes, "the danger today is not lack of information; the danger today is drowning in it."1 It is commonly claimed that the majority of jobs will increasingly require the use of computers. In 1982 Naisbitt wrote that "by one estimate, 75% of all jobs by 1985 will involve computers in some way, and people who don't know how to use them will be at a disadvantage."2

Daniel Watt claims that not only will the computer permeate the workplace, most individuals will have frequent interaction with computers throughout the day. He notes the increasing use of personal computers at home as well as at the office and the increasing use of large computer systems for banking, shopping, etc.3

There is concern expressed by many authors that the citizenry is perhaps unprepared for competently interacting with this new technology. To become prepared is to become "computer literate." The National Council of Supervisors of Mathematics believes that

It is important for all citizens to understand what computers can and cannot do. Students should be aware of the many uses of computers in society, such as their use in teaching/learning, financial transactions and information storage and retrieval. The 'mystique' surrounding computers is disturbing and can put persons with no understanding of computers at a


2Naisbitt, 33.

disadvantage. The increasing use of computers by government, industry, and business demands an awareness of computer uses and limitations.¹

In addition to the personal disadvantages of computer illiteracy, there is concern that a computer illiterate public will be unqualified to make sound policy decisions. Ronald Anderson and Daniel Klassen warn that

> In an information society such as ours, widespread understanding of computer technology and the consequences of computer use and misuse is necessary, even required, for public policy-making. A lack of understanding and acceptance of computers could seriously impede the use of computer technology in solving important problems.

> For the individual, an understanding of computer technology and uses is important because it reduces bewilderment about computers and promotes a balanced view of the computer's role in society. Such understanding also enables people to use and influence the design of computer-based social services and to develop informed opinions regarding particular computer applications having political, economic and social implications.²

Furthermore, it is believed that a computer illiterate populace may be incapable of taking full advantage of scientific knowledge and development. Andrew Molnar claims that science has been most greatly affected by the "information explosion" in that increased information and access to information has made science more complex. He writes,

> it is evident that the problems of the economy, science, education, and the computer are all interdependent and highly related. Science driven innovations spur the economy and create new jobs. Computers increase productivity but require a more skilled and professional labor pool with a broader education and a greater familiarity with the tools of science.³


Molnar is further concerned with the United States' waning superiority with regard to technological innovation. He concludes that

A nation concerned with its social needs and economic growth cannot be indifferent to the problems of illiteracy. If we are to reap the benefits of science driven industries, we must develop a computer literate society.¹

Molnar claims that "the lack of low-cost energy sources and the diminishing supply of raw materials has led to a shift from the production of industrial goods and services to a greater emphasis on science and knowledge-based industries."² Moreover, according to Molnar, "information has become a national commodity and a national resource and has altered the very nature of work."³ Unfortunately, however, Molnar does not provide evidence supporting his claim that work in the Information Age requires and will require more highly skilled, computer literate workers.

The authors of the 1983 report, A Nation at Risk, also seem to be concerned about the public's computer competence in the Information Age as they state that "individuals in our society who do not possess the level of skill, literacy, and training essential to the new era will be effectively disenfranchised."⁴ The authors of the report are concerned with improving, through education, citizens' competence in all basic areas of knowledge (literacy, mathematics, science, and so forth). However, it is clear that they believe competence in the 1980s to necessarily include some knowledge and

¹Ibid., 283.
²Ibid., 277.
³Ibid.
skills with regard to computers, as they include computer science as one of the Five New Basics. ¹

While it is seen as desirable for today's adults to become computer literate, concern is primarily focused on the training of the young, as the first generation of children raised in the new age.² And, the most effective means of reaching these youth is via our schools. As Watt points out, while CL is taught by many agents (e.g., in business and in computer clubs),

there is a clear need for an all-out effort by public school educators. Only public schools can help ensure that all citizens have equal access to the opportunity of computer literacy education, and only the public schools in our society have responsibility for the education of citizens who can make effective decisions about the impact of technology on society. ³

Anderson and Klassen are in agreement with Watt when they write, "the school is the main institution for socialization in citizenship, thus, it is appropriate that computer literacy education be provided to future citizens as early as junior high school."⁴ And, Bramble and Mason voice their support when they state that

Computer literacy cannot replace traditional literacy. Students of the future will still need to learn, among other things, to read, write, and do basic mathematics. However, to participate in a technological society, they will also need to have knowledge, skills, and understanding of computer procedures and applications. The technological advances of the late 1970s and 1980s have produced a challenge to the schools. That

¹Ibid., 24.

²Harold Shane refers to this generation as "microkids" in his article, "The Silicon Age II: Living and Learning in an Information Epoch," Phi Delta Kappan, 65 (October 1983): 129.

³Watt, 59.

⁴Anderson and Klassen, 132.
challenge is to develop computer literacy in tomorrow's citizens to enable them to participate fully in a technological society. ¹

According to Stephen Radin and Harold Greenberg,

The rapid increase in computer utilization by almost every field of employment will by necessity pressure forward-looking school systems throughout the nation to provide meaningful educational programs in computer literacy so that an entry-level workforce may be adequately prepared for absorption into projected high-technology industries in the United States. U.S. schools are the key to the development of a trained workforce that will allow U.S. industry to compete successfully with the challenges of other nations.²

Clearly, there is widespread support for CL programs. According to Anderson and Klassen,

Evidence of widespread teacher agreement with the need to foster computer literacy among students is also emerging. The MECC survey of 3,576 mathematics, science, and business education teachers in Minnesota found that 85% of the teachers believed that "every secondary student should have some minimal understanding of computers." Fully 93% supported the statement that "every student should learn about the role that computers play in our society." More limited surveys in other states suggest similar teacher support.

There is also evidence that public support for computer literacy is high. The Minnesota Poll sampled more than 1,000 in January of 1979 and found that 87% of the surveyed adults agreed with the need for every high school student to have some understanding of computers. These data and growing evidence of interest among school boards and parent-teacher organizations suggest that public support for computer literacy is very high, perhaps much higher than most observers would expect.³

As Kara Gae Wilson sees it, "the question is no longer whether to teach computer literacy but how best to do it."⁴

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³ Anderson and Klassen, 130.

⁴ Kara Gae Wilson, "The Minicourse Approach to Teaching Computer Literacy," The Education Digest 52 (September 1986): 44.
However, as mentioned previously, while there appears to be little disagreement regarding the desirability of or need for CL programs, there is, unfortunately, a great deal of confusion concerning how 'CL' ought to be defined. Thus, the administrator or classroom teacher who wishes to develop and implement a CL program is likely to experience some frustration, for while the business community, parents, and fellow educators are likely to support the decision to implement such a program, the individual in charge will at every turn find a different interpretation as to which knowledge and skills should comprise a CL program. This confusion is readily admitted in the literature. As Bikkar Randhawa and Dennis Hunt note,

Computers and computer literacy are among the most common topics for the in-service and pre-service teachers. However, computers and computer literacy mean many different things to many people.

Daniel Klassen recognizes the ambiguity of 'CL' to be one of the major obstacles to implementing CL programs and remarks that

Education has been profoundly influenced in recent years by the concept of computer literacy. Behind its superficial appeal lies a tangle of ambiguities. What is computer literacy? What does it mean to be computer literate?

Klassen notes the two "historical roots" to the concept—specialized literacies (e.g. scientific literacy) and general literacy (i.e. reading, writing and communication)—and claims that these roots contribute to the confusion.

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1 Of course, there are other problems as well—availability of funds and equipment, to name two—but these are outside the scope of this dissertation.


So we have these two different roots mixed in together, which does not really help us to define what it means to be computer literate. If you look in the dictionary attempting to find some solution to your problem, you will again find two different definitions. Computer literacy is the ability to communicate through reading and writing and is the advanced stage of being cultured, informed or well versed. This makes it difficult for us to come to grips with what it really means to be computer literate. It certainly is a very nice, convenient shorthand for talking about a lot of different things that are going on in education these days.

Unfortunately, Klassen's comment does more to confuse than to clarify 'CL'. It makes little sense to say that computer literacy is "the ability to communicate through reading and writing," unless, of course, one were speaking of a society in which the primary means of print communication was via computers. Given that our society does not fit such a description, 'CL' cannot be seen as equivalent to 'literacy' (in its ordinary sense). As will be argued later in this dissertation, 'CL' is a metaphor, an implicit comparison with 'literacy'. Failing to distinguish between the two concepts being compared, as Klassen has done, serves only to further confuse matters.

Often, authors writing about CL programs make no attempt to define or clarify 'CL', as if doing so is unimportant to their work. And there are those who, while expressing dismay at the diversity of definitions offered by others, contribute to the confusion by offering yet another definition of 'CL'. Moreover, when definitions are offered they are often rather useless due to their extreme generality. The problem is not so much that the definitions are meaningless, but rather that they have too many possible meanings. Generally, definitions suffer both from ambiguity and vagueness. The definitions are ambiguous in that just what the computer literate is to know or be able to do can be interpreted as being many different things. The definitions are vague in that they leave to the imagination the degree of knowledge/skill one is expected to

\[\text{1 ibid., 45.}\]
gain. Of course, it would be virtually impossible to define 'CL' in such a complete way that vagueness and ambiguity were completely eliminated. But the fact that there are so many definitions, all of which provoke questions concerning the meaning and boundaries of 'CL', serves to confuse the reader.

Consider the definition formulated by the National Center for Education Statistics: "computer literacy may be defined as whatever a person needs to know to function competently in our information-based society." 1 "Whatever a person needs to know . . ." could consist of using a bank card or word processing or programming (among other things). And how much skill in any of these areas might one be expected to have? Anderson and Klassen offer a similar definition when they claim 'CL' to be "whatever understanding, skills and attitudes one needs to function effectively within a given social role that directly or indirectly involves computers." 2

For John Lombardi utility is of major concern; he defines 'CL' as the ability to recognize problems for which the computer may be a useful part of the solution. Computer literate adults will be able to identify appropriate computer resources for a wide range of tasks and they will know how to ask experts for assistance in finding solutions. 3


2Anderson and Klassen, 131. Anderson and Klassen do offer a detailed list of objectives for a computer literacy course. Suggested topics for study range from learning how to get on the computer to discussing ethical issues concerning computer use. Anderson and Klassen's program will be briefly discussed in Chapter III, however, since their list of objectives is lengthy, I cannot reproduce it within this document. It should also be noted that these definitions are definitions of functional computer literacy and it would seem impossible to offer such a definition which was not vague and ambiguous. More will be said on this later.

Again, there is some ambiguity here—can one be considered computer literate if they only know which applications are appropriate and know how to ask for help or does this definition require that the computer literate be able to use the appropriate computer applications? Another definition which emphasizes the importance of utility or applications is the rather general definition offered by Warren Jones, et al. They define 'CL' as

an appreciation of the general principles which underlie computer hardware, software, and the application of computing technology to various science, business, education, government, and entertainment objectives.¹

Does appreciation of general principles involve merely having learned some propositional knowledge about computers and their uses or does it require being able to use the computer for various purposes? And, what degree of propositional knowledge and/or skill is required?

Other definitions stress the importance of attitudes about computers in addition to skills relating to computing. Randhawa and Hunt claim that

Computer literacy is not a superficial acquaintance and familiarity with computers, nor is it just learning to use computers for specific applications. It is a set of cognitive and affective behaviors. Cognitive components of computer literacy range from knowledge level skills and behaviors to higher level understandings and applications.²

They further explain that these affective behaviors would be comprised of "attitudes, values, and motivation" which would function as "mediating components of and


²Randhawa and Hunt, 9-10.
supplements to cognitive skills and abilities."¹ Daniel Watt also stresses the value
component of CL. He views an understanding of the social impact of the computer as a
necessary part of CL education. Rather than mere "computer awareness," Watt
believes CL should be viewed as a

cultural phenomenon which includes the full range of skills, knowledge,
understanding, values, and relationships necessary to function effectively
and comfortably as a citizen of a computer-based society.²

Watt attempts to clarify his definition by proposing four categories of CL:

1. The Ability to Control and Program a Computer to Achieve a Variety
   of Personal, Academic, and Professional Goals .
2. The Ability to Use a Variety of Pre-Programmed Computer Applications
   in Personal, Academic, and Professional Contexts .
3. The Ability to Make Use of Ideas from the Cultures Surrounding
   Computer Programming and Computer Applications as Part of an
   Individual's Collection of Strategies for Information Retrieval,
   Communication, and Problem Solving .
4. The Ability to Understand the Growing Economic, Social, and
   Psychological Impact of Computers on Individuals and Groups within
   our Society and on Society as a Whole . . . .³

Drawing on the work of Watt, Bobbie Hentrel and Linda Harper define 'CL' as "that
collection of skills, knowledge, understanding, values and relationships that allows a
person to function comfortably as a productive citizen of a computer-oriented society,"
and claim that

the tangible assets that such an individual should possess include the ability to:

1. program, debug, and modify a computer,

¹Ibid., 2.
²Watt, 57.
³Ibid., 57-58.
2. select and use software applications,

3. be sensitive to the impact of computers and refrain from involvement in computer abuse,

4. apply concepts learned in the computer world to other tasks.¹

While these categories point out general areas of concern, and thus reduce to some extent the ambiguity of the definitions, both Watt's and Hentrel and Harper's definitions leave open to interpretation the degree of skill expected.

Radin and Greenberg state that

although there are several interpretations as to what constitutes computer literacy, the most widely accepted definition encompasses four principal components: (1) defining the term computer, its basic parts, their interrelationship, and the means by which computers communicate with human beings; (2) the history of the computer with an understanding of those pressures that motivated its evolution and multidimensional applications for resolving continually developing technological problems; (3) cognizance of the positive and negative impact of computers on society; and (4) controlling the computer with quality programming that achieves a desired objective proficiently and accurately.²

Here, too, the listing of areas for study serves to reduce ambiguity but how much must one know about each of these areas? Just what counts as quality programming, for example?

Gregg Brownell defines CL in terms of two basic components. With regard to the knowledge component, he claims that students must be:

1. familiar with the components of a computer system (hardware and software) and how they work and interact;

2. informed about the history of computing;


²Radin and Greenberg, 6.
3. aware of the current and projected uses of computers in society and the possible implications of those uses;

4. knowledgeable about job opportunities associated with computers.¹

With respect to the performance component,

students must be able to:

1. use the computer for instructional purposes by using computer-assisted instructional software of both the tool and tutor type, both with teacher direction, and, when presented with appropriate documentation, alone;

2. write simple programs in two computer languages;

3. engage in problem solving by breaking a complex problem into modules, generating a solution for each module, and combining the solutions to solve the problem.²

How familiar must students be with the workings of the computer? What counts as writing simple programs?

Beverly Hunter limits her definition to CL for grades K-8. She notes that the definition has changed many times, but the current definition is as follows:

The ability to use suitably programmed computers in appropriate ways to assist in accomplishing tasks and solving problems; and ability to make informed judgments about social and ethical issues involving computer and communications systems.³

Hunter also suggests that the goals for a CL course should be to:

1. help students and teachers to value computers as general-purpose machines designed, built and operated by humans to assist in many tasks;


²Ibid.

2. encourage teachers and students to find and create computer applications that are useful to them in teaching, learning, managing information and solving problems in math, science and social studies;

3. help students and teachers to develop a sense of control over computers and to learn a variety of tools and techniques for exercising that control;

4. help students and teachers learn to use computers as an aid in solving problems: this should have the side effect of increasing the emphasis on problem solving in the classroom and increasing the variety of problems addressed;

5. encourage teachers and students to behave in an ethical and responsible manner in relation to the computers and information system they use;

6. help students and teachers to become aware of a variety of computer applications and their uses by individuals and organizations;

7. help students and teachers learn to evaluate advantages, disadvantages and limitations of particular computer applications;

8. help teachers and students to become aware of ways computers affect groups and individuals, thereby helping to prepare students for responsible citizenship; and

9. help students and teachers become aware of computer-related skills and experience that are important in a variety of careers.¹

Hunter's definition and objectives seem to be the most successful in reducing the ambiguity and vagueness of 'CL'.

Often, attempts to reduce vagueness and ambiguity result not in a more precise definition but in a list of skills which the computer literate individual should possess. Larry Noonan has compiled a list of such skills taken from the various definitions and interpretations of 'CL'. Noonan claims that

It is possible to state that a computer literate person must have knowledge of the following:

the history of computers

¹Ibid.
what computers are
kinds of computers
abilities of the computer
computer hardware
computer software
computer systems
how to communicate with the computer
computer languages
how to write simple programs
what goes on inside the computer
people who work with computers
problems with computers and social implications
the future of computing

Noonan also sees CL as more than a set of skills and states that "another important component part of computer literacy is the attitudes that are developed toward computers and their impacts on society." ^2

Noonan believes that 'CL' should be thought of in terms of degrees. According to Noonan, the lowest level of CL is "functional computer literacy," which involves merely being able to load and use a program. Noonan quotes J.C. Crains, stating that the functional literate will have

---


^2Ibid.
acquired the essential knowledge and skills which enable him to engage in all those activities in which (computer) literacy is required for effective functioning in his group and community. ¹

Noonan terms functional CL "minimal literacy for the world of tomorrow." ² The next level of CL is "average computer literacy." At this stage the individual will know what a computer is, be able to operate the computer, write short programs, make simple alterations to other programs, understand a little about the operation of hardware and think a little, at least, about the future of computers and computing. ³

At the top level of CL is the "expert" or "computer enthusiast." Noonan terms such individuals "complete computer literates." From this group comes programmers of high caliber and the designers of computer hardware. Noonan claims that few people need or are able to attain this level of CL. Thus, according to Noonan, schools should strive to turn out average computer literates.⁴

Daniel Klassen seems to be in agreement with Noonan in believing 'CL' to be necessarily ambiguous. Klassen writes,

what is computer literacy? I think that each of you will have to deal with that in your own situation. It depends on the kind of institution that you are in, and the kind of graduates that you are trying to turn out. ⁵


²Ibid.

³Ibid.

⁴Unfortunately, Noonan does not explain why the functional level would not be adequate. Lack of justification for proposed CL programs is a topic which will be addressed in Chapter III.

⁵Klassen, 44-45.
'CL' is made even more nebulous by authors who claim the concept to be mutable due to the rapid technological advances of the new age. For example, Richard Bowman claims that

unlike conventional definitions of reading, writing, and numerical literacy, computer literacy is undergoing constant redefinition as innovative languages, communication devices, and applications software slip into the technological marketplace. The result is that computer literacy is likely to remain an essentially fluid notion for the foreseeable future.¹

Hentrel and Harper remark that "the rapidity with which computer technology is invading our lives makes most definitions obsolete before a bit can be stored in the register--in archaic terms, before the ink can dry."²

Hunter voices what seems to be a common sentiment when she claims that despite the confusion surrounding 'CL', CL must be pursued. She writes,

"Computer literacy" is an ambiguous phrase used by different people to mean different skills and knowledge related in some way to computers, communications, and the handling of information. It will be a very long time--perhaps decades--before a significant number of educators agree on definitions and priorities in this area. This is because society and technology are changing very rapidly. We all have different experiential backgrounds to bring to the task of deciding what children need to learn about computers, their uses, and social implications of both.

Despite lack of consensus on goals, objectives and methods, we are all under much pressure to begin the process of educating our present and future citizens to uses and implications of electronic tools that aid in learning, thinking, handling information, communicating ideas, and solving problems.³


²Hentrel and Harper, 22.

³Hunter, 59.
But it must be wondered why such a nebulous concept is so widely supported. Its support is likely due in large part to fear of being unprepared for the Information Age. This fear seems not only to operate at a personal level (i.e., one might fear lack of skill on one's own part or on the part of one's children), but also at a national level—it is feared that without computer literate citizens the United States will not be able to maintain its position as a major economic power. These fears are excited by verbiage which often borders on scare tactics. For example, according to Radin and Greenberg,

There is much concern that unless funding is provided by Congress only students in wealthy communities will become computer literate and the education of youngsters in disadvantaged areas will suffer. Although the Apple Bill was not enacted last year, as problems and reservations held by education groups are resolved, new measures will be put before the Congress that may gain the necessary support for enactment. To delay may permit other nations such as Japan to gain the upper hand in computer literacy, a reality from which the United States may never recover. A national commitment is in order to ensure that the creativity of the U.S. people is not destroyed because of a lack of such national will.¹

In case the potential downfall of the nation is insufficient motivation for becoming a CL advocate, they present a false dilemma, warning that "there are two kinds of people who are involved with computers--those who control them and those who are controlled by them."² According to the authors, the controllers are those who are capable of programming, and non-programming users are the controlled. If computer users are in danger of being controlled, one hesitates to imagine where this leaves the non-user. Similarly, John Lombardi states:

Either you will become literate enough to know what these machines can do and when they should be avoided, or you will have to continue to pretend that it doesn't matter. However, it does matter, and if you don't

¹Radin and Greenberg, 174.
²Ibid., 159.
understand, someone else will make many decisions for you in the name of a computer.¹

Douglas Noble attributes the support of CL to the prevalence of what he terms a "futuristic ideology." According to Noble,

what amounts to a blind faith in computer literacy cannot be traced back entirely to merchants, educators, or parents, who are themselves caught up in the same assumptions about the importance of computer literacy. Instead, there is something resembling ideology in all of this, an unwitting compliance, among promoters and initiates alike, with the ubiquitous imperatives of high technology: the promise of a part in a brighter economy and a grand new social order. Computer literacy seems so plausible precisely because it fits so nicely within this futuristic ideology.²

The widespread support of CL programs can also be attributed to the linking of the notion of learning computer knowledge/skills with the acquisition of literacy. 'Literacy' carries with it a positive connotation and, while it used to be reserved for reading and writing, is now used to describe the possession of knowledge/skill in virtually any subject area. It is possible to read about scientific literacy, mathematical literacy ("numeracy"), aesthetic literacy, music literacy, or visual literacy, for example. Fear of incompetence and the use of such a positively charged term as 'literacy' is a powerful combination for eliciting support. No one wants to be left in the wake of technological innovation and certainly no one wants to be illiterate. As Noble puts it,

Individuals have... been driven to become computer comfortable by being made to feel acutely uncomfortable about their unfamiliarity with computers. This unfamiliarity, heretofore the benign consequence of intimidation, disinterest, or disdain, has become infected by the urgent necessity of computer literacy and has been transformed into a full-blown fear of computers. "Computerphobia," by no coincidence, has taken on epidemic proportions just as its "antidote," computer literacy, has become available. The consequence of all this diseased emotionality is that the majority line up to take the "cure" and those left behind are seen by

¹Lombardi, 2.

themselves as well as by others to be regressive relics of a suddenly distant past, their competence, their skills, their years of experience suddenly irrelevant.¹

I advocate a more cautious approach to CL. I disagree with Wilson's claim that "the question is no longer whether to teach computer literacy but how best to teach it," as it is precisely such a lack of careful consideration which has caused the current state of affairs.

Strategy

Chapters II and III will be devoted to the questions, "How is 'CL' defined?" and "What are the underlying assumptions of these definitions?" As will be shown, the definition of 'literacy' is not agreed upon in the first place, but attaching 'literacy' to virtually any subject matter, in an effort to provide a convenient label for a fuzzy, complex set of desired knowledge/skills, confuses the issue even further. It will be helpful to attempt to determine what literacy in X is believed to entail. That is, what sort of learning is expected of one who is literate in X? Chapter II will focus on this question. The work of authors who have written about "specialized" literacies (e.g. scientific literacy, aesthetic literacy) will be consulted. The distinctions of Israel Scheffler concerning "teaching/learning that . . .," "teaching/learning how to . . .," and "teaching/learning to . . ." will be employed in determining the types of learning hoped for or expected of one who is literate in X and, more specifically, one who is computer literate.

Chapter III will be an examination of definitions of 'CL'. This chapter is intended not only to provide a further and fuller account of definitions of 'CL', but also to examine the degree to which current definitions in the literature aid or hinder

¹Ibid., 609.
understanding of 'CL'. It will be shown that many definitions not only take advantage of vagueness and ambiguity, but also that definitions are commonly "persuasive" or "programmatic" in that they attempt to persuade readers and gain support for their suggested programs without providing argument. Again, this chapter will draw on the work of Scheffler, making use of his distinctions regarding types of definitions.

Chapter IV will focus on the relationship between 'literacy' and 'CL'. It will be asserted that in using 'literacy' to describe the acquisition of computer knowledge/skill, the acquisition of such knowledge/skill is implicitly compared with the acquisition of knowledge/skill concerning reading and writing. In other words, 'CL' is a metaphor. In this chapter the points of comparison will be made explicit and the metaphor will be judged on its effectiveness and legitimacy; the analysis will be based on the work of Max Black, Thomas F. Green, Ronald Munson and Israel Scheffler. This chapter will pertain to second and third general questions—"What are the assumptions underlying definitions of 'CL'?" and "Given the definitions of and underlying assumptions concerning the concept, should CL be taught?" Analyzing 'CL' as a metaphor will provide further clarification as to what CL is believed to involve, but it will also provide occasion to consider whether beliefs about CL are warranted and thus, whether CL should be taught in our schools.

Chapter V will provide a summary, conclusions, and suggestions regarding further research. It should be noted that while conceptual analysis such as that found in this dissertation would be helpful in clarifying and seeking justification for all types of literacy, the task at hand must be limited primarily to 'CL'. 
CHAPTER II

COMPUTER LITERACY AS A SPECIALIZED LITERACY

Introduction

Specific curricular decisions such as whether students should learn how to program and which programming language should be used, although important, may get in the way if our concern is to clarify 'CL'. We must concentrate instead on such issues as determining what general sorts of learning are required of the computer literate. Is a computer literate person one who has a certain amount of knowledge about computers, and/or one who can do certain things with computers, and/or one who uses her knowledge/skill regularly?

What a person in the Information Age should know or be able to do with computers depends on many factors, such as the prevalence of the computer in the workplace and so forth. Some such issues will be dealt with in Chapter IV.

Determining what is required of someone who is to be called computer literate is a matter of determining what sort of accumulated learning 'literacy' (in the ordinary sense) is intended to describe. It has been noted that 'literacy' has been extended and modified so that it is now used to describe knowledge/skill in virtually any subject area. The reason for this occurrence is difficult to pinpoint. Perhaps "X literate" was seen as a convenient shorthand for describing the state of a person who has the required knowledge/skill in some area. Nevertheless, 'literacy' is the root concept and refers to some knowledge/skill with regard to reading and writing. When we speak of scientific
literacy or CL we are extending the use of 'literacy' to describe what will be called in
this chapter a specialized literacy. Essentially, "X literacy" (e.g., scientific literacy,
computer literacy) is metaphorical, i.e., the use of a familiar concept, 'literacy,' in
speaking of the knowledge/skill required of a person with regard to science, for
example, allows the latter, more unfamiliar, concept to be better understood. This is not
the only effect of the metaphor, of course; it also serves to lend importance to the
specialized literacy. These points will be discussed more thoroughly in Chapter IV.

In determining what learnings are expected of one who is literate (in the ordinary
and extended senses) we will investigate 'literacy' and various specialized literacies.
Some sort of conceptual framework is needed to guide our investigation; Scheffler's
distinctions regarding "teaching/learning that . . . ," teaching/learning how to . . . ," and
"teaching/learning to . . . " will prove useful here. The question to be answered first is
whether literacy requires that one learn that . . . , and/or learn how to . . . , and/or learn
to do X.¹ Our findings concerning the types of teaching and learning appropriate to
literacy will then be applied to CL in an effort to determine what sorts of teaching and
learning are necessary for CL. Green's distinctions regarding the various modes of
teaching will then be utilized to determine what sorts of teaching seem most appropriate
for the intended learning. Let us begin with Scheffler's distinctions.

¹In this dissertation "X learned that . . . " and "X learned how to . . . " will be used
in the strongest sense, where they are essentially equivalent to "X knows that . . . "
and "X knows how to . . . ." That is, in speaking of someone "learning that . . . " or
"learning how to . . . ," I am implying that the truth, belief, and evidence conditions
for knowledge have been met; thus, with this interpretation, one who has learned
that Y is the case knows that Y is the case and one who has learned how to do Y knows
how to do Y. This stipulation is being made because it seems to reflect the view of
those writing about CL. That is, it seems to be expected that students not simply
learn information and skills regarding computers, but that they actually know them.
Conceptual Framework: Scheffler on Types of Teaching

According to Scheffler, the goal of "teaching that . . . " is often the acquisition of propositional knowledge/belief. In such cases we teach students facts and judge the teaching successful if the students are able merely to supply the facts at a later date (perhaps on a written exam or in conversation). But there are other times when the goal of "teaching that . . . " is the acquisition of some norm; in such cases we would not judge our teaching successful if students merely stated that X is the case. As Scheffler explains, teaching students that Columbus discovered America is much different from teaching them that one ought to be honest. Whereas stating the fact on an exam might be regarded as sufficient proof that one's students had learned that Columbus discovered America, one might feel that she has not succeeded in teaching Sally that one ought to be honest if Sally writes on an exam that one ought to be honest, yet continues to be dishonest in her own life.

Scheffler explains that learning that Columbus discovered America involves learning a fact-stating sentence. In such cases the learner is only expected to "learn that . . . " in a non-active sense. That is, to be said to have learned that X is the case, one must merely be able to supply the fact; acting accordingly is not required. However, learning that one ought to pay one's debts is a matter of learning a norm-stating sentence; in such cases there are two possibilities. The learner may be expected to "learn that . . . " in the non-active sense (hereafter referred to as "learning that . . . " [N]) or in the active sense (hereafter referred to as "learning that . . . " [A]). In the former case, teaching is successful if the learner merely states the relevant fact. In the latter case, the learner is said to have "learned that . . . " if he acts accordingly.

Scheffler writes:
If Jones is said to have learned that honesty is the best policy, we may, ordinarily, interpret what is said in two ways distinguishable, roughly, as follows. We may, on the one hand, suppose that Jones has acquired the norm or pattern of action referred to, that he has developed a tendency to pursue the policy of honesty in his own conduct, that he has learned to behave honestly or to be honest. The acquisition of the norm or pattern of action need not be the whole of Jones' learning, on this interpretation, but it is an indispensable part, so that evidence of Jones' flagrant dishonesty would be considered to refute the assertion that he had learned that honesty is the best policy. Analogously, evidence that a schoolboy had defiantly refused to return the money he admits having borrowed, would, on the present interpretation, show that he had not learned that he ought to pay his debts. Let us refer to the foregoing interpretation as "active."

We may, on the other hand, have a non-active interpretation of the statements, "Jones has learned that honesty is the best policy," or "Jones has learned that he ought to pay his debts." On this non-active interpretation, the acquisition by Jones of the patterns of action referred to is not required by the truth of these statements. Thus, evidence that Jones is dishonest would not be supposed to refute the first, nor would evidence of willful non-payment of acknowledged debts be taken as refuting the second. Such evidence might, at most, be construed as a sign of Jones' weakness of will, irrationality, or "inconsistency" as between behavior and belief.¹

"Teaching how to..." is a matter of teaching skills. One may teach someone how to sew, how to water ski, or how to subtract, for example. Here, proof of successful teaching would be that the learner possesses the skills necessary for sewing, water skiing, or subtracting. It is not required that they engage regularly in these activities, but simply that they know how to do them. A swimming teacher's task is to teach students certain swimming skills; she will feel that she has succeeded in teaching her pupils how to swim if, when they attempt to swim, they can execute the motions which have been taught. The teacher can claim to have taught these students how to swim even if they rarely go swimming. For example, as a child I was taught how to swim. I learned the skills taught to me, as well as propositional knowledge related to

swimming (e.g., swimming too soon after eating is dangerous as it might cause cramping). But, I dislike swimming and so rarely engage in the activity. Although I rarely use the knowledge and skills taught to me, I can still rightly claim to have learned how to swim, for I possess the necessary skills. Scheffler notes that "learning that . . ." (A) may be helpful in "learning how to . . ." but having a skill is different than having "learned that . . ." (A).

To know how to swim is not to have memorized lots of swimming information and swimming rules to be consulted continually during the act of swimming. Information and rules may help initiate the learning of a skill, but the exercise of a skill is not therefore to be identified with continued references to information and rules. To know how is something else, in short, than knowing that.1

"Teaching to . . ." involves teaching patterns of behavior. A parent might wish, for example, to teach her child to brush his teeth before going to bed. If the child brushed his teeth before bed on only one occasion, the parent would likely conclude that she had not succeeded in teaching her child to acquire the desired pattern of behavior. What is wanted is for the child to acquire a habit or disposition regarding teeth brushing. It cannot be stated exactly how many nights the child must perform this action in order for it to be said that he has acquired the disposition of brushing his teeth before bed, for he might occasionally forget, or feel too tired, or whatever. But the child should usually brush his teeth when he is getting ready for bed. Learning how to do X is a necessary condition for learning to do X, of course; the child cannot learn to brush his teeth if he does not know how to brush his teeth. But learning to do X requires more than simply acquiring skills.

Even though both "learning that . . ." (A) and "learning to . . ." involve the acquisition of a disposition, they are not synonymous. Scheffler claims that while

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1 Scheffler, 99-100.
"learning to . . ." requires merely that the learner acquire the appropriate pattern of action, "learning that . . ." (A) requires not only that the learner do X but also that he believes that X ought to be done. It is possible, Scheffler claims, to learn to pay one's debts without actually learning that one ought to, that is, without believing that one ought to pay one's debts. But, as Scheffler explains, "to teach Y that one ought to be honest is . . . not merely to try to get Y to be honest; it is also to try to get Y to be honest out of conviction."1 Thus, a parent could intend to teach her child to brush his teeth before going to bed, or to teach him that (A) he ought to brush his teeth before bed. In the former case, no change in beliefs would be required; the child simply brushes his teeth before bed out of habit. But if the child brushes his teeth before bed because he believes that it is the right thing to do, he has learned that (A) he ought to brush his teeth before bed. Essentially, "learning that . . ." (A) is a matter of "learning that . . ." plus "learning to . . ."

The distinctions discussed here are important for educators as we must consider what sort of learning we expect of our students. Scheffler uses the teaching of science as an example and asks,

Are we trying to teach that science is such-and-such, that it tells us this-and-that about the world? Are we rather trying primarily to teach how to think scientifically? Or are we really trying to teach our pupils to be scientific in their thinking and their approach to problems?2

We will now use Scheffler's conceptual distinctions as we examine the question of what sort of learning and teaching is required for literacy (in the ordinary or specialized sense), and for CL. Let us begin with an examination of the ordinary concept of 'literacy'.

1Ibid., 94.

2Scheffler, 100.
Literacy

In Chapter I it was shown that there is diversity of opinion as to how 'CL' ought to be defined. Furthermore, it was shown that definitions are generally vague and ambiguous, leaving open to interpretation just what sort of knowledge and/or skill is expected and to what degree one is to gain this knowledge and/or skill. Such is the case with 'literacy' as well. Generally speaking, 'literacy' is considered to be the ability to read and write. (As we shall see, such a view is regarded by many authors as too narrow, but it is a good place to start.) Furthermore, to call someone literate is to imply that their reading and writing skills at least meet some minimum standard. In an effort to delineate the minimum standard, Daniel Watt describes the literate person as one who

- can read and write well, and can use reading and writing fluently in a variety of contexts. Further, a literate person in our society will have had a range of experiences with the literature of our common cultural heritage. S/he will be able to read, understand, interpret, and make judgments about a news article or a literary work, and will be able to compare the works of different writers. ¹

Raymond Nickerson defines 'literacy' as the

- ability to read comprehendingly material that has been written for non-specialist readers or "general audience" . . . and [having] sufficiently good writing skills to compose such things as a narrative description of one's work history, an opinion on a topic of personal interest, or instructions for an activity with which one is familiar. ²


Depending on what is meant by material for general audiences, these authors might be expecting a rather high level of literacy; publications such as *Time* and *The New York Times* are judged to be written at the twelfth-grade reading level. The problem with attempting to establish the lowest acceptable level of literacy is that it is difficult to determine a level of skill which is truly necessary for all people in a society. This seems especially true for complex industrial and post-industrial societies where most (but not all) people need a fairly high level of reading and writing skills. Of course, one could set the standard at a very low level but then it becomes, practically speaking, vacuous. That is, it would be possible to have a society of literates whose literacy skills do not enable them to complete necessary tasks.

In times past, it was common to view literacy in terms of a very low minimum standard. A brief look at seventeenth century England and New England will show that this was probably due to the fact that many members of these societies (if not other pre-industrial societies, as well) needed only minimal skills, if they needed any at all. David Cressy notes that it is generally believed that religious objectives were the primary force behind the acquisition of literacy skills in seventeenth century England and America. Reading was important as it allowed one to read God’s word. According to Cressy, there seemed to be concern that children who did not become literate would become nearly barbaric, turning wicked and sinful.

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2. This would of course also be true among different societies.

Although religion may have been a major factor in the acquisition of literacy skills in the seventeenth century, Cressy notes that it was not the only factor. Being literate also had its secular advantages.

Reading and writing could also be credited with securing a variety of secular benefits which were equally important for cultural cohesion. Literacy and education could combat "misorders" and "disobedience" and could promote "polity and civility."\(^1\)

Cressy goes on to explain that "reading was a tool for cultural integration and could keep you in touch with people and ideas across the centuries and across the miles."\(^2\)

Furthermore, "illiteracy might be socially damaging."\(^3\) Not only might it cause embarrassment, it might allow one to be taken advantage of in business dealings.\(^4\)

Cressy warns that such beliefs may not have been those of the general population, but may have been used as scare tactics by clergy and teachers wanting to gain clients. Nevertheless, while literacy had its religious and secular advantages, it seems that for most people they were just that: advantages, but not necessities. As he explains,

The importance of literacy varied with circumstances. In one social situation, in one place or time, the ability to read and write was of unquestionable importance. The affairs of some people might be of such a complexity, their aspirations of such a richness, that literacy was essential. Other people in simpler circumstances might have no such need of those skills. The literacy needs of neighboring communities could be entirely different, especially if one was enmeshed in the market economy while the other was mainly bucolic. Different individuals made different use of literacy in their lives, depending on their social position or occupation, their family arrangements, and their religious persuasion.\(^5\)

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\(^1\)Cressy, 25.

\(^2\)Ibid.

\(^3\)Ibid.

\(^4\)Ibid.

\(^5\)Ibid., 27.
Cressy believes that economic factors were the primary determinants of literacy rates. The degree of reading and writing skills possessed among individuals and communities correlates with occupational demands for such skills.

As one moved from the level of husbandman to yeoman, from copyholder to freeholder, from subsistence farming to production for market, the ability to read and write grew appreciably in importance. As the complexity of one's dealings increased, so did the advantages of being able to decipher writing and record things on paper. The farmer who could jot down market prices and compare them from week to week or season to season could secure a commercial advantage over his illiterate neighbor, who relied on his memory. The yeoman who could write his own bonds and receipts for himself and otherwise dispose of his affairs in writing would develop a commercial fluency and would be free of the expense and possible untrustworthiness of the scrivener or writing man. Reading and writing would become useful and thereby worth knowing.

This diversity of literacy needs extended also to other occupations.

Among townsmen of various sorts and among tradesmen and craftsmen in the country, the level of skill in reading and writing might vary with the frequency and complexity of their dealings on paper. To achieve or sustain a position among the mercantile elite, full fluency with print and script was virtually indispensable. Active literacy went with business acumen in pursuing commercial opportunities, keeping abreast of trade regulations and shipping news, preparing financial records, and corresponding with associates. Literacy was also useful to shopkeepers and specialist craftsmen, people like haberdashers and goldsmiths, and it could be an asset to retailers and commercial artisans lower down the social scale. But manual workers and village craftsmen, carpenters and bricklayers, might find no more use for reading and writing than did the majority of husbandmen.

Not only did some citizens' occupations not require reading and writing skills, neither did other aspects of their lives. Cressy notes that while literacy may have been beneficial from a religious standpoint, participation in religious life did not require it. Certainly sermons were equally accessible to illiterates and literates alike. And,

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1 Ibid., 29.
2 Ibid., 30.
illiterates were capable of full participation in day-to-day affairs as well. The news was "cried" by the town crier. Even one's court dealings tended only to require aural and verbal participation. On occasions when illiterates would need to produce documents, a scrivener could be hired. If a signature was required, a mark would be considered legally and socially acceptable. According to Cressy, in the seventeenth century life was a mixture of oral and print communication.

The oral world, with its traditions and tales, proverbs and jokes, customs and ceremonies, provided a store of enrichment and entertainment which required no literacy for access. Face-to-face communication, the sharing of stories and songs, the retelling of news and gossip, offered information and diversion enough. This culture of speech and action gave the illiterate person his bearings, but it was not at all closed to one who could read and write. Nor was the culture of print and script debarred from the illiterate. The two worlds interacted, mingled, merged.¹

The illiterate's ability to function with regard to court dealings seems to have held until the early part of the nineteenth century. As Edward Stevens reports, the "mark" was still considered to be an acceptable manner of "signing" documents. Furthermore, the courts ruled several times that illiteracy did not imply incompetence. However, if illiterates' court dealings are a fair indication, it would seem that attitudes toward illiterates began to change in the nineteenth century. Stevens notes that by the end of the nineteenth century (in the matter of contracts, at least) the courts became less paternalistic toward illiterates. Stevens writes,

During most of the nineteenth century, courts seemed to make an effort to preserve the rights of illiterate contracting parties and to protect these persons against abuses stemming from the inability to read and write. By the end of the nineteenth century, however, the emphasis had shifted. While both a literate and an illiterate party were obligated to express accurately the contents of an agreement, no longer did the major responsibility seem to lie with the literate person. Rather, it had become

¹ibid., 33.
clear that the illiterate person was bound to inform himself and to take the initiative in securing a correct reading of the contract.¹

It is interesting to note what seemed to count as literacy in the nineteenth century courts. In cases involving the witnessing of documents, reading and writing were called for. Here writing involved, at least, signing one’s name. In cases involving jurors, there was little agreement on what skills were required. As Stevens notes, some courts found it necessary for jurors only to be orally “literate” in the English language, while others found necessary the ability to read and write English. In 1886 it was determined by a Texas court that mere ability to write one’s name was not sufficient evidence of literacy. The Court said,

That a person can write his name certainly does not fill the measure of the statutory requirement that the juror should be able to write. We think that he should be able to express his ideas in words upon paper with pen or pencil.²

Stevens claims that “unlike most previous judicial decisions, the court in this case attempted to distinguish among levels of literacy and urged that a functional definition ought to be employed.”³

Clearly, a large number of people in pre-industrial times could function without any reading and writing skills. Furthermore, of the individuals who did need such skills, many may have been able to function on minimal skills. But it seems that reading and writing became important for an increasing number of people in the nineteenth century. In an effort to establish the minimum criterion for literacy, it was common to appeal to age and/or grade level achievement. For example, in the 1840

¹Edward Stevens, “Illiterate Americans and the 19th Century Courts,” in Resnick, 80.

²21 Texas Ct. App. 379, quoted in Stevens, 69.

³Stevens, 69.
U.S. Census (which was the first to compile statistics on literacy) people over the age of twenty were merely asked if they could read and write. By 1870, however, the age marker and method of reporting were changed. Lawrence Cremin remarks that the marshals were asked to enumerate in separate categories the number of persons ten years of age and upwards who were unable to read and write, with writing (the more stringent criterion) the necessary skill in determining literacy.¹

As time has passed, the minimum standard for literacy has increased. In today's industrial and post-industrial societies it is generally expected that a literate individual can do more than merely sign her name. Furthermore, "functional literacy" has become of concern since the late nineteenth century. Larry Mikulecky notes that "the social context for literacy has changed during a single life span to the point where functional literacy means a level of ability achieved by only an extremely small fraction of the population in 1910."² Mikulecky believes that war had much to do with the rising expectations.

During the time period since 1910, changing social conditions have preceded changes in acceptable levels of literacy. Each major war during this century has brought with it increased demands for military performance.³

Kenneth Levine is in agreement with Mikulecky and writes,

The notion of a level of literacy more sophisticated than the mere capacity to write one's name and to read a simple message, but less than "full fluency," appears to have gained currency in specialist circles during World War II. This intermediate level of attainment was assumed from


³ Ibid., 17.
the outset to be associated with employability and, in a loose and unclarified way, with the social integration and adjustment of its possessors. During the war, the U.S. Army defined illiterates as "persons who were incapable of understanding the kinds of written instructions that are needed for carrying out basic military functions or tasks." As in World War I, the draft uncovered extensive illiteracy.1

It is interesting to note that while the point of speaking in terms of "functional literacy" was to account for varying needs with regard to reading and writing, early uses of the term still tied the notion of functionality to specific age and/or grade level achievement. For example, in 1947 the U.S. Census declared "functionally literate" persons over fourteen years of age who had completed five years of schooling.2

W.S. Gray was the first to use the term 'functional literacy' in a publication (although clearly this idea was not new). However, he did not define functional literacy as related to some specific grade level achievement. In 1956 he claimed an individual to be functionally literate "when he has acquired the knowledge and skills in reading and writing which enable him to engage in all those activities in which literacy is normally assumed in his culture or group."3

Just what constitutes functionality is not agreed upon by contemporary authors but functional literacy is usually perceived as being a more accomplished level of skill than is literacy. A person is literate if they are able, on some rudimentary level, to read and write. This means that if one does not possess even such basic reading and writing

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2 Levine; Aron.

3 W.S. Gray, The Teaching of Reading and Writing (Paris: UNESCO, 1956), 24. According to Levine, Gray later succumbed to the traditional grade level perception and claimed that a person is literate when he has "successfully completed three years' schooling." Levine, 253.
skills, he is illiterate.\footnote{Unfortunately, I cannot with any confidence state what is generally considered to count as rudimentary reading and writing skill.} One is functionally literate if the level of skills which she possesses allows her to function in her environment. Obviously, not all individuals need the same degree of reading and writing skills. A college professor needs skills which go far beyond the rudimentary level, while one who is a garbage collector could probably function without going nearly so far beyond the level of mere literacy. Nevertheless, it is possible, given the distinction between literacy and functional literacy, to be literate but not functionally literate. Say Smith reads and writes only at a third grade level. He can be said to be literate, for he possesses minimal reading and writing skills. Smith wants to take courses at a nearby technical college but finds that he is unable to do the required reading and writing. Smith, while literate, is not functionally literate. The category of functional illiteracy includes individuals who are illiterate as well as those who have inadequate literacy skills. Of course, literacy and functional literacy need not be so categorized—one could describe functional literacy as the lowest acceptable level of skill, whereby a person would be "truly" literate if their skills exceeded such a level.\footnote{Such a way of viewing the matter is not unheard of. For example, I saw a recent talk show about literacy where the panelists, who had recently become literate or functionally literate, appeared to view functional literacy as inferior to literacy.} However, the former interpretation seems most common.

While possession of the skills described by Watt and Nickerson would certainly be desirable for all people, there may be people who can function without them. Furthermore, there may be individuals for whom such skills are inadequate. Terming such individuals "literate" would overlook their handicap, whereas the distinction...
between 'literacy' and 'functional literacy' allows one to recognize that while such a person is not without literacy skills and thus could function in some (if not many) environments, their skills are insufficient for their particular situation.

Contemporary authors have followed Gray's lead in providing definitions of functional literacy which allow the minimum standard to be relative to one's situation. For example, Paula DiPerna notes that while "literacy has traditionally meant simply the ability to read and write," more recent definitions stress one's ability to function effectively in society. DiPerna quotes a UNESCO definition:

"a person is literate when he [or she] has acquired the essential knowledge and skills which enable him to engage in all those activities in which literacy is required for effective functioning in his group and community." 2

Thomas Valentine explains functional literacy as

the state of equilibrium between one's literacy ability and the literacy tasks one finds it necessary to perform. Thus general literacy can be expressed solely in terms of an individual's reading and writing ability, without considering the broader social context, while functional literacy must be expressed as an individual's reading and writing ability in relation to the reading and writing tasks imposed by, or existing in, the environment in which that individual resides and seeks to function. 3

Carmon Hunter and David Harmon claim that "conventional literacy" is

the ability to read, write and comprehend texts on familiar subjects and to understand whatever signs, labels, instructions, and directions are necessary to get along within one's environment. 4


2 Ibid., 2.


They define "functional literacy" as

the possession of skills perceived as necessary by particular persons and groups to fulfill their own self-determined objectives as family and community members, citizens, consumers, job holders, and members of social, religious or other associations of their choosing. This includes the ability to obtain information they want and to use that information for their own and others' well-being; the ability to read and write adequately to satisfy requirements they set for themselves as being important for their lives; the ability to deal positively with demands made on them by society; and the ability to solve the problems they face in their daily lives.¹

It is generally agreed that in our society, as well as in other industrial and post-industrial societies, functionality requires reading and writing skills. Of course, such is not the case in all cultures. But there are authors who go so far as to term "functionally literate" individuals who can get along without reading and writing skills.

For instance, Sarah Goddard Power claims that

within the context of a given culture, a literate person is one who can gain access to information and transmit it to others. In contrast to more conventional definitions of literacy, the notion of functional literacy does not necessarily entail the ability to read and write.²

To illustrate her point, Goddard Power uses the example of a member of a tribal society who is adept at communicating within his society via drums. Such an individual functions quite well without the skills of reading and writing.³ It seems that Paul Strassman would agree with Goddard Power on this point. He writes:

Although literacy has many possible meanings, I prefer a definition that is broad in scope: "the ability of individuals to cope with communications

¹Ibid., 27-28.


³Goddard Power claims, however, that if such an individual were to be "globally literate" (i.e. capable of communicating with members of other societies) he would need to acquire reading and writing skills.
within their civilization." This general definition implies that literacy is a cultural phenomenon dependent on the environment.¹

Thus it could be said that in any society past, present or future, which has not reached the complexity typical of industrial and post-industrial societies, functional literacy for some members will likely not require reading and writing skills. Thus, the seventeenth century husbandman, for example, who possessed no literacy skills could be termed functionally literate. I find it curious that Goddard Power and Strassman would consider such a person functionally literate. 'Literacy' and 'functional literacy' are often expanded to include more than reading and writing skills but most authors consider reading and writing to be necessary at the least. It would be more reasonable to term individuals with no reading and writing skills merely functional rather than referring to them as functionally literate.

Kenneth Levine extends the notion of functionality to include not merely the possession of skills, but access to information one needs. According to Levine, general literacy is

the exercised capacity to acquire and exchange information via the written word. Functional literacy is taken to be the possession of, or access to, the competences and information required to accomplish those transactions entailing reading or writing in which an individual wishes—or is compelled—to engage.

Thus, the denotation of illiterate is greatly widened—people without access to printed material relevant to their information needs, as well as those lacking rudimentary reading and writing skills, now count as illiterate.²

Levine's view provides some interesting twists: producers of information as well as its potential consumers can be illiterate if "whether by design or incapacity, the texts they

¹Paul A. Strassman, "Information Systems and Literacy," in Bailey and Fosheim, 115. Strassman, too, expresses concern for "global literacy" but, further claims that a world-known computer language will make such literacy possible.

²Levine, 264.
create mystify, mislead, or pass uncomprehended by interested audiences.\textsuperscript{1}

Furthermore, it seems that Levine may consider literate a person who cannot read and write but who has access to information. As he explains,

in many countries with low rates of literacy, the one member of a household—or even of a village—who can read and write competently can disseminate vital knowledge and procure substantial advantages for the whole community.\textsuperscript{2}

In Levine's view, "access to skills and information is a very effective substitute for personal possession."\textsuperscript{3}

This "access to information" view has political significance in Levine's position. He claims that

the social and political significance of literacy is very largely derived from its role in creating and reproducing—or failing to reproduce—the social distribution of knowledge. If this were not so, if literacy did not have this role, the inability to read would be a shortcoming on a par with tone-deafness, while an ability to write would be as socially inconsequential as a facility for whistling in tune.\textsuperscript{4}

Agreeing that literacy has a political dimension, some authors claim that 'literacy' must include "critical literacy." That is, becoming literate entails the possibility of political and social empowerment. Henry Giroux claims that

to be literate is \textit{not} to be free, it is to be present and active in the struggle for reclaiming one's voice, history, and future . . . . Literacy provides an essential precondition for organizing and understanding the socially constructed nature of subjectivity and experience and for assessing how knowledge, power, and social practice can be collectively forged in the

\textsuperscript{1}Ibid.

\textsuperscript{2}Ibid.

\textsuperscript{3}Ibid.

\textsuperscript{4}Ibid., 264-265.
service of making decisions instrumental to a democratic society rather than merely consenting to the wishes of the rich and powerful.¹

Giroux quotes Stanley Aronowitz who, in describing "functional literacy," writes:

The real issue for the "functionally" literate is whether they can decode messages of media culture, counter official interpretations of social, economic, and political reality; whether they feel capable of critically evaluating events, or, indeed, of intervening in them. If we understand literacy as the ability of individuals and groups to locate themselves in history, to see themselves as social actors able to debate their collective futures, then the key obstacle to literacy is the sweeping privatization and pessimism that has come to pervade public life.²

Paulo Freire also views ordinary literacy as potentially empowering and claims that literacy cannot be viewed as simply the development of skills aimed at acquiring the dominant standard language. This view sustains a notion of ideology that systematically negates rather than makes meaningful the cultural experiences of the subordinate linguistic groups who are, by and large, the objects of its policies. For the notion of literacy to become meaningful it has to be situated within a theory of cultural production and viewed as an integral part of the way in which people produce, transform, and reproduce meaning.³

Since Freire's work is done in developing countries, it is clear that he finds such a view of literacy important not only in industrial and post-industrial societies. However, it is less clear whether he would believe such political enlightenment to be necessary for cultures in the twentieth century due to the complexity of world politics, or whether such enlightenment would be deemed important for all cultures. That is, would literacy for social and political empowerment be as important in earlier times as it is in the modern world?


Clearly, the meaning of 'literacy' has changed over time and even now there is not consensus on its definition. But the core meaning of the concept has to do with an ability to communicate through reading and writing. In the past, only a very low level of knowledge and skill was required and today the notion of functional literacy has made impossible and undesirable the establishment of a minimum proficiency level for literacy. But no matter how much or how little one is expected to know and be able to do, literacy continues to be about learning the propositional knowledge and skills of reading and writing. While some contemporary authors define 'literacy' in ways which include such things as political empowerment, these interpretations also have at their core the notion of communicating through reading and writing. Thus, we can conclude that becoming literate (in the ordinary sense of the term) involves learning propositional knowledge ("learning that . . ." [N]) and learning skills ("learning how to . . ."), with the emphasis on learning the skills of literacy.

Specialized Literacies

In attempting to determine what "X literacy" is believed to involve, I investigated several "X literacies"—aesthetic literacy, music literacy, visual literacy, scientific literacy, and numeracy.¹ A detailed discussion of each of these literacies does not seem necessary here, but a summary follows.

Most authors appear to view "X literacy" as a matter of possessing certain skills. For example, Linda Schamber suggests the following objectives for visual literacy:

¹ 'Visual literacy' might be an unfamiliar concept. Most authors link visual literacy with electronic media (such as television and video), although some use the term in connection with any visual stimulus, which would include the visual arts. However narrowly or broadly 'visual literacy' is defined, most authors seem concerned with people learning skills of perception in order to avoid being "taken in" by the plethora of visual messages which one encounters daily.
The visually literate communicator should be able to:

1. READ and interpret visible actions, objects, and symbols appropriate to communications media; understand visual grammar and syntax.

2. EVALUATE and appreciate visual communication from knowledgeable critical perspectives.

3. WRITE or create visual messages appropriate to communications media; understand the creative process.

4. INTEGRATE VISUAL AND VERBAL content at every stage from evaluation through execution of the message.

5. RECOGNIZE legal, ethical, and moral RESPONSIBILITIES inherent in presenting visuals in a mass communications context.

6. UNDERSTAND THE MECHANICAL PROCESS of communications media as they affect the visual message.¹

Schamber's objectives seem ambiguous to this writer. I do not know what it means to understand visual grammar and syntax, for example. In fact, I do not know what visual grammar and syntax is. Nevertheless, it seems that Schamber is interested in teaching students skills (teaching them how to . . .) since her list of objectives concerns the required abilities of the visually literate individual. Thus, in order to be visually literate, one must (among other things) learn how to interpret visual actions, objects and symbols and learn how to understand visual grammar and syntax.

In discussing 'aesthetic literacy', Maxine Greene notes the importance not only of "learning how to . . ." but of "learning that . . ." (N). She sees becoming aesthetically literate as learning how to have an aesthetic experience and describes 'aesthetic literacy' as involving "certain decoding skills, certain modes of 'knowing how' involved in fully

realized encounters with the arts. Greene emphasizes, however, that teaching aesthetic literacy is not a matter of teaching specific skills; becoming aesthetically literate is more a matter of learning how to view an experience as result of learning that (N). She explains that

Teachers and students require a minimal cognitive familiarity with the symbol systems and with the cognitive style involved. Such familiarity may feed into reflectiveness that deepens and extends experiences with art forms. Also, it enables persons to encounter works of art in their own spaces, on their own aesthetic terms. 

And,

No one can be "trained" into this sort of awareness or what we are calling aesthetic literacy. It is not the kind of attainment that can be separated out into discrete "competencies." A kind of aesthetic education must be invented, therefore, that provides certain fundamental insights, certain ways of proceeding; but its emphasis must be on releasing learners to attend in such a fashion that they are moved to go further on their own initiative, to begin teaching themselves as they uncover (through repeated readings, viewings, hearings) particular works, and as they move more and more deeply into the province of the arts. 

Greene believes that "aesthetic perception is a mode of viewing that can only be personally undertaken" and thus, she apparently believes that to some extent, the development of aesthetic awareness must also be personal.

A.B. Arons provides twelve objectives which she believes the scientifically literate person must meet. These objectives involve both the learning of propositional knowledge ("learning that ... " [N]) and the acquisition of skills ("learning how

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2 Ibid., 131.

3 Ibid., 132.

4 Ibid., 138.
to . . . ). For example, meeting the first objective requires learning that (N),

scientific concepts (e.g., velocity, acceleration, force, energy, electrical charge, gravitational and inertial mass) are invented or created by acts of human intelligence and imagination and are not tangible objects accidentally discovered, like a fossil, a new plant, or a particular mineral.¹

Objective #9 states that the student must "develop enough basic knowledge and understanding in some area (or areas) of interest to allow intelligent reading and subsequent learning without formal instruction. "² Here Arons seems to be saying that in order to be scientifically literate, one must learn how to engage in independent study. Arons distinguishes between "declarative knowledge," which is a matter of knowing facts, and "operational knowledge," which "involves understanding the source of such declarative knowledge" (e.g. "How do we know the earth revolves around the sun and why do we accept this view when appearances suggest the reverse?"³). Arons points out that the schools do a better job with teaching declarative knowledge than operative, and claims that they must strive to do a better job of the latter. Thus, Arons wants students not merely to learn facts but to learn how to think critically about those facts.

David Adams and Robert Baker are in agreement that one must begin with facts and then use those facts as a basis for critical thought. They believe that in teaching scientific literacy, we must begin with propositional knowledge about science and about ethics and then use this knowledge to discuss current issues. In their article Adams and Baker describe a course which they have designed. The objectives for the course are as follows:

² Ibid., 93.
³ Ibid., 94.
1. To define science, its relation to philosophical ethics, and its role in society.

2. To provide a basic knowledge in the physical and life sciences.

3. To provide a knowledge of technology, its relation to science, and its risks.

4. To provide a basic knowledge in ethics and moral reasoning.

5. To explore several current technological issues using these basic knowledges.¹

All of these objectives seem to involve teaching students that such-and-such is the case. For example, objective #1 would likely be a matter of teaching students that (N) science is such-and-so and that it is related to ethics in this or that manner. But, the authors go on to state that the essential goals of their course are

- the ability to identify and articulate the nature and scope of moral issues;
- the ability to write acceptable ethical statements on the case studies; and
- the ability to defend a moral position as a normative ethic.²

Clearly, Adams and Baker want students to learn how to use the knowledge they have gained in making moral decisions.

While some authors do not clearly indicate the need for "teaching that . . ." (N), such teaching must be assumed, for it would be virtually impossible to learn how to do X without learning any facts relevant to X. For instance, learning how to drive must involve (among other things) learning that (N) the object located in X spot is the shifting apparatus. To return for a moment to Schamber's discussion of visual literacy, we can see that learning the skills of visual literacy suggested by Schamber also requires learning some propositional knowledge. Learning how to understand visual


² Ibid., 256.
grammar and syntax (objective #1) would probably involve (among other things, I suppose) learning that (N) visual grammar and syntax is such-and-such. Similarly, learning how to create a visual message (objective #3) would involve, at the least, learning that (N) a visual message is such-and-so. It must be noted that objectives #5 and #6 are somewhat confusing, as they would seem to involve merely learning propositional knowledge, yet Schamber uses skills language. Does objective #5 merely require learning that such-and-such is a moral responsibility or does this objective involve the learning of some sort of skills? That is, would merely learning some propositional knowledge give one the ability to recognize these responsibilities or does Schamber believe that there are some relevant skills which can be taught? Again, objective #6 seems primarily to do with propositional knowledge; that is, the student is expected to learn that such-and-such is the mechanical process. Yet, Schamber speaks of the ability to understand the mechanical process.

Some authors seem to imply that literacy requires not only "learning that . . . " (N) and "learning how to . . . ," but also "learning that . . . " (A). For example, Karen Hamblen claims that aesthetic literacy

involves the knowledgeable appreciation of art. This means bringing to awareness already present, taken-for-granted definitions of and attitudes toward art for purposes of examination, refinement, and elaboration.¹

As Hamblen describes aesthetics, it is concerned with "artistic response, meaning, function, and production."² Thus, aesthetic literacy has to do with an examination of one's response to an art object, the meaning and function of the object, and how the art object came to exist. Hamblen sets up a curriculum model which focuses on the kinds


²Ibid., 67.
of questions children do and should be encouraged to ask when focusing on these topics. Since Hamblen wants children to be active in asking questions, she apparently is not merely concerned with "teaching that . . . " (N); rather, she seems interested in teaching children how to better understand art. But, given that Hamblen defines aesthetic literacy as the knowledgeable appreciation of art, one can ask whether she merely wants her students to know how to appreciate it, or whether she intends for her students to learn new behaviors with respect to art. That is, would the teacher be successful in teaching aesthetic literacy if the students can ask the right sorts of questions when asked to do so, yet do not ask these questions of art objects outside the classroom experience? Or, does success in teaching aesthetic literacy require that the students actually use their knowledge and skills on a regular basis when they are not playing the role of student? Although I cannot be certain, it seems likely that Hamblen desires the latter, as she describes aesthetic literacy as appreciation rather than merely the ability to appreciate art. Moreover, since she describes aesthetic literacy as knowledgeable appreciation of art, becoming aesthetically literate would likely involve "learning that . . . " (A) rather than merely "learning to . . . " If this interpretation is correct, students would somehow need to learn a norm-stating sentence such as "One ought to appreciate art" in addition to the learning of propositional knowledge and skills.

Vincent Lanier speaks of "visual aesthetic literacy," and, while he does not define the term, he claims that if we are aiming for aesthetic literacy in the visual context we must have as our purpose enhancing "pupil access to objects experience aesthetically."¹ Lanier believes that art education should include four perspectives: the critic, the

historian, the artist, and the aesthetician. Attention to these areas will presumably provide the student with a more full understanding of aesthetic experiences. Again, the question is, what sort(s) of teaching (and learning) does Lanier have in mind? He writes,

Aesthetic literacy prescribes that the principle function of art teaching in the school is to ensure that the pupil will become a knowledgeable consumer of all the visual arts. Just as the term literacy in a verbal context does not mean simply the ability to read, but, rather, to be "well read" (that is, to know about literature), an aesthetically literate person is one who knows about the character and context of what there is to be seen aesthetically.1

In Lanier's view is "knowing about" merely a matter of "learning that . . . " (N)? In other words, am I aesthetically literate if I merely have some information encompassing each of the four categories he mentions? I would be tempted to claim that this is what Lanier is suggesting if it were not for his mention of ensuring that students become knowledgeable consumers of the arts. The notion of being a consumer implies that one is active in doing or using something. It would seem then that being a consumer of the arts would be a matter of "using" the arts, e.g. attending the ballet, going to the art museum, buying art objects, and so forth. Furthermore, Lanier is interested in helping students become knowledgeable consumers. Once again, this would seem to involve "learning that . . . " (both N and A).

With this brief overview of some specialized literacies, it appears that "learning that . . . " (N) and "learning how to . . . " are regarded as necessary components of "X literacy." Some authors may also believe "learning that . . . " (A) to be a requirement of "X literacy." Thus, there are two options available: we can claim that even though not all agree, "X literacy" does require "learning that . . . " (A), or we can proceed from

1 Ibid., 36.
the belief that authors who imply the necessity of such learning are really advocating that we educate people beyond literacy. The latter option is the more reasonable.

First, we must remember that the root concept of "X literacy" is 'literacy' and we have determined that 'literacy' involves "learning that . . . " (N) and "learning how to . . .," but not "learning to . . . " or "learning that . . . (A)." For consistency, we should view specialized literacies in the same manner. It is also helpful to consider the ordinary usage of 'illiterate'. We use this term to describe a person who is ignorant or unable to perform some task. Of course, the literal meaning is one who lacks knowledge and skill with regard to reading and writing, but we use the term to describe many other sorts of deficiencies. Nevertheless, the term denotes a lack of knowledge and/or skill. It is important to distinguish between a person who cannot do X and a person who can but does not do X for whatever reason. If such a distinction were not drawn, think of the possible consequences. Having been told that Smith is illiterate, Brown may choose not to interview Smith for a job. This might be a terrible mistake since Smith is fully capable of reading and writing but does as little of these activities as possible, preferring to spend his leisure time in other pursuits. Calling Smith illiterate would seem inappropriate because he is simply choosing not to employ knowledge and skills which he is capable of using. I, for example, can swim but choose not to swim on more than a very irregular basis. Similarly, while I have been taught propositional knowledge concerning sewing (material usually comes in 45" and 60" widths) and have been taught some sewing skills (e.g., how to thread a machine), I very rarely sew. It is not because I cannot sew, but simply because I do not want to sew. It would seem to be more reasonable to reserve the term "sewing illiterate" for someone who does not sew not only because they do not want to, but because they are unable to. I am able, when it is necessary, to use the sewing knowledge and skills which I possess and so, I
may be considered lazy or unresourceful but I should not be considered to be illiterate when it comes to sewing.

There is another component of literacy which merits attention: "learning when to . . . ." My undergraduate Philosophy of Education students provide a good illustration of this point. I teach them that (some of) the skills of philosophical analysis are such-and-such, and I teach them how to use these skills. Furthermore, I at times succeed in teaching these things, as at least some of my students learn them. But, many times students ask, "How is this relevant to the classroom?" or "When would I actually do this?" I would claim that these students, in spite of their possession of some propositional knowledge and skills, are not literate in the analytic methods of Philosophy of Education. Although they possess relevant knowledge and skills, they do not recognize when they should use them.

John Willis seems to view "learning when to . . . ." as an important part of becoming numerate. He views numeracy as a matter of having a feel for numbers and indicates that it is a matter of knowing which operations need to be done and knowing how to estimate. I interpret this as meaning that one must not only know how to add, subtract, etc., but must also know when each of these skills is appropriate. Essentially, it could be said that "knowing when to . . . ." is a type of "learning that . . . ." (N). That is, one must learn that in an X-like situation, one must do Y and Z. To an extent, this can be taught—as a Philosophy of Education professor, for example, I can teach my students that (N) in situations involving vagueness, skills Y and Z apply. Yet, the students must become proficient enough at recognizing vagueness so that they are able

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1 John Willis, "Who Are These People With Numeracy Problems?" Viewpoints: A Series of Occasional Papers on Basic Education (London: Adult Literacy and Basic Skills Unit, March 1984), 1, ERIC, ED 281 065.
to use these skills without coaching. I am not certain what type of learning is involved here (perhaps merely learning that \([N]\) vagueness is such-and-such), nor am I confident that this can really be taught. Nevertheless, I believe that it is important to distinguish between a person who does not do \(Y\) because they do not realize that \(Y\) is called for (and thus, in a sense, cannot do \(Y\) when \(Y\) is called for), and one who does not do \(Y\) because they do not want to. The former constitutes illiteracy, whereas the latter does not.

In summary, like 'literacy', "X literacy" seems to involve "learning that . . . " (N) (and this may include "learning when to . . . "), and "learning how to . . . ." "Learning that . . . " (A) might be desirable, however, it should be regarded as learning beyond mere literacy. What we, as educators, want to do is prepare students so that if they want to develop a disposition for doing \(X\), they can because they have "learned that . . . " (N) and have "learned how to . . . ." That is, it is our task, in teaching "X literacy," to provide students with the knowledge and skills prerequisite to the development of a disposition. Of course, most teachers try to instill in their students an enthusiasm for the subject matter so that students will like the subject and thus, will develop a disposition for doing \(X\). Teachers of literacy, for example, sometimes go to great lengths to try to teach students that (A) reading and writing are enjoyable. For instance, they create cozy reading corners and allow students to read and write about experiences that are meaningful to them. But the teacher has not been unsuccessful in teaching literacy if a child does not often read and write despite their learning the propositional knowledge and skills which enable her to do so.

Now that the notion of literacy has been explored and it has been determined, to some extent, what it means to be literate (in the ordinary or specialized sense), let us focus our attention once again on the definitions of 'CL' presented in Chapter I. What
we will consider in the next section is whether the same sorts of learning and teaching are expected for CL as are required for literacy.

Computer Literacy

Let us return to Noonan's list of knowledge and skills which the computer literate must possess, which was presented in Chapter I. Noonan states that

It is possible to state that a computer literate person must have knowledge of the following:

- the history of computers
- what computers are
- kinds of computers
- abilities of the computer
- computer hardware
- computer software
- computer systems
- how to communicate with the computer
- computer languages
- how to write simple programs
- what goes on inside the computer
- people who work with computers
- problems with computers and social implications
- the future of computing

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Given Noonan's list, CL consists of "learning that . . . " (N) and "learning how to . . . " For example, Noonan states that the computer literate must have knowledge of the history of computers. This is apparently a matter of learning that the history is such-and-such. The computer literate is also expected to learn how to write simple programs. The learning of propositional knowledge and skills is also necessary for the various levels of CL Noonan suggests. In describing the "functional computer literate" as one who is "able to turn the computer on, load a program into the computer, [and] run and use the program,"¹ Noonan's main concern is with learning skills; however, learning these skills would also involve learning some related propositional knowledge. According to Noonan, the "average computer literate"

will know what a computer is, be able to operate the computer, write short programs, make simple alterations to other programs, understand a little about the operation of hardware and think a little, at least, about the future of computers and computing.²

While I am unsure what sort of learning the last item is to involve, the rest of Noonan's definition clearly indicates the learning of propositional knowledge and skills. The same would be required of the "complete computer literate," as being able to "write sophisticated programs and/or design and construct hardware for the computer"³ would require both "learning that . . . " (N) and "learning how to . . . "

According to Radin and Greenberg, CL consists of four components:

1. defining the term computer, its basic parts, their interrelationship, and the means by which computers communicate which human beings;

¹ibid.

²ibid.

³ibid.
2. the history of the computer with an understanding of those pressures that motivated its evolution and multidimensional applications for resolving continually developing technological problems;

3. cognizance of the positive and negative impact of computers on society; and

4. controlling the computer with quality programming that achieves a desired objective proficiently and accurately.¹

The first three components appear to involve "learning that . . . " (N), while the fourth apparently is a matter of learning how to program the computer.

As mentioned in Chapter I, the National Center for Education Statistics' panel of experts has defined 'CL' as "whatever a person needs to know and do with computers in order to function competently in our information-based society."² While this definition is too vague and ambiguous to indicate what might be the necessary components of a CL program (if, indeed the panel believes that there are any), it appears that the panel is advocating "learning that . . . " and "learning how to . . . ." Certainly, "whatever a person needs to know . . . " would indicate learning propositional knowledge ("learning that . . . " [N]). "Whatever a person needs to . . . do . . . " is probably meant to indicate that CL involves learning computer skills, however it is possible that the panel believes that one must "learn that . . . " (A) and thus, actually use computers.

Warren Jones, et al define 'CL' as

a minimal knowledge and appreciation of the general principles which underlie computer hardware, software, and the application of computing


In stating that the computer literate must possess minimal knowledge, the authors indicate the importance of "learning that . . . " (N). However, it is not clear what appreciation is to involve. Is this merely another way to refer to the learning of propositional knowledge or is the individual expected to value these principles? If the latter is intended, what counts as valuing such principles—would it be a matter of learning to enjoy studying about computers? Is one expected to learn that (A) one ought to use computers for the mentioned objectives? It is interesting to note that the program outlined in their book includes the learning of propositional knowledge concerning hardware, software, the history of computers, types of communications systems, and social issues involving computers. But also included is learning the skills of using a computer and programming a computer. In fact, the emphasis of the course is on programming. Such learning is not, in my estimation, indicated by their definition of 'CL'. More will be said on this apparent disparity (and the disparity between other authors' definitions and proposed programs) in Chapter III.

John Lombardi defines 'CL' as

the ability to recognize problems for which the computer may be a useful part of the solution. Computer literate adults will be able to identify appropriate computer resources for a wide range of tasks and they will know how to ask the experts for assistance in finding solutions using computers.2

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Lombardi uses skill language to describe 'CL'. That is, he says the computer literate is able to determine when a computer would be helpful and knows how to ask experts for help. What would be involved in knowing how to ask for help? Knowing how to speak or write? Knowing how to be diplomatic? It seems that what Lombardi is intending to convey is that a computer literate knows that (N) computers are useful for tasks X, Y and Z. Furthermore, such an individual knows that help can be obtained from source S. Like Jones, et al, Lombardi's proposed CL program is not entirely consistent with his definition. He suggests that individuals learn propositional knowledge about computer hardware and software in addition to learning what are appropriate resources for help. Furthermore, over half of the course is to be spent learning how to use computers for various applications (e.g. word processing and spreadsheets).

Daniel Watt views CL as

a cultural phenomenon which includes the full range of skills, knowledge, understandings, values and relationships necessary to function effectively and comfortably as a citizen of a computer-based society.1

While Watt believes that specific CL needs will vary from person to person, his use of the terms 'skills' and 'knowledge and understanding' indicate the necessity of "learning how to ..." and "learning that ..." (N). It is not immediately clear what sort of learning Watt expects in regard to values and relationships. By way of explanation, Watt presents four categories of CL.

1. The Ability to Control and Program a Computer to Achieve a Variety of Personal, Academic, and Professional Goals . . . .
2. The Ability to Use a Variety of Pre-Programmed Computer Applications in Personal, Academic, and Professional Contexts.


4. The Ability to Understand the Growing Economic, Social, and Psychological Impact of Computers on Individuals and Groups Within Our Society and on Society as a Whole.

Watt clearly intends for the computer literate to know how to use and program a computer. I must admit that I do not fully understand the third category. At the least, Watt expects the computer literate individual to know how to gather information and problem solve. The fourth category is rather interesting, as Watt states that the computer literate has the ability to understand the impact of computers. As Watt explains it, this involves the possession of propositional knowledge, e.g. "the recognition that computer applications embody particular social values and can have different kinds of impacts on different individuals and different segments of society." Yet, it would seem more appropriate for Watt to indicate that the computer literate not only can understand the impact but, in fact, does understand. Watt seems to be making a curious split between possessing knowledge (with which one could, but does not necessarily, understand something) and understanding, which he probably does not really intend to make. Furthermore, Watt's position may be even better represented if he would indicate that he expects the computer literate to "learn that . . . " (A). He claims that computer literacy includes

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1 Ibid., 57-58.
2 Ibid., 58.
the understandings necessary to play a serious role in the political process
by which large and small scale decisions about computer use are made,
and to transcend the dependent roles of consumer or victim.¹

Watt seems to expect the computer literate to use her knowledge to avoid being a
victim. That is, one must learn that (A) one ought to get involved in making decisions.
The "relationships" component of Watt’s definition remains unclear.

Hentrel and Harper use Watt’s definition and, like Watt, they list four categories
of CL. Whether these categories are intended to be virtually the same as Watt’s is
unclear, but they do appear to be slightly different. They claim that a computer literate
should be able to

1. program, debug, and modify a computer,
2. select and use software applications,
3. be sensitive to the impact of computers and refrain from involvement
   in computer abuse,
4. apply concepts learned in the computer world to other tasks.²

The first two categories are easily understandable and seem similar to Watt’s. The third
category seems a bit odd, however. What would be involved in being able to
be sensitive to the impact of computers and being able to refrain from computer abuse?
First, one would probably need to know that (N) the impact is such-and-such. But it
does not seem that there are skills to be learned which enable one to be sensitive to the
impact and refrain from computer abuse. What the authors seem to have in mind is
students developing the disposition to be sensitive to the impact and refrain from
computer abuse. Thus, their position would be more easily understood if they indicated

¹Ibid.
that a component of CL is learning that (A) one ought not engage in computer abuse. The fourth category concerns transfer. Being able to apply computer-related concepts to other tasks would perhaps involve learning that (N) X-like concepts apply in Y-like situations.

Beverly Hunter defines 'CL' (for grades K-8) as

the ability to use suitably programmed computers in appropriate ways to assist in accomplishing tasks and solving problems; and ability to make informed judgments about social and ethical issues involving computer and communications systems.¹

Hunter's use of 'ability' indicates a concern for students "learning how to . . . ."

Hunter's list of proposed goals for a CL program (presented in Chapter I) gives a clearer indication of the skills which Hunter believes are important. For example, Objective #2 states that a CL program should "encourage teachers and students to find and create computer applications that are useful to them in teaching, learning, managing information and solving problems in math, science and social studies."² Within the list of proposed goals, Hunter also implies the importance of other sorts of learning. For example, in claiming that one goal of a CL program is to "help students and teachers to become aware of a variety of computer applications and their uses by individuals and organizations"³ (Objective #6), Hunter is clearly advocating "learning that . . . ." (N). With some of the proposed goals, it is not entirely clear what sort of learning is being suggested. Consider, for example, Hunter's claim that a CL program should "help students and teachers learn to use computers as an aid in solving problems . . . ."


²Ibid.

³Ibid.
Objective #4. This must involve learning how to so use computers. It must be wondered whether Hunter also intends for these individuals to acquire the disposition for using computers. If a disposition is desired, does Hunter merely want students to learn to use computers or does she want them to learn that (A) they ought to use them? A similar question can be asked of Objective #2. If a goal of CL programs is to "encourage teachers and students to find and create computer applications that are useful to them . . .," does this mean that one merely learns related skills, or must one also learn to act on this ability or learn that (A) they ought to so act? Also confusing is the first objective which states that a CL program should "help students and teachers to value computers as general-purpose machines designed, built and operated by humans to assist in many tasks." At the least, Hunter seems to have in mind teaching that computers are general purpose machines, etc. But what is involved in helping students and teachers value computers as general purpose machines? Are students and teachers to learn that (A) computers have positive value?

Anderson and Klassen define 'CL' as "whatever understanding, skills, and attitudes one needs to function effectively within a given social role that directly or indirectly involves computers." While this is a functional definition (meaning that the level of knowledge/skill required to be literate is dependent upon one's specific needs), Anderson and Klassen give a detailed outline of objectives for a CL course. Many of the objectives relate to the acquiring "understandings" and thus, involve "learning

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1Ibid.

2Ibid.

that . . ." (N). For example, one of the objectives under the heading "Applications," is "recognize features and capabilities of personal microcomputer systems as compared to features and capabilities of large data processing systems."¹ This would seem to involve learning that (N) the features of each system are such-and-such. Quite a few of the objectives relate to the acquisition of "skills" and so, have to do with "learning how to . . . ." An example of such an objective appears under the heading "Programming/Algorithms": "modify a simple algorithm or program to accomplish a new but related task . . . ."² As with the aforementioned authors, it is when Anderson and Klassen speak of values that their position gets particularly difficult to interpret. Some of the objectives under the heading "Values" could merely be a matter of "learning to . . . ." For example, one of the objectives listed is "Does not feel fear, anxiety, or intimidation from computer experiences."³ It would be logically possible to simply acquire the disposition of not being "computer-phobic." But some of the other objectives may need to be a matter of "learning that . . . " (A). Consider, for example, this objective: "Values efficient information processing provided that it does not neglect accuracy, the protection of individual rights, and social needs."⁴ It would seem that in order to fulfill this objective, one must learn (among other things) that (A) one ought not violate people's rights. Of course, it could be said that in order not to "feel fear, anxiety, or intimidation from computer experiences," one must learn that (A) the computer is "friendly."

¹ ibid., 144.
² ibid., 148.
³ ibid., 150.
⁴ ibid., 150.
Briefly summarizing, CL, like the other specialized literacies discussed here, is viewed by all of the authors as a matter of "learning that..." (N) and "learning how to...". I have noticed that there is more explicit mention made of "teaching that..." (N) with regard to CL than with the other specialized literacies discussed (with the possible exception of science literacy). Perhaps this is merely a coincidence, having to do with the authors I chose to include. Or, perhaps it is due to the fact that CL is a new concern, and therefore, adults (for whom these articles were written) need to be reminded of, or made more aware of, what the relevant propositional knowledge is, whereas with the other disciplines it is more established. It can be said, then, that all of the authors discussed view "teaching that..." (N) and "teaching how to..." as necessary conditions for teaching CL. Whether these are also believed to be sufficient conditions is not clear in all cases, for some authors may believe CL to include "learning that..." (A). Such learning, however, goes beyond the bounds of mere literacy.

Green on the Modes of Teaching

Now that it has been determined what general sorts of learning are required of the computer literate, it will be helpful to determine what sorts of teaching should be engaged in to reach these learning goals. Thomas F. Green builds upon Scheffler's work by distinguishing among the various modes of teaching. In The Activities of Teaching\(^1\) Green explains that there are two primary emphases in teaching. One focuses on the formation of behavior while the other concerns shaping beliefs or communicating knowledge. Green claims that the various acts which teachers might

perform—conditioning, training, instructing, and indoctrinating—can be placed into these two categories. Conditioning and training are aimed primarily at shaping behavior, while instructing and indoctrinating are concerned mainly with the shaping of knowledge and beliefs. By way of illustration, Green provides the following diagram:

![Diagram of modes of teaching]

As Green notes, the aim in training is to shape behavior; the expectation is that when doing X, the pupil will do X in the manner in which they have been taught. It is not required, however, that the learner actually do X with any regularity. The outcome of successful conditioning, on the other hand, is that the student develops a disposition for doing X. As previously noted, I have learned how to swim but have not learned to

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1Green, 33.
swim. Thus, it can be said that while I have been trained how to swim, I have not been conditioned to swim. Conditioning is also unlike training in the degree of intelligence required of the learner. Of course, some thought will need to go into learning the prerequisite skills for doing X, but since the teacher's goal is to get the pupil to merely do X, the reasons for doing X this way instead of that need not be provided. That is, the objective is merely to get the student to do X, not to provide the student with an understanding of X. With training, however, the aim is to provide the student with skills and some understanding of those skills so that the student will be able to complete relevant tasks on his own, even if the tasks are somewhat complex or if modifications might at some point need to be made. For example, one who is being taught a factory job ought to be trained, rather than conditioned, for the worker must be able to be flexible and do some thinking if the machine should malfunction or the usual order of tasks should otherwise be altered. Thus, in training someone the teacher offers some explanation as to why X is done in this way instead of that, and the student must exercise a greater amount of intelligence than if being conditioned to do a task.

According to Green, the aims of indoctrination and instruction are somewhat different and there is a differing amount of intelligence required of the learner. The goal of indoctrination is to get the pupil to believe X and therefore, one is successful in indoctrinating one's pupil if the pupil does, in fact, believe X. However, as Green notes,

Whether the belief is adopted for some good reason, whether it is grounded in evidence, or even whether it is a true belief is not of primary importance in indoctrinating as it is in instructing.¹

¹Ibid., 30.
The person being indoctrinated need not do much thinking. In fact, since the goal of indoctrination is to get the pupil to believe X independent of good reason for believing it, it best suits the indoctrinator's purpose if the learner does very little thinking. The purpose of instruction, on the other hand, is to get the learner to believe X because he sees that there is good reason for believing it. Greater intelligence on the part of the learner is required in that instruction involves the giving, and evaluating, of reasons--it involves a conversation between teacher and student. A parent might wish to indoctrinate his child to believe that God exists. On the other hand, he might wish to instruct his child that God exists; the difference lies in whether the parent offers reasons and allows the child to exercise independent judgment in deciding whether to believe that God exists.

Green indicates that while we are likely to refer to all four of these activities as teaching, conditioning and indoctrination fall outside the realm of what can properly be termed teaching. Green quotes Scheffler who writes,

To teach, in the standard sense, is at some points, at least, to submit oneself to the understanding and independent judgment of the pupil, to his demand for reasons, to his sense of what constitutes an adequate explanation. To teach someone that such-and-such is the case is not merely to try to get him to believe it . . . . Teaching involves further that . . . we try also to get him to believe it for reasons that within the limits of his capacity to grasp, are our reasons. Teaching, in this way, requires us to reveal our reasons to the student, and, by so doing, to submit them to his evaluation and criticism . . . .

Even to teach someone to do something (rather than how to do it) is not simply to try to get him to do it; it is also to make accessible to him, at some stage, our reasons and purposes in getting him to do it. To teach is thus, in the standard use of the term, to acknowledge the "reason" of the pupil; i.e., his demand for and judgment of reasons, even though such demands are not uniformly appropriate at every phase of the teaching interval.¹

Given that CL has been determined to involve "learning that..." (N) and "learning how to...", which modes of "teaching" would be appropriate in teaching CL? Because the goal of CL programs would not simply be to get students to learn to use computers, conditioning would be inappropriate. Training would clearly have a place, since one of the major goals is to teach students how to use computers in various ways. It would be logically possible to indoctrinate students when the goal is that they "learn that..." (N). But, given the continual change in the world of technology, indoctrinating students with regard to computer knowledge would likely leave them unprepared for assimilating new information and amending the old. Moreover, it could be claimed that indoctrination is contradictory to what education is fundamentally about--teaching students the ability to reason.\(^1\) Clearly, instructing is the only viable choice here.

It has been argued that teaching students that (A) they ought to use computers would go beyond literacy. Yet, teaching CL (or any other literacy) would probably not be completely devoid of teaching dispositions. Certain skills must be done in certain ways if they are to be done correctly. Thus, we may need not only to teach our students how to get off the computer, for example, but also to teach them that (A) one should log off in such-and-such a manner. I am aware of at least three ways to get off my computer--follow the exit procedure (which involves several steps), simply turn off the computer, or unplug the computer. Any of these will allow me to quit the task on which I have been working. But, I have learned that (A) one should go through the

\(^1\)One might argue that indoctrination has its place--for example, a teacher might indoctrinate young children with the belief that all drugs are addictive and life-threatening (even though she does not believe this) in order to keep them from experimenting and perhaps harming themselves. But I believe it would be agreed that indoctrination should be used sparingly, if ever, in the classroom.
exit procedure since merely turning off or unplugging the computer might result in a scrambled mess the next time the computer is turned on. Teaching students that they should do X in such-and-such a manner is different, though, from teaching students that (A) they ought to do X. The former can be seen as an important component of teaching literacy, as it is essentially part of teaching students how to do X. If the students do not learn such norm-stating sentences, they may not learn how to do X properly and thus, may not be able to do X if they choose to do so. However, teaching students that (A) they ought to sew, for example, goes beyond equipping the student to sew if they choose to do so, and thus, oversteps the bounds of teaching literacy.

Like "learning that . . . (N)," "learning that . . . " (A) must be brought about by instructing rather than indoctrinating, for it requires that the learner act on reasoned belief. Scheffler clearly regards both "teaching that . . . " (N) and "teaching that . . . " (A) as a matter of instructing, for he is interested in the pupil's doing X because he thinks there is good reason for doing so. As he explains,

To learn to be honest is to acquire a certain norm, a "pattern of action." Belief is not implied. The notion of belief is not even applicable. One learns to be honest but no one believes to be honest. By contrast, to learn that Columbus discovered America is (whatever else is involved) to come to believe that he did. Similarly, to learn that one ought to be honest is to

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1 Of course, there are differing degrees of skill in performing any activity and sometimes the lack of learning such norm-stating sentences might merely mean that one can do X but not do it very well. For example, my sewing teacher tried to teach me that (A) one should always baste a seam before doing the final stitching. I learned that (N) basting is a good idea but I didn't learn that (A) I ought to do it. My not learning the disposition of seam basting has been responsible for my sewing badly (i.e., I have spent much time ripping out seams), but it has not prevented me from being able to sew at all. In speaking of the necessity of "learning that . . . " (A) for "learning how to . . . ," I am speaking of dispositions which, if not learned, will be disabling.
come to believe that one ought to, (whatever else is involved, --in this case, at least acquisition of the norm). . . . 1

It must be asked what is the difference between instructing for the purpose of "teaching that . . . " (N) and "teaching that . . . " (A). Roger Straughan, in writing about moral education, raises such a question. Straughan does not draw Scheffler's distinctions regarding "teaching that . . . " (N) and "teaching that . . . " (A), so he merely speaks of teaching children to be good (i.e., moral agents). But Straughan distinguishes between a person who does X out of habit or obedience and a person who does X because he thinks it is the correct thing to do. Straughan obviously considers the latter situation as the more desirable; he is interested in children acquiring the disposition of moral agency not out of habit, but out of reasoned judgment. But he notes that there is no sort of teaching which can guarantee that one's students will acquire this disposition. He writes:

Teaching children to be moral, then, must become a matter of teaching them to want to be moral. The knowledge and abilities which can result from teaching that . . . and teaching how . . . are not enough in themselves to ensure this motivation, though it will no doubt often be the case that children will want to make use of what they have learned, in forming moral decisions and acting upon them. Clearly, no teaching method can guarantee to produce the appropriate motivation and subsequent behavior, for teaching (unlike conditioning and indoctrination) implies that the learner is a free agent, capable of accepting or rejecting what is taught; and furthermore, the necessary "gappiness" of morality means that there must always remain the possibility of a moral decision not being acted upon. 2

So in addition to instructing students about X, teachers who wish to teach students that (A) X is the case need to try to motivate their students to act accordingly, realizing that the students may choose not to.

1 Scheffler, 93.

2 Roger Straughan, Can We Teach Children To Be Good? (London: George Allen and Unwin, 1982), 91-92.
It would seem, then, that "teaching that . . ." (A) would be a matter of instructing plus motivating students. Of course, good "teaching that . . . (N) will also require motivating one's students, but in a different way. In trying to teach one's students that (A) they ought to be honest, one must instruct them as to the many good reasons for and consequences of being honest and motivate the students to want to be honest, perhaps by being a role model and showing them how personally rewarding being honest can be. If one is trying to teach one's students that the square root of nine equals three, one must not, in addition to instructing, motivate the students to want to be three; rather, the necessary motivation will involve more general things such as pointing out the rewards of studying math.

Summary
Confusion surrounding CL programs has been fostered in part by the fact that attention has been focused primarily on the making of curricular decisions. Of course, the curriculum is of great importance, but serious thought must also be given to the questions underlying such decisions. Confusion could be lessened by first attending to the definitions of 'literacy'. We should begin with the understanding that being computer literate involves learning propositional knowledge about computers ("learning that . . ." [N], which may include "learning when to . . .") and learning some skills of computer use ("learning how to . . ."). It must be recognized that while educators might hope to teach students the disposition of computer use (either "teaching to . . ." or "teaching that . . ." [A]), such teaching would go beyond literacy. (Teaching students how to correctly use computers might very well include some "teaching that . . ." (A), however.)
With this basic understanding of literacy, serious thought can then be given to which specific propositional knowledge and skills should be taught. Questions concerning the prevalence of computers (in and out of the workplace), the complexity of such computers' operations, and so forth, are of importance in making such decisions. Such issues cannot be dealt with at length in this dissertation but will be touched upon in Chapter IV.

Once it is determined which knowledge and skills are to be taught, it must be decided which modes of teaching would be most appropriate. Again, determining the means of teaching specific lessons will require asking empirical questions regarding the types of learners involved, and so forth. But educators should begin by understanding that in "teaching that . . ." (N) or (A), instruction will be the desired mode, while "teaching how to . . ." will involve training students. In teaching CL (or any type of literacy) "teaching that . . ." will largely involve the teaching of fact-stating sentences; for example, one might teach their students that (N) the Macintosh computer uses 3.5" hard disks. But, it has been shown that the teacher will also need to teach students norm-stating sentences; e.g., one might need to teach their students that (A) their disk should be inserted into the disk drive with the metal piece facing forward. It must be emphasized that "teaching how to . . ." must build upon the teaching of propositional knowledge. The teacher will not be successful in teaching students how to program a computer with BASIC if they have not taught the students that (N) the symbols used in BASIC are such-and-such.

While she is commenting specifically on science instruction in higher education, a point made by Arons is useful in summing up the nature of teaching literacy:

It is impossible to consider every important problem, open every significant perspective. The time is long past when we could teach our students all the things they must know . . . . The only viable and realistic function of higher education is to put students on their own intellectual
feet: to give them conceptual starting points and an awareness of what it means to learn and understand something so they may then continue to read, study, and learn, as need and opportunity arise, without perpetual instruction. ¹

Taking some liberties with Arons' comment and adapting it to the current discussion, we might say that literacy requires being able to use one's knowledge and skills in pursuing one's own ends. Moreover, this would seem to involve knowing when certain knowledge and skills ought to be used. Essentially what we are speaking of here is the ability to transfer one's knowledge and skills from one area of discussion to another. We would be unwilling to term a child literate in reading if she could only read the book used in her reading group. Similarly, I would be unwilling to regard a student as literate in Philosophy of Education if she possessed the necessary knowledge and skills yet could not do philosophy outside of the classroom. Teaching literacy involves imparting the knowledge and skills necessary for doing X. Whether one actually does X is another matter.

¹Arons, 108.
CHAPTER III

AN ANALYSIS OF SOME DEFINITIONS OF 'COMPUTER LITERACY'

Introduction

Now that it has been seen what general types of teaching and learning are expected with regard to CL, it will be helpful to investigate more closely definitions of 'CL'. In addition to providing information on how 'CL' is defined, this chapter will focus on the legitimacy of these definitions. Scheffler's distinctions regarding the types of definitions will be used here. First the definitions will be categorized as to type—that is, are proposed definitions descriptive (used to merely report the standard usage of 'CL'), stipulative (used to specify an author's more particular usage), or programmatic (whereby a program or course of action with regard to CL is suggested)? We will then turn to an evaluation of these definitions. This will essentially be a matter of judging whether the definition fulfills the purpose(s) for which it was proposed. Let us begin with a brief explication of Scheffler's distinctions regarding definitions.

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1There are other ways of categorizing definitions. See for example, Robert H. Ennis, Logic in Teaching (Englewood Cliffs, NJ: Prentice-Hall, Inc., 1969) and Ronald Munson, The Way of Words: An Informal Logic (Boston, MA: Houghton Mifflin Company, 1976). As these category systems are similar to Scheffler's, they will not be discussed here.
Scheffler on Definition

Scheffler begins by making a broad distinction between "scientific" and "general" definitions. By way of general explanation, it can be said that scientific definitions operate within the realm of very specialized knowledge and, in Scheffler's words, "are evaluated primarily in terms of their contributions to theoretical adequacy, irrespective of their degree of conformity to familiar usage, their ability to enlighten the layman, and their social and rhetorical effects."\(^1\) But, when discussing matters relating to the schools, educators would not generally make use of such technical definitions. As Scheffler explains,

We are here interested, broadly, in non-scientific discourses in which definitions of educational notions are offered, for example, in curriculum statements, in enunciations of program and objectives, in interpretations of education addressed to the general public, in debates over educational policy. It makes no difference whether the definitions offered in such contexts are put forward on scientific authority or not; the important fact is that they are presented not as technical statements interwoven with special scientific research and for theoretical purposes, but rather as general communications in a practical context.\(^2\)

Scheffler distinguishes among three types of general definitions: descriptive definitions, stipulative definitions, and programmatic definitions. In offering a descriptive definition, one's purpose is to explain how the term is usually used. One may offer such a definition merely to acquaint someone with the meaning of a term or the intent may be to help the individual become more proficient at using the term, nevertheless, the normal usage of the term (in a non-scientific context) is what is intended to be conveyed.\(^3\)


\(^2\)Ibid.

\(^3\)I say that with a descriptive definition one \textit{intends} to explain normal usage because it is, of course, possible to give an inaccurate descriptive definition, i.e. one
In stipulating a definition of X, the intent is to make clear one's own more specific use of the term in order to facilitate discussion. Scheffler speaks of "inventive" and "non-inventive" stipulative definitions. Non-inventive stipulations essentially involve using in a new way a term which already has a descriptive definition. This can be a matter of placing limits on the descriptive definition or of going completely outside the descriptive definition and using the term in a way which is inconsistent with the descriptive meaning. For example, 'teacher' is a familiar concept and thus, has a descriptive definition. If we were to ask the proverbial "man or woman on the street" to define 'teacher', we would likely get a response like, "a teacher is someone who is paid by a school to help children learn." However, a school may find it necessary to stipulate a more specific definition of 'teacher'. Imagine that the school has a policy which states that children will be placed in classes according to teacher evaluation of students' ability. Perhaps a definition such as the following would be stipulated: "By 'teacher' we mean an individual placed in charge of a classroom who holds a current teaching certificate valid in this state." Such a stipulative definition would be helpful in this case, as it would disallow placement decisions being made by teachers' aides. In stipulating this definition of 'teacher', the administration is not indicating that they believe the descriptive definition of 'teacher' to be false, but merely that it is too broad in scope to allow accurate communication. Thus, in offering a non-inventive stipulative definition, the administration has placed boundaries within the descriptive definition of 'teacher' and restricted its meaning to suit the circumstances. The point is to offer a precising definition which will reduce vagueness and ambiguity in order to

which does not actually reflect the generally accepted prior usage. Other sorts of descriptive definitions can be given, e.g., one might define a technical term as it is commonly used or report the past usage of a term, but in discussing 'CL' we will not be concerned with such definitions.
minimize confusion as to who is to count as a teacher. In using a non-inventive stipulative definition it is also possible to denote a meaning entirely different from the descriptive definition. Such would be the case if one were to claim that, for purposes of discussion, they would be equating 'teacher' with "one who is hired to assume the role (among others) of therapist."

An inventive stipulative definition is a matter of coining a new term. Marketing analysts in the 1980's have found it necessary to speak frequently about households which contain two married but childless working adults. As a matter of convenience, the term 'dinks' (dual income, no kids) has been coined to refer to such individuals. As with non-inventive stipulations, such definitions are used to "economize" discussion in that stipulating a definition of 'dinks' and then using that term throughout the discussion is less verbose than is repeatedly saying "households which contain two married but childless working adults."

Finally, programmatic definitions are offered with the aim of suggesting that some course of action be taken. For example, if one defines 'teacher' as "an individual responsible for the moral growth of children," it is clearly the case that one believes that teachers must in some way involve themselves in providing moral education. It is possible, and common, for stipulative definitions to also be programmatic. Thus, the administration at a particular school may note that they define 'teacher' as "an individual responsible for the moral growth of children," while realizing that this may not be the commonly accepted definition of 'teacher'. According to Scheffler, overlap between descriptive and programmatic definitions is also possible. Such a situation can occur in discussions of practice when one discussant uses a descriptive definition of X which is programmatically opposed to a non-inventive stipulative definition of X proposed by another discussant. Even if the descriptive definition does accurately reflect normal
usage, the definition, in the context of the discussion, can be seen to suggest some course of action. For example, imagine a principal discussing with one of his teachers the various tasks which teachers should be expected to perform. The principal offers the stipulative definition previously discussed—"a teacher is one who is hired to assume the role (among others) of therapist." The teacher sticks to a descriptive definition, saying that "a teacher is one who is hired to teach school subjects such as math, English, etc." While the latter definition is descriptive, that is, it reflects standard usage of 'teacher', it can also be seen in this context to suggest a course of action, i.e. not requiring teachers to act as students' therapists. Descriptive-programmatic overlap is also possible when two accurate descriptive definitions have been offered which are programmatically opposed. Such overlap involves the interpretation of borderline cases of X. As Scheffler notes, such situations arise fairly often in legal discussions, as definitions are offered which reflect prior legal usage yet which are intended to legislate practice. Scheffler offers the following example:

Suppose a new sect is founded, with no prescribed creed or holy book, but with recommended rituals and hymns, and meetings designed to improve men's conduct and ethical attitudes. Ought this sect be called 'religious'? Prior usage may be puzzled, but whether the legal definition to be adopted has the effect of applying the term to this sect or not will determine whether or not it will receive those privileges the law accords to religious institutions. Two definitions of 'religion,' equally correct in that each adequately covers clear cases of predefinitional usage, may still diverge in the way in which they classify our imagined sect....

It is clear that these definitions in legal contexts are programmatic in nature as well as descriptive, their point being to direct practical policy with respect to the new case, as well as to summarize past usage.¹

The importance of Scheffler's distinctions regarding the types of definitions lies in how each type is to be evaluated. Because descriptive definitions are to explain the

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¹Scheffler, 29.
generally accepted prior usage of a term, the definition is a good one if it does, indeed, reflect such usage. If one defines 'chair' as "a piece of furniture used for sitting," the definition will probably be found to be an acceptable descriptive definition as it seems to reflect standard usage of 'chair'. There can be difficulties with such a definition in that it allows for many borderline cases of 'chair'. As Scheffler explains,

the word 'chair' clearly applies to certain objects in accord with standard usage, e.g., the four-legged, straight-backed, movable pieces of wooden furniture placed around the dinner table and used for seating adults. It also clearly does not apply to a number of other objects, e.g., windows, horses, engines, lakes, and clouds. But some things are neither clear cases of application nor clear cases of non-application, e.g., toys resembling chairs but made of plastic and two and a half inches high, and objects used for seating adults but lacking the typical shape of chairs, for example, boxes or barrels. Regarding such undecided or borderline cases, descriptive definitions are free to rule either way.¹

While borderline cases can be ruled either way, the descriptive definition must include clear cases of X or fail to be a good definition. If one defines 'chair' as "a three-legged, backless piece of furniture used for sitting," the definition does not allow the four-legged, straight-backed piece of furniture used at the dining room table to be counted as a chair and thus, the definition would be considered to be too restrictive. On the other hand, if one defines 'chair' as "a moveable piece of furniture used for sitting," the four-legged, straight-backed piece of furniture used at the dining room table would be included but so might items which are clearly not chairs, such as coffee tables. Thus, an accurate descriptive definition must allow for the inclusion of clear cases of X, as well as the exclusion of clear non-cases of X.

In evaluating a stipulative definition, it must be determined whether the definition succeeds in facilitating understanding. This will be a matter of judging whether the definition reduces vagueness and ambiguity as well as determining whether the

¹Ibid., 18.
definition seems to be consistent with the rest of the speaker's position. Here, it is irrelevant whether the definition reflects standard usage of the term. While descriptive definitions are truth-functional, i.e., they are either accurate or not, stipulative definitions do not have this feature. Scheffler explains that stipulative definitions legislate conventions that may be more or less helpful in discussion, that may be consistently or inconsistently followed, that may be coherent or not, taken as a whole, but they can neither be fairly justified nor rejected by consideration of the accuracy with which they mirror predefinitional usage.\(^1\)

In evaluating a programmatic definition, one must ask whether the course of action suggested ought really to be undertaken. It should be noted that while a programmatic definition might suggest a program which is desirable, the definition is still problematic in that the use of the definition may function to get people to accept a conclusion for which no good argument has been given. In other words, no matter how desirable a program may seem to be, a rationale for the program must be given and evaluated. According to Scheffler, judging whether a suggested program should be implemented requires asking social and moral questions. In the case of overlap, i.e., definitions which appear to be of more than one type, the questions relevant to each category must be raised.

**Application of Scheffler's Distinctions to Definitions of 'Computer Literacy'**

In this section it will be determined which types of definitions of 'CL' are offered. We will begin by discussing which types seem possible and will then move to classification of actual definitions of 'CL'.

\(^1\)Scheffler, 15.
It is logically possible that in disagreeing about how 'CL' should be defined, authors are disagreeing about the standard usage of the term, each believing that their own definition more accurately reflects such usage. Given the newness of and the constant change associated with computers, there is not a standard definition of 'CL'. Nevertheless, the term is used often and people have some familiarity with it. Clear cases of computer literates can be recognized, such as the computer whizzes who are able to break into large computer systems. There are also clear non-cases, such as individuals who would be lucky to find the on/off switch on a computer. It is the middle part of the CL continuum which causes difficulty. Short of being a computer whiz, what must one be able to do to be considered computer literate? Most concepts might be illustrated as follows:\(^1\)

\[\text{Model cases} \quad \text{Borderline cases} \quad \text{Contrary cases}\]

Fig. 2. Depiction of a relatively clear concept.

\(^1\)These diagrams are not intended as Venn diagrams; they are intended to depict the relative size of the circles.
'CL', however, would be illustrated as such:

![Diagram showing model cases, borderline cases, and contrary cases]

Fig. 3. Depiction of a relatively unclear concept.

Thus, a descriptive definition of 'CL' is not going to be very useful to educators, as there are too many borderline cases which can be ruled on either way. What is needed are stipulative definitions which include model cases, exclude contrary cases, and rule on borderline cases of 'CL'. Independent of the confusion surrounding the standard usage of the term, authors can offer precising definitions for the purpose of reducing vagueness and ambiguity, thus helping one decide what belongs in a CL program. It seems that authors writing about CL recognize the need for such definitions and thus offer stipulative definitions of 'CL'. The authors do not claim others' definitions to be wrong, and it is proper that they do not, for stipulative definitions cannot be wrong, merely more or less helpful or appropriate. Each of the authors merely seems to believe their own definition works better than others. Some of the authors claim that their definitions are widely accepted. The truth of such claims aside, the popularity of one's definition seems largely irrelevant, for claiming that one's definition has attracted
followers seems merely to be a reliance on the fallacy of appeal to popularity. The fact that others agree with one's definition does not make the definition a good one.

The next point which must be considered is whether a stipulative definition of 'CL' would qualify as an inventive or non-inventive stipulation. Essentially, an inventive stipulation involves coining a new term, a term which not only has no prior denotation, but also brings with it no prior connotations. Even though 'CL' as yet does not have a clearly defined general denotation, the term does evoke certain ideas in people's minds. This is probably due in part, at least, to the use of the term 'literacy' which carries with it certain connotations. The term 'CL' is a metaphor in that an implicit comparison is made between learning something about computers and learning something about reading and writing. Literacy is viewed as essential to survival in our society and the term 'computer literacy' lends this same importance to the learning of computer knowledge/skills. Thus, despite the lack of a clear denotation of 'CL,' CL will be viewed as something which is desirable, important, and necessary for life in the Information Age.\footnote{This point will be discussed more fully in Chapter IV.} Stated more simply, 'CL' does have predefinitional usage and thus, the stipulation of 'CL' definitions is non-inventive.

As already noted, while the authors are willing to tolerate other definitions of 'CL', they do not necessarily view these definitions as equal in value to their own. And, their disagreement does not seem to stem from a belief that the definitions are inaccurate descriptive definitions, nor do they object on the basis that particular stipulative definitions do not succeed in facilitating communication. Complaints about the adequacy of definitions generally center on related curriculum suggestions. Thus, such definitions of 'CL' can be interpreted both as stipulative and programmatic.
All of the definitions of 'CL' encountered in my reading qualify as non-inventive stipulative definitions. One of these definitions, cited by Roy Gabriel, seems to be intended solely as a stipulative definition; the others, however, function also as programmatic definitions. Gabriel begins his article, entitled "Assessing Computer Literacy: A Validated Instrument and Empirical Results," by noting the various definitions of 'CL' which exist. He then cites a definition formulated by the National Center for Education Statistics' "panel of experts." According to this panel, "computer literacy may be defined as whatever a person needs to know and do with computers in order to function competently in our information-based society."1 The purpose of Gabriel's article is to report results of a CL exam used in the Department of Defense Dependents School system. Presumably, Gabriel provides the definition in order to provide the reader with an understanding of what the CL exam was intended to evaluate. Thus, it is a stipulative definition offered for purposes of communication. The definition fails in this respect, however. Because of the generality of the definition, it gives no indication of the type of information and/or skills for which students were tested. Thus, the definition does nothing to reduce vagueness and ambiguity.

A covert definition is offered later in the article when Gabriel lists the basic components of the CL program in the DoDDS system. The four components are "interacting with computers, functions and uses of computers, general problem solving skills and applications and impact in society."2 This covert definition is helpful in


2Ibid., 155.
understanding what was being tested. However, it certainly cannot be derived directly from the original definition. "Whatever one needs to know and do with computers in order to function competently in our information-based society" may not necessarily include these four components or it may involve additional information and/or skills. Thus, this definition seems more of a hindrance to the article than a help. Gabriel's article (and the definitions contained in it) seems merely to be an attempt to describe how CL is being treated in the DoDDS system; he does not seem to be advocating a program. Thus, the definition does not function also as a programmatic definition. However, the other definitions, in addition to stipulating an intended meaning, can also be interpreted as programmatic definitions. Moreover, many of the authors have also offered covert definitions of 'CL' by way of related goals or objectives for a CL course.

Evaluation of 'Computer Literacy' Definitions

Having categorized definitions of 'CL' as to type, the next task is to evaluate the definitions. Since the remaining definitions are stipulative-programmatic, evaluation will require both determining the degree to which each definition does facilitate communication, and considering whether the proposed program really ought to be undertaken. Presumably, one advocates CL programs for schools because it is believed that adults do or will need certain knowledge and/or skills concerning computers. Thus, in promoting a particular sort of CL program, one should begin to justify one's program by offering an underlying definition of 'CL' which essentially describes what it is, in general, that a computer literate person must know or be able to do. One may then interpret the definition for one's readers via goals and/or objectives.
which embody the more specific points of one's general outlook on CL. Obviously, then, if one is to clearly communicate to the reader, there must be consistency between what computer knowledge/skills one believes necessary and one's definition of 'CL'. Furthermore, there must be consistency between the stated goals/objectives and one's definition, as well as between the goals/objectives and the knowledge/skills which have been claimed necessary.

In order to proceed with evaluation of the definitions, some familiarity with the programs advocated is necessary. For the purpose of conciseness, this information will be presented in table form. Two tables follow: one depicting the type of instruction which each definition appears to indicate and one summarizing the actual program proposed by each author. The tables are based on Anderson and Klassen's suggested areas for study in a CL course. These authors' system of categorization has been chosen because their list seems quite complete; while other authors do not necessarily include all of the items on this list, it seems to account for all the areas of study considered important by the various writers being discussed here.

Anderson and Klassen suggest eight broad areas of instruction: applications, hardware, impact, limitations, programming/algorithms, software and information processing, usage, and values. They also suggest objectives for each of these categories. As the list is rather lengthy, only a general overview of the intended learnings in each category will be provided here. Usage involves such matters as learning about the various types of computer applications (e.g. word processing and graphics) and learning about how people in various occupations use these applications. It also involves, among other things, learning how to evaluate the usefulness of an application for a given task and learning how to develop a computer application for one's own personal use. Concerning hardware, Anderson and Klassen suggest
teaching students the various parts of a computer and how they work as well as teaching them a bit about the history of computers. Impact has to do with learning about computer-related careers and the fact that "computers and computer-supported applications have a major impact on the way ordinary citizens live, work and play."\(^1\) Also included in this category is teaching students about computer-related crime and ethical issues related to computer use.

The limitations category is intended to provide students with the understanding that computers cannot think and are only tools built by humans to assist them in tasks. Furthermore, students are to learn that there are some tasks which computers cannot do better than humans. With the programming/algorithms category, students are to learn how to use existing programs as well as how to modify an existing program and how to write their own program. Regarding software and information processing, students are to learn what software is and how it works. Usage involves the ability to start up a computer, run the computer and "enter, compile and debug a simple program written in a 'higher level' language."\(^2\) The values component ranges from students not having computer phobia, to enjoying the computer, to valuing "increased communication and availability of information made possible through computer use provided that it does not violate personal rights to privacy and accuracy of personal data."\(^3\)

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\(^2\) Ibid., 150.

\(^3\) Ibid.
Let us begin the evaluation of the stipulative aspect of these definitions with the definition offered by Jones et al. These authors define 'CL' as

a minimal knowledge and appreciation of the general principles which underlie computer hardware, software and the application of computing technology to various science, business, education, government, and entertainment objectives.¹

Their book is intended as a text for a pre-college or college level CL course. Presumably, the definition is offered in the preface in order to aid the teacher in understanding what knowledge and skills the students should gain by studying this book. The definition reduces ambiguity to the extent that it illustrates the areas which the authors believe must be studied, but the term 'minimal' makes the definition so vague that one has little idea what or how much one who is computer literate is supposed to know or be able to do. Of course, a definition is supposed to be succinct.

and so must be supplemented with an outline of the suggested program. This is where the definition fails, in that it seems to be inconsistent with the rest of the authors' position. The definition seems suited to an emphasis on the uses, limitations, and perhaps, the impact of various hardware and software. However, Jones et al place a heavy emphasis on programming. This hardly seems to constitute minimal knowledge and appreciation of the general principles underlying hardware and software. It is interesting to note that in the first chapter of the text the definition is amended to read "an appreciation of the general principles which underlie computer hardware, software and the application of computing technology to various science, business, education, government, and entertainment objectives" (deleting 'minimal' and 'knowledge').

In speaking to what citizens must know and do with computers, the authors merely make general claims concerning the need for citizens in a democracy to be equipped to make good judgments. They write:

Knowledge of these basic principles can aid not only in our understanding of how computers are used but can also generate an increased awareness of how their use can be abused. When the impact of a technology is as vast as computing, it is incumbent upon a democratic society to be informed of the nature of these systems and their potential for use as well as abuse.

While their definition of 'CL' may not be contradictory to this position, it is not clear that the program suggested by Jones, et al is necessary for a well-informed citizenry. Thus, the definition proves to be more of a hindrance than an aid to communication.

Lombardi has defined 'CL' as the

ability to recognize problems for which the computer may be a useful part of the solution. Computer literate adults will be able to identify

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1 Ibid., 8.

2 Ibid., xi-xii.
appropriate computer resources for a wide range of tasks and they will know how to ask experts for assistance in finding solutions.¹

Lombardi's book is intended for adults (who have at least graduated from high school) who want to learn about computers. Lombardi's definition of 'CL' does not seem terribly vague or ambiguous, until one reads on in the book. Either the definition is entirely inconsistent with the rest of Lombardi's position on CL, or identifying appropriate computer resources is to be interpreted quite differently than what one might think. Lombardi outlines what he believes to be a model case of a CL course. The bulk of the course (10 out of 16 recommended hours of instruction) focuses on various computer applications (e.g., word processing and spreadsheets). This is troubling, for according to the definition, it would seem to be possible to be computer literate and not know how to actually operate the computer. Given Lombardi's definition, possession of some propositional knowledge concerning the applicability of various computer applications to different sorts of tasks and knowledge of who to ask to perform the appropriate computer maneuvers would seem to constitute CL.

In introducing his book to the reader, Lombardi writes:

This book provides enough information about microcomputers for adults to understand general articles about the machines and their impact, to feel confident enough to turn one of them on and off, to begin learning how to do word processing tasks, to understand how to prepare a financial or mathematical table, and to have a general understanding of what computer programming is and how it is accomplished.²

It is not clear whether Lombardi believes these to be the knowledge and skills needed for CL in the Information Age or whether he is merely explaining what learning the book is intended to promote. If the former is the case, the Lombardi's position

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²Ibid., 1-2.
regarding the necessary knowledge/skills and his definition of 'CL' are inconsistent. If
the latter is the case there is no explanation given as to why his book has been written to
promote learnings different from those required of the computer literate. It would be
possible to say that Lombardi's book is written for those who wish to go beyond CL,
but this does not seem a sensible explanation given that the title of the book is
Computer Literacy. Nevertheless, Lombardi's definition seems to be inconsistent
with the rest of his position and so, like the definition of Jones et al, does not serve to
facilitate understanding. It is interesting to note that in the glossary of Lombardi's book
[computer] literacy is defined as "the ability to read computer manuals, understand
computer operations, and make computers work for you." It is puzzling that the
definition given in the glossary is different from that in the text.

Hunter's definition, unlike that of Jones and Lombardi, seems more consistent
with the CL objectives which she proposes. Hunter claims that CL for grades K-8 is
currently defined as

the ability to use suitably programmed computers in appropriate ways to
assist in accomplishing tasks and solving problems; and ability to make
informed judgments about social and ethical issues involving computer
and communications systems.2

The definition is not terribly vague or ambiguous; although one might question what
counts as appropriate, the context would imply that Hunter is suggesting that students
learn which computer functions work in solving particular sorts of problems, e.g.,
learning that a spreadsheet is the appropriate computer use if one wishes to keep some
sort of financial log. There is some ambiguity in the latter part of the definition as one

1 Ibid., 102.

2 Beverly Hunter, "Computer Literacy in Grades K-8," Journal of Educational
might wonder whether Hunter expects students merely to learn how to make such judgments or whether she expects them to actually make informed judgments. For the most part, the objectives suggested by Hunter do seem drawn from the definition and thus, in its stipulative function, the definition is largely successful. I do, however, question the necessity of two of the objectives. Objective #1 states that we must "help students and teachers to value computers as general-purpose machines designed, built and operated by humans to assist in many tasks."¹ Perhaps Hunter assumes that one could not make informed judgments about social and ethical issues concerning technology without valuing computers, but this point could be debated. Since I am not clear as to what is to count as valuing computers, I am not convinced that it would be necessary for making sound judgments. If Hunter is referring to a personal valuing, valuing computers would seem unnecessary to the making of sound judgments. One might not value using computers at the personal level but might recognize their contribution to society and thus, might make judgments on the social level which do not coincide with one's personal feelings. If valuing computers has to do with a more objective judgment about the worth of computers, it would certainly be true that one could not make judgments without having some view on the worth of computers, but it is a mistake to assume that the best judgments could only come from those who believe that computers have positive value. One who is skeptical of the computer's contribution to society might make valuable contributions as well. Objective #9 concerns helping "students and teachers become aware of computer-related skills and experience that are important in a variety of careers."² Again, in my view, such

¹Ibid.
²Ibid.
learning does not seem necessary to the ability to use computers and to make informed judgments about computer-related issues. Nevertheless, Hunter's definition is successful, for the most part, in clarifying her interpretation of 'CL' so as to facilitate understanding of her position. Hunter does not discuss what knowledge and/or skills she believes are necessary for adults so no comment can be made regarding the consistency between such beliefs and her definition of 'CL'.

According to Radin and Greenberg, CL involves four components:

1. defining the term computer, its basic parts, their interrelationship, and the means by which computers communicate with human beings;
2. the history of the computer with an understanding of the pressures that motivated its evolution and multidimensional applications for resolving continually developing technological problems;
3. cognizance of the positive and negative impact of computers on society;
4. controlling the computer with quality programming that achieves a desired objective proficiently and accurately.

This definition is quite straightforward. Again, one can question how much or to what degree students are to learn these things, but such specifics do not belong in a definition. Since the definition consists of areas of study, there is obviously no inconsistency between the definition and the suggested program. Yet, this definition does not serve to clarify the authors' position because they do nothing further with it. The book is written for administrators and focuses on how to set up a computer system in the school. Relatively little space is devoted to explaining why school systems ought to make use of computers. They claim that CL is necessary for gaining employment but make no claims regarding which computer skills they believe that citizens must have. Regarding the use of computers in school, they write:

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1For the rest of Hunter's objectives, see Chapter I of this dissertation.

At best, computers can do a fair job of lecturing, can tirelessly provide students with a series of questions to test mastery of a body of content, can evaluate the accuracy and inaccuracy of responses and assign new material based upon those responses, and though limited, if selectively and judiciously used, can be a positive adjunct to the instructional process in specific situations.¹

If students are going to use the machines primarily for drill and practice and tutorial study (as the book suggests), why must they learn about the parts of the computer, the history and the impact of the computer, and why must they learn how to program? Radin and Greenberg’s definition of ‘CL’ is at odds with what they expect the students to do with the computer. And, while it cannot be said that their definition is inconsistent with their views concerning the CL needs of citizens (because their views are unknown), it also cannot be said that there is consistency here. It seems as if Radin and Greenberg believed that if they were going to write about CL, they were obligated to provide a definition of the concept. Indeed, they should have felt so obligated. However, their definition does not serve as an aid in communication since it seems rather arbitrary, if not immaterial, to the rest of the book.

As discussed in Chapter I, Noonan’s definition of ‘CL’ appears in the form of a list of knowledge which he claims the computer literate person must possess. While the list illustrates areas for study and thus, reduces ambiguity to some extent, it is not indicated whether one is simply to know something about these things or whether they are also to develop some skills. As noted in Chapter I, Noonan does discuss three levels of CL: functional CL, average CL, and complete CL.² Noonan’s notion of CL levels is interesting, even helpful. However, the definitions of these levels of CL are inconsistent with the previous definition. The complete computer literate (who has

¹Ibid., 140.

²Ibid.
advanced programming skills and designs hardware) clearly possesses knowledge beyond that indicated in Noonan's original definition. Moreover, the functional computer literate (who can run a computer, do simple programming tasks, and has some understanding of hardware and the history and future of computers), possesses few of the items on the list. The list is a compilation of items from Noonan's research on CL. If he were to state that these are the things most authors expect of a computer literate, but that his three levels constitute a more accurate way of characterizing CL, there would be no problem with inconsistency. As it is, however, Noonan writes, "I formulated some consensus as to what computer literacy is. It is possible to state that a computer literate person must have knowledge of the following . . ."1 Offering such a definition, then delineating three levels of knowledge, all of which use the term 'CL', but do not all make use of all the knowledge stated in the definition, serves only to confuse matters. Offering the original definition and then referring to the three levels as pre-CL, CL and extra-CL, would also allow for consistency. Taken as is, however, Noonan's definition fails in its stipulative function. Moreover, it is not clear why Noonan has bothered offering a definition. His intent in writing the article seems to be to explain to school administrators how they can make use of the computer. Noonan makes no connection between his section on the definition of 'CL' and the sections which follow. Thus, the definition(s) serve to confuse rather than illuminate.

Brownell claims that "computer literacy for students consists of two components: knowledge (information) and performance (skills)."2 Regarding knowledge,

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1Ibid. (Italics mine.)

students must be:

1. familiar with the components of a computer system (hardware and software) and how they work and interact.

2. informed about the history of computing.

3. aware of the current and projected uses of computers in society and the possible implications of those uses.

4. knowledgeable about job opportunities associated with computers.¹

Concerning performance,

Students must be able to:

1. use the computer for instructional purposes by using computer-assisted instruction software of both the tool and tutor type, both with teacher direction, and, when presented with appropriate documentation, alone.

2. write simple programs in two computer languages.

3. engage in problem solving by breaking a complex problem into modules, generating a solution for each module, and combining the solutions to solve the problem.²

While we might still be unclear as to the degree of knowledge/skill to be gained, this stipulation of 'CL' does help reduce vagueness and ambiguity concerning the concept. Since the definition includes the knowledge and skills which Brownell believes must be learned, there can be no inconsistency between the definition and the proposed objectives. Brownell's book is intended as a text for a CL course. However, some of the topics covered seem to be outside the realm of CL as defined by Brownell. For example, Chapter Four is titled "Computer Resources: Trends and Issues" and discusses the cost of computer education and types of computer labs. Chapter Five

¹Ibid., 186.

²Ibid.
concerns computer-managed instruction and speaks to such issues as uses for teachers and administrators. I fail to see how such topics are relevant to the objectives suggested in Brownell's definition of 'CL'. Furthermore, it must be noted that Brownell's definition seems to be inconsistent with his view concerning the CL skills needed by adults. In discussing CL for adults, Brownell defines the term differently:

In general, one may say that computer literacy is a state in which an individual has an understanding of what a computer is and how it works, and is comfortable and effective in making a computer accomplish a necessary task.¹

It seems likely that one could be computer literate under this definition without knowing the history of computers, the impact of computers, job opportunities concerning computers and without being able to program in two languages. It must be asked why so much more is expected of students. Perhaps it has to do with Brownell's claim that "in reality, . . . a good definition of computer literacy will be specific to the situation in which the computer-literate individual must function."² Brownell might feel an obligation to prepare students who may end up needing a high level of knowledge and skill regarding computers. Yet, he does not argue for the inclusion of the specific knowledge and skills mentioned in the definition of 'CL' for students. Thus, there is still a possibility of discordance between the two views. In my judgment, these definitions fail in their stipulative function.

Brownell has raised an important consideration--the notion of functional CL. Anderson and Klassen's definition reflects this concern. They write,

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¹Ibid., 182.

²Ibid.
computer literacy, in our definition, is whatever understanding, skills, and attitudes one needs in order to function effectively within a given social role that directly or indirectly involves computers.¹

Attitudes clearly has to do with the values component of their suggested areas of study. Beyond that, it is impossible to determine via this definition in what areas one is to gain knowledge and skills. Of course, some vagueness and ambiguity seems necessary in functional definitions of 'literacy' since the point is to leave open the specific knowledge/skills and level of expertise which might be required for any individual.

The notion of functional literacy ought to be taken seriously, for it is undoubtedly the case that not all people's lives necessitate the same computer skills and information. But the notion of functional CL raises an important question. If knowledge and skills at level 1 are sufficient for Person X but not Person Y, how can schools develop CL curricula? If it could be determined that all people need skills X, Y, and Z, a course could be developed which is aimed at teaching these skills. However, such a course will not serve to make literate those individuals whose lives require more extensive knowledge and skills. Teaching all the knowledge and skills which anyone could ever need (if, indeed, it would be possible to determine what these would be) would go beyond literacy for most people; thus, it would seem inappropriate to term such a course "computer literacy." Moreover, it is unlikely that most people would have the desire and/or aptitude to learn such material. Of course, these comments apply also to the teaching of reading and writing (literacy). Not everyone needs the same degree of knowledge and skill. But there is a difference between CL and literacy. There are very basic skills of reading and writing (e.g., decoding words) which, if learned, allow one to read or write nearly anything. Everyone in our society needs these basic skills. They are taught in early grades and subsequent instruction aims at polishing these

¹Anderson and Klassen, 131.
skills, developing appropriate writing style and a larger vocabulary. But one is considered literate if they have mastered the basic skills (since this will enable one to read and write in most situations). If CL involves the learning of a couple of basic skills, then CL programs can be treated similarly. But it seems likely that different people will need to learn different sorts of skills, based on the uses of the computer required in their future lives. For example, I use my personal computer for word processing and I can be considered computer literate, as I possess the necessary degree of knowledge and skill. However, I do not know how to use any statistical or spreadsheet programs on my computer. I have not learned the necessary knowledge and skill for using my computer in that way. It seems that becoming literate in those areas would require learning somewhat different knowledge and skills.

Thus, I find curious the list of areas of study and related objectives proposed by Anderson and Klassen. Surely they do not believe that all citizens must be able to program a computer, for example. So, why these particular objectives? Like Brownell, they seem to demand more of students than the general public. As they explain,

our approach to computer literacy is not compatible with the approach of those who choose to define the term narrowly. Some writers argue in favor of equating computer programming instruction with computer literacy. Others view computer literacy as just general knowledge about the role of computers in society. We believe that to function effectively as a citizen of the 1980's one needs to know about the role of computers in society, and to function effectively as a student (at high school and above) one needs to know the elementary concepts and techniques of computer programming.¹

If it is true that students must know programming in order to function effectively, it must be asked why, given that it does not seem to be necessary for all people outside of

¹Ibid., 132.
Because of these questions, Anderson and Klassen's definition does not seem to help the reader understand their position. Therefore, it fails as a stipulative definition.

Watt also offers a definition of functional CL:

I think of computer literacy as a cultural phenomenon which includes the full range of skills, knowledge, understandings, values and relationships necessary to function effectively and comfortably as a citizen of a computer-based society.

As noted in Chapter II, Watt delineates four related categories of CL:

1. The Ability to Control and Program a Computer to Achieve a Variety of Personal, Academic, and Professional Goals.

2. The Ability to Use a Variety of Pre-Programmed Computer Applications in Personal, Academic, and Professional Contexts.


4. The Ability to Understand the Growing Economic, Social, and Psychological Impact of Computers on Individuals and Groups Within Our Society and on Society as a Whole.

Again, Watt's is defining functional CL and, as such, is necessarily vague and ambiguous. If being computer literate truly means acquiring whatever knowledge, skills, values, etc. necessary for one's functioning in society, it is curious that Watt suggests four necessary categories of learning. Watt may or may not regard (2), (3), and (4) as necessary for all citizens in the Information Age, but it seems unlikely that he

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2Ibid., 57-58.
believes all citizens' lives to require programming skills. Again, the functional
definition seems to be in conflict with the outlined CL program.

Hentrel and Harper cite Watt's definition of 'CL' and present four slightly
different components. According to these authors,

the tangible assets that such an individual should possess include the
ability to:

1. program, debug, and modify a computer
2. select and use software applications
3. be sensitive to the impact of computers and refrain from involvement
   with computer abuse
4. apply concepts learned in the computer world to other tasks.¹

Once again, a definition is offered which states that CL is situation- or person-
specific. Then, in expanding the definition it is indicated that in order to be computer
literate one must possess certain knowledge and skills. Given this inconsistency, the
definition is not helpful. But Hentrel and Harper take a further step in confusing the
reader. Their book, like that of Radin and Greenberg, is intended to aid in the
implementation of a computer system and course of study in the school. At the end of
the short section on CL, there appears a page which is blank except for these words at
the top: "My definition of computer literacy is . . . ." Given that Hentrel and Harper
have taken the effort to offer what they believe is the most suitable definition of 'CL', it
seems odd that they would expect the reader to reject the definition in favor of their
own. True, each school may require slightly different emphases in their CL programs.
But if Hentrel and Harper believe that the four areas outlined are important, why would

they not want the implementers of CL programs to merely vary their programs within these four areas rather than completely change the definition of 'CL'?

The next step of evaluation requires determining whether the proposed programs should actually be undertaken. Such decisions would require a more detailed analysis than can be provided in this dissertation. Empirical research needs to be done regarding the computer skills needed by citizens of the Information Age, both in and out of the workplace. Value questions such as, "Should the schools be involved in preparing students for work?" "To what extent should the schools be involved in teaching life skills?" should also be given careful consideration. Some of these questions will be discussed briefly in Chapter IV of this dissertation but a more in-depth investigation is necessary. A useful and interesting preliminary step to such analysis is the investigation of the authors' justifications of proposed CL programs. Let us proceed by looking at the justifications offered.

It is commonly the case that authors advocate CL programs without justifying them. For example, Noonan advocates average CL but does not explain why most people should be able to operate a computer, make alterations to programs, and so forth. In explaining why not all people need to attain the level of complete CL, Noonan offers what appears to be a false analogy:

The ability to be a completely computer literate person is a talent and cannot be attained by the majority of the population. Like Art, Music, Sports, etc. people should be encouraged to become as proficient as possible in the understanding and use of the computer.¹

Whatever average sports literacy would entail, it seems doubtful that all or most people need such a level of literacy. If Noonan wished to argue by way of analogy, likening

¹Noonan, 6.
CL to numeracy or science literacy would have likely been more fruitful. Nevertheless, Noonan does not justify the need for average CL.

Lombardi does an equally poor job of defending his position. In Chapter I it was noted that Lombardi resorts to scaring the reader into wanting to become computer literate, claiming that one must either become computer literate or be at the mercy of computer literate individuals who will make decisions for them. Presumably, Lombardi's proposed CL program is what will enable one to be literate enough to avoid being controlled but he does not clearly state this, nor does he explain why the particular components of his program are necessary.

As mentioned, Radin and Greenberg's book is intended for administrators who wish to use computers in their schools. The authors make only weak attempts at justifying the use of computers in schools,¹ and make virtually no attempt to support the four suggested components of CL. Regarding the fourth component ("control"), they write: "There are two kinds of people who are involved with computers—those who control them and those who are controlled by them."² The controllers are those who can program and the controlled are the mere users. This claim is another false dilemma and is ridiculous for two reasons. First, computers are incapable of exerting control since they are inanimate objects. Second, it is certainly the case that those who can program have a degree of control much greater than those who cannot.

Frequently, authors expend some effort arguing the necessity of CL in general, neglecting to justify the particulars of their own program. For example, Watt writes

¹I find this to be a fault of rather large proportion. Perhaps the authors were interested only in writing a guide for an audience who has already decided to use computers. If this is the case, however, no justification of the use of computers in schools is necessary; thus these portions of the book are irrelevant.

²Radin and Greenberg, 159.
several pages about the necessity of CL in the Information Age, however, he does not attempt to justify the four components of CL which he advocates. Similarly, Hentrel and Harper find it important to justify the use of computers in schools, but do not provide any justification for the suggested components of CL.

Brownell discusses the need for CL and should be given credit for attempting to deal with some common objections to his position. However, when it comes to justifying his particular view of CL he merely claims that CL as he defines it will "provide students with information and skills that will be of value when coming into contact with tomorrow's world as well as the world of today." He does not explain what it is about the world which requires knowledge of the history of computers or why it is that people must be able to program a computer in two languages.

Anderson and Klassen are to be commended for presenting a somewhat detailed account of their proposed CL program. However, they do little to convince the reader of the desirability of this program. Their justification consists of the following claims:

Students need to know how to use the computer as a tool in their school work, and they need to know about the limitations, general capabilities, and social implications of computers for coping with computerization in their everyday lives.

And,

We believe that to function effectively as a citizen in the 1980's one needs to know about the role of computers in society, and to function effectively as a student (at high school and above) one needs to know the elementary concepts and techniques of computer programming.

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1 Brownell, 186.

2 Anderson and Klassen, 132.

3 Ibid.
Of course, it first must be wondered whether these claims are true—I seriously doubt, for example, that one cannot function as a high school (or even college) student without being able to program a computer. But, even if these claims are true, they might not justify all of the CL objectives suggested by the authors. For example, does CL necessarily include one's describing "past experiences with computers with positive-affect words like fun, exciting, challenging, etc."?¹

Hunter makes only a few general claims about the necessity of CL and then presents her approach to CL. In addition to the nine general goals, which have been discussed in this chapter, she also lists five topic areas or "strands":

1. Using computer programs
2. Procedures
3. Applications and systems
4. Impact
5. Writing computer programs

The strands are composed of specific objectives which are presumably too numerous to list in the article, for Hunter provides only one or two samples under each strand. Hunter does make some attempt to justify the strands, although for the most part she makes very general claims with insufficient explanation. For example, in support of the usage strand, she merely claims that people learn better through concrete learning experiences. With regard to the procedures strand, Hunter says "being able to plan out a set of steps for accomplishing a task is central to computer literacy as well as to all of education."² Applications and systems should be taught because "given the basic

¹Ibid., 150.

²Hunter, 64.
concepts of computer applications, the student can then more easily learn about any particular application she/he needs to learn about.”1 In discussing the impact strand, Hunter describes what it is intended to teach but does not explain why such things ought to be taught. Hunter designates the programming strand as optional and explains that

there are strong arguments for and against the teaching of programming to all elementary level (K-8) students. The arguments depend partly on one's definition of programming, the kind of programming languages available, the background and abilities of the teachers, the emphasis one places on proper program structures and techniques, and one's guesses about the need in the future for everyone to be able to write computer programs in general-purpose programming languages.2

Hunter suggests that the following be taken into consideration:

1. availability of adequate computer equipment;
2. availability of suitable programming languages for children;
3. preparation of teacher to teach programming; and
4. amount of classroom time available to learn programming.3

The availability of equipment and so forth is certainly important, however, I would regard as most important considerations such as educational benefit of or need for programming skills. Unfortunately, Hunter does not discuss these issues. It must also be noted that Hunter does not explain how the strands complement or are derived from the general goals. Furthermore, she does not provide justification for these goals. Thus, in spite of the reasons provided for the strands, if the strands do not complement

1Ibid.
2Ibid., 65.
3Ibid.
the goals or if the goals cannot be justified, the teaching of the strands would not be warranted.

Since the work of Jones, et al cited here is a text, one would not expect a great deal of justification concerning the program outlined in the book. However, a few of the chapters begin with a statement concerning the necessity or desirability of the topic. For example, the authors chose to explain why they included the chapter on Programming as a Team Activity. Some of the reasons concern educational benefit (e.g. it will allow students to get more involved with their portion of the project; students will learn more from their teammates), whereas some border on the irrelevant (e.g. it will promote team spirit; team programming is fun). While these might justify team activity, no justification has been provided for programming in the first place. The authors claim that the chapter on computer systems is important because learning about various systems will help students use their personal computers to their "fullest potential." They do not explain why being able to so use one's computer is essential to CL. And, with regard to the chapter on social issues, they write: "In a democratic society we all have the obligation to be well-informed on the issues of concern which may in some way threaten our basic rights."¹

Summary

Although CL is a much discussed topic, the term does not have an agreed upon definition. Attempts to offer a descriptive definition of 'CL' would likely result in vague and ambiguous statements such as, "Being computer literate is knowing something about computers." Educators, recognizing the need for a more precise

¹Jones et al, 218.
rendering of 'CL', offer stipulative definitions in order to reduce vagueness and ambiguity and to help individuals understand their positions regarding CL. While the intent behind these definitions is noble, wading through the plethora of stipulative definitions of 'CL' makes the reader's head swim. The fact that the definitions also function to advocate particular sorts of programs adds to the confusion.

What has been attempted in this chapter is a categorization and evaluation of some definitions of 'CL'. In evaluating the stipulative aspect of the definitions, it was judged whether each definition succeeded in reducing vagueness and ambiguity and in making clear the author's viewpoint on CL. The boundary drawing feature of stipulative definitions serves to make most any stipulative definition more precise, thereby reducing to some degree vagueness and ambiguity. Thus, most of the definitions discussed here are an improvement over a descriptive definition such as, "Being computer literate is knowing something about computers." But the definitions did not go far enough in reducing vagueness and ambiguity, leaving many questions about CL unanswered. In addition, virtually all of the definitions were found to be somewhat inconsistent with the rest of the author's position. This doesn't make the definitions wrong; it merely weakens the power of the definitions in terms of clarifying the authors' stand on CL. A stipulative definition cannot be a good one if it fails in its purpose of clarification.

It was noted that evaluation of the programmatic aspect of the definitions requires an analysis greater in scope than can be provided in this dissertation. It was shown that the protagonists of the CL programs discussed in this chapter offer little justification for their programs. Some areas of inquiry were suggested, such as investigation of the computer needs of citizens in the Information Age and consideration of the proper role of the schools. Some of these issues will be touched on in Chapter IV of this
dissertation but additional research is needed. The topic of CL would benefit from attention by philosophers, curriculum specialists, and those researching economic and technological trends.
CHAPTER IV

'COMPUTER LITERACY' AS A METAPHOR

Introduction

In this chapter 'CL' will be evaluated as a metaphor. In using the term 'computer literacy' the learning of knowledge/skill with respect to computers is implicitly compared with the learning of knowledge/skill with regard to reading and writing (the ordinary sense of 'literacy'). It will be claimed that 'CL' is an inappropriate metaphor, which allows for the belief in unwarranted assumptions regarding CL. The content of this chapter will be based primarily on the work of Israel Scheffler, Max Black, Thomas F. Green and Ronald Munson.

Metaphor is the use of implicit comparison in order to provide a fresh perspective on the subject being discussed. As Israel Scheffler explains,

metaphors are not normally intended to express the meanings of terms used, either in standard or in stipulated ways. Rather, they point to what are conceived to be significant parallels, analogies, similarities within the subject matter of the discourse itself. Metaphorical statements often express significant and surprising truths, unlike stipulations which express no truths at all, and unlike descriptive definitions, which normally fail to surprise.¹

¹Scheffler, 47.
As Thomas Green states it, using metaphor "is a way of establishing 'thought-full' relations between things."¹ The degree of reflective thinking desired can, of course, vary. But metaphor can be used to promote rigorous thinking about concepts. In fact, it is often useful to frame a new metaphor in order to determine the boundaries of a concept. Such metaphors Green terms "constructive metaphors."

Metaphor can be dangerous in that it is easy to overlook its non-standardness and interpret the statement literally. Whereas simile offers a more explicit comparison ("X is like Y"), metaphor is an implicit analogy ("X is Y"), and thus has even more potential for being taken literally. Such misinterpretation results not in clarification, but in confusion. Furthermore, one must be careful as to the purpose for which metaphor is employed. While metaphor can be quite useful in explaining or illustrating a concept, it is dangerous if used for the purpose of persuasion; recognizing that X and Y are similar in terms of a, b, and c is not evidence that they are similar in other respects as well. Using metaphor aids in organizing thoughts, and, as Green remarks, we would be able to do little important thinking without it. However, he warns that "if it is true that we cannot think without the use of metaphor, then it is also true that we cannot think well unless we think about the metaphors we use."²

Black suggests that in discussing a metaphor, the concept which the metaphor is supposed to illustrate or explain be termed the primary subject matter (hereafter PSM) and that the concept with which the PSM is being compared be referred to as the secondary subject matter (hereafter SSM).³ In the case of the CL metaphor, the PSM


²Ibid., 63.

³The secondary subject matter is also often referred to as the analogue. See Ronald Munson, The Way of Words (Boston: The Houghton Mifflin Co., 1976).
is some sort of knowledge/skills regarding computers while the SSM is knowledge/skill regarding reading and writing, or in other words, what we might call literacy.

Two articles on CL claim that CL is analogous to literacy. M.E. Lockheed, A. Nielsen, and M.K. Stone write:

"Although no consensus has been reached about the definitions of computer literacy, it may be considered analogous to language literacy. Thus levels of computer literacy may be seen as falling along a continuum ranging from knowledge of concepts and definitions (conversational level), to the ability to write simple or "cookbook" programs or adapt and run "canned" programs (reading level), to the ability to create new programs for solving diverse problems (fluency level)."

Larry Noonan also characterizes CL as analogous to "English" literacy based on the notion of degrees of skill. It has been noted that he sees CL consisting of "functional literacy," "average literacy," and "complete" or "expert literacy." Clearly, these authors realize that there is a comparison which can be made between 'literacy' and 'CL', but these authors offer no further explanation or analysis of the analogy; therefore it is not clear whether they realize the extent to which our thinking about CL is influenced by the metaphor. Nevertheless, such articles seem to be the exception rather than the rule.

Generally, no such explicit analogies are drawn, nor is mention made of a metaphorical relationship between 'CL' and 'literacy'.

Since there is no evidence that most authors cited as writing about CL interpret the concept metaphorically, it can be wondered whether it is fitting to treat it as a metaphor. Colin Turbayne claims that there are two conditions which must be met in order for

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1M.E. Lockheed, A. Nielsen, and M.K. Stone, "Determinants of MicroComputer Literacy," *Journal of Educational Computing Research*, 1 (1985): 82. There are other metaphors used in talking about computers, for example, there has recently been a great deal of concern about computer "viruses" and how one can "immunize" one's computer against such maladies.
metaphor to occur. First, there must be a "sort-crossing," that is, "the use of a sign in a
sense different from the usual."\(^1\) Sort-crossing is what Turbayne terms the logical
condition for metaphor. But there is also a psychological condition which must be met.
Turbayne claims that one must "make-believe" that the two sorts are as one. As
Turbayne explains, metaphor "involves the pretense that something is the case when it
is not."\(^2\) Turbayne notes that the hearer can interpret an utterance as metaphor even if it
was not so intended by the speaker (or vice versa), as the hearer (or speaker) can
engage in make-believe whether or not the speaker (or hearer) does.

It seems important to note that if we demand that both the logical and the
psychological conditions must be met by both the speaker/writer and the hearer/reader,
it would often be impossible to determine whether an utterance is or is not a metaphor.
A given utterance which *appears* to be metaphorical could be simply a category mistake
by the speaker even though it is viewed as a metaphor by the hearer. Conversely, an
utterance may be intended as a metaphor by the speaker but may be happily and
unwittingly accepted by the hearer as an expression embodying a category mistake.
This is mentioned here because I want to make clear that I am "receiving" this CL
literature as metaphorical but do not intend to claim that every one of the authors
intended the CL claims as metaphorical. "Sort crossing" can be a productive aid to
thinking, but it can also be dangerous or misleading, and the dangers occur even if the
"sort crossing" is unintentional. Here then we will treat language that *appears* to be
possibly metaphorical as metaphorical, even though it may be that the psychological
condition is not in fact met by some of the authors.

\(^1\) Colin Murray Turbayne, *The Myth of Metaphor* (Columbia, S.C.: University of

\(^2\) Ibid., 13.
Turbayne's sort-crossing is similar to Black's "system of associated commonplaces" (hereafter referred to as the SAC). In expanding the CL metaphor, the SAC of the PSM (some sort of knowledge and skill concerning computers) as well as the SAC of the SSM (literacy) will be made explicit; in this way it will be shown that 'CL' involves a sort-crossing. Once the substance of the metaphor has been made explicit it will then be possible to evaluate it. Here I will draw upon the work of Munson and Scheffler, focusing on the points at which the metaphor breaks down.

Black on Metaphor

According to Black, the successful use of a metaphor rests in large part on the SAC. The SAC is a set of beliefs regarding X which are held by most people in a particular culture. In order to understand a metaphor the hearer need not possess precise definitions of the primary and secondary subjects, but must merely hold some common beliefs about them. For example, in using the metaphor, "man is a wolf," the speaker wants to call our attention to certain beliefs about man that are similar to our beliefs about wolves. In order for the metaphor to be successful, the hearer need not necessarily possess a sophisticated definition of 'wolf'; holding a common set of beliefs will suffice. Note that the SAC is characterized in terms of beliefs rather than knowledge. The SAC may contain knowledge but it can also be comprised in part of false beliefs. Black explains that

From the expert's standpoint the system of commonplaces may include half truths or downright mistakes (as when a whale is classified as a fish); but the important thing for the metaphor's effectiveness is not that the commonplaces shall be true, but that they should be readily and freely worked.¹

In order for there to be the possibility of metaphor, of course, the SACs of the PSM and SSM must at some point cease to be similar. If one's SAC of 'wolf' was identical to one's SAC of 'man', then 'man' and 'wolf' would not merely be viewed as analogous; they would be perceived as being one and the same. As Munson notes,

"every analogy is potentially misleading, for the analogue must be different in some ways from the primary subject matter even for there to be an analogy. If they are not different, then the primary and secondary subject matter simply collapse into one subject matter."

Thus, in using and understanding metaphor, we use similarities between the SACs of the PSM and SSM as aids toward illuminating certain aspects of the concepts, while ignoring the dissimilarities which would act as impediments. As Black explains, when the "wolf-metaphor" is used

A suitable hearer will be led by the wolf-system of implications to construct a corresponding system of implications about the principal subject. But these implications will not be those comprised in the commonplaces normally implied by the literal uses of 'man.' The new implications must be determined by the pattern of implications associated with literal uses of the word 'wolf.' Any human traits that can without undue strain be talked about in "wolf-language" will be rendered prominent, and any that cannot will be pushed into the background. The wolf-metaphor suppresses some details, emphasizes others—\textit{in short, organizes} our view of man.

Black speaks metaphorically in describing this organization. He claims that the SAC of the SSM functions like a lens. That is, in using the wolf metaphor, 'man' is viewed through the "wolf lens." Black also speaks of the SSM acting as a filter. Both metaphorical depictions illustrate the selection feature of the SSM's SAC.

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\(^{1}\)Munson, 323.

\(^{2}\)Black, 41.
One's SAC of 'man,' when using the term literally, might be:

* animal biped
* opposable thumb
* (most?) intelligent life form
  -- uses language and symbols
* social animal
* divides time into work/leisure

However, these beliefs are not necessarily those called to mind when the wolf metaphor is used. One's SAC of 'wolf' is likely to be something like the following:

* has fangs
* has fur
* walks on four legs
* animal
* carnivorous
  --eats lambs
* dangerous
* runs in packs

Certain elements of the 'man' SAC do not fit through the filter of the 'wolf' SAC. Since they are unlikely to be deemed important anyway, these elements would probably be ignored. For example, it does not seem destructive to the metaphor to ignore "biped," "opposable thumb," and "uses language and symbols," which are part of the
"man SAC." Similarly, when man is viewed through the "wolf lens," certain elements of the wolf SAC will need to be ignored in order to avoid oddities. For example, the elements pertaining to the physical description of wolves ("has fangs," "has fur," "walks on four legs") will need to be overlooked. Given the remaining beliefs, 'man' as viewed through the 'wolf' lens is perceived in the following manner:

* animal
* dangerous/vicious ---> eats "lambs" (i.e. more passive/weaker humans)?
* social ---> runs in packs

But Black claims that the influence of the SAC is not uni-directional. Rather, in using metaphor the SSM or "focal word," takes on a new meaning which is not quite its meaning in literal uses, nor quite the meaning which any literal substitution would have. The new context (the "frame" of the metaphor, in my terminology) imposes an extension of meaning upon the focal word. Black calls such a view of metaphor the "interactive" view.

Thus, not only does the wolf metaphor cause the hearer to view 'man' via a different set of implications than he normally uses, so is he led to view 'wolf' differently. Perhaps the 'wolf' SAC would be amended to include more teleological traits:

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1 Of course, we will want to retain the figurative notion of having fangs, for having fangs represents viciousness, an important part of the metaphor.

2 Black, 39.
* animal  
* carnivorous  
* dangerous/vicious  
* intelligent  
* social --> runs in packs

Thus, the use of the metaphor, as Black notes, makes wolves appear more human than they otherwise would.

'Computer Literacy' as Sort-Crossing

In order to determine whether sort-crossing occurs with 'CL', the SACs of 'literacy' and 'CL' must be constructed. It will be fruitful to take some liberties with Black's view here. Since it is the users of the term 'CL' with whom we will be concerned when judging whether the make-believe condition is met, it seems that it would be more productive to construct the SAC of the term's users, rather than of the layperson as Black's view would suggest. The users with whom we are concerned here are educators who talk and write about CL.

Let us construct the SAC of 'literacy', based upon the discussion of the concept found in Chapter II. 'Literacy' is most commonly viewed as:

1. (at least) the ability to read and write comprehendingly (whatever else it might include)

2. something all people of modern industrial and post-industrial societies need if they are to function (if not succeed) in society, since:
a. it allows one to get along in one's environment (e.g. reading signs, etc.)

b. being illiterate limits one's ability to compete and be happy/fulfilled in the workplace

c. being illiterate inhibits one's intellectual growth

3. socially and politically beneficial, since:

a. illiteracy contributes to inequities which aggravate social conflict

b. literacy allows for societies to be more democratic as a literate citizenry is more able to intelligently participate

c. literacy, if viewed as "critical literacy," is potentially socially and politically empowering

4. something which allows nations to become more economically productive, since:

a. illiteracy contributes to loss of productivity

b. illiteracy contributes to high turnover in the workplace

c. illiteracy contributes to financial loss due to accidents

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1 Hunter and Harmon.


3 Nickerson.


5 Aronowitz; Freire; Giroux.

6 Kozol, "How We Can Win: A Plan to Reach and Teach Twenty-Five Million Illiterate Adults."

7 O'Donnell.

8 Kozol, "How We Can Win: A Plan to Reach and Teach Twenty-Five Million Illiterate Adults."
d. illiteracy contributes to an outlay of funds by taxpayers for welfare and other social programs ¹

5. something which must be taught since it is unlikely that people will become literate on their own.²

6. personally rewarding, since:
   a. it is a means for self-development and is a basic human right ³
   b. being illiterate is persistently humiliating ⁴
   c. being illiterate inhibits one's intellectual growth ⁵

In order to determine whether a sort-crossing occurs in using the term 'CL', it is necessary to also construct the SAC of 'CL'. Based on the beliefs surrounding 'CL' and the various definitions of the term which were presented in Chapters I and III, it can be said that 'CL' is most commonly viewed as:

1. (at least) an awareness and rudimentary understanding of computers and the ability to run a program on a computer (whatever else might be included)

2. what all people of modern industrial and post-industrial societies need if they are to function (if not succeed) in society, since:
   a. it will be necessary in conducting one's personal affairs (e.g.

¹Ibid.; Nickerson.

²This is evidenced by the multitude of articles published regarding literacy programs. The necessity of these programs seems to be taken for granted.

³Irwin Isenberg, ed., The Drive Against Illiteracy (N.Y.: The H.W. Wilson Co., 1964), 22. Also, the "Right to Read" program seems to operate under this belief.


⁵Nickerson.
b. it will be necessary in order to compete for jobs

3. socially beneficial, since a citizenry knowledgeable about computers will be more able to make intelligent policy decisions regarding societal uses of computers

4. something which allows nations to become more economically productive since it allows society to take full advantage of scientific knowledge and development

5. something which must be taught in order to ensure equal access to computers

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4Molnar; Hunter; Randhawa and Hunt.

6. something which (due to #4) will allow for technological superiority ¹

Since the SACs of our PSM and SSM are not identical, it is clear that a sort-crossing does occur when one uses the term 'CL'. Thus, 'CL' is a metaphor. We will now turn to an evaluation of the metaphor.

Evaluating the Metaphor

Munson suggests four criteria which must be met if a metaphor (or analogy, in Munson's terms) is to be an effective one: 1) "the analogue should be more familiar than the primary subject matter;" 2) "the analogue must be fitting;" 3) "the analogue should be vivid;" and 4) "the analogue must not be misleading."² Let us evaluate the CL metaphor according to these criteria.

In the case of the CL metaphor, the analogue (or SSM) is more familiar than the PSM. While not all people in our society have been exposed to some sort of CL education, virtually all have been exposed to literacy education. It is clearly the case that not all individuals in our society have succeeded in becoming literate in reading and writing, however, all individuals who have attended our schools have at least been exposed to literacy education; thus, they at least know what it involves. The same would not be true of CL. Presumably, then, speaking of some sort of education regarding computers in terms of the CL metaphor would make the notion more familiar.

Fittingness has to do with more general similarities between the PSM and SSM while misleadingness involves the more specific points of comparison. In other words,

¹Molnar; Radin and Greenberg.

²Munson, 319-324.
a metaphor is fitting if there are some general similarities between the PSM and SSM which allow a comparison to be made. A fitting metaphor can be misleading, however, in that upon closer inspection, it may be found that comparison between the PSM and SSM (although possible due to general similarities) leads one to hold beliefs about the PSM which are unwarranted. For example, comparing life to a football game is fitting, in that both are similar in some respects: both involve working with others toward a common goal, both involve success and failure, etc. But the metaphor may be misleading in certain cases. If this metaphor were used in an attempt to cheer someone up who had just learned that they have a fatal illness, the metaphor might give false hope. The fatally ill patient cannot lose this game and then simply gear up to win the next one, for example.

The CL metaphor is fitting, as both the PSM and the SSM have to do with learning knowledge and skills in some subject area, often in a formal setting such as school. And, as Lockheed et al and Noonan have claimed, the notion of different levels of learning can be applied both to literacy and CL. But more careful examination of the metaphor reveals significant dissimilarities between the PSM and the SSM, thus the metaphor is misleading.

Scheffler suggests looking for the points at which the metaphor breaks down, that is, the points at which the PSM and SSM are dissimilar. Of course, as already mentioned, some dissimilarities do not harm the metaphor. Since PSMs and SSMs can never be identical, certain points must be overlooked. In the case of 'CL' we must overlook the specific definitions of the PSM and SSM, for it certainly is not the case that CL is believed to be the ability to read and write comprehendingly. And, there are items in the SAC of 'CL' which do not appear in the SAC of 'literacy'; for example, it is believed that illiteracy causes high turnover in the workplace, financial loss due to
accidents and an increase in the number of people on welfare (4 b, c, and d of the
'literacy' SAC). Such things may or may not be believed of CL. What is of greater
importance are the points which are believed to be similar but are not. This is the point
at which the metaphor not only organizes, but distorts our view of 'CL' and allows us to
be mislead.

Both literacy and CL are believed to be necessary in conducting personal affairs
and in competing for jobs (2 a & b of the 'literacy' SAC and the 'CL' SAC). But there
are those who question the validity of such claims with regard to CL. For example,
Douglas Noble doubts the necessity of CL for personal use. He points out that

while computers are indeed invading the marketplace and the home, there
is nothing one has to know about computers in order to function
successfully in a world of electronic ovens, "moneymatic" machines, and
multifunction watches.¹

He also notes that, while it would be nice to understand one's computer well enough to
perform repairs, one can enlist the help of knowledgeable friends or service people, just
as is the case with automobiles and televisions. Noble makes the point that individuals
who cannot repair their cars are not deemed dysfunctional; neither will individuals who
cannot repair their computers be so regarded. Moreover, with regard to home use,
Twila Slesnick points out that computers have proved to have little use in the home for
most people. As she puts it, "using the computer for everyday household chores is still
more trouble than it's worth."²

¹Douglas Noble, "Computer Literacy and Ideology," Teachers College Record 85
(Summer 1984): 603.

²Twila Slesnick, "Bunk! Computer Myths We Can Live Without," Classroom
There are also authors who dispute the claim that CL is necessary due to the increasingly technical world of work. To begin with, it is argued that there are fewer high-tech jobs being created than we are led to believe. Noble claims that only 7 percent of the new work force will involve high-tech positions for programmers, technicians, computer operators, and engineers, and any current shortages in these areas will soon be filled.¹

Noble further claims that "most job openings in the next decade will be for janitors, nurses' aides, sales clerks, kitchen helpers, and truck drivers" and such jobs do not require familiarity with computers.² Slesnick claims that while computer programming is a skill currently in demand, only two percent of the future workforce will consist of computer programmers. She notes that

as the industry progresses toward the development of computers that can program themselves, diagnose their own malfunctions and, perhaps, even repair themselves, high-level jobs in technology will become scarce. Even now, for every high-level job opportunity in technology, there are nine unskilled job openings.³

Israel Scheffler makes an interesting point when he writes,

All our youth will of course be affected by the computer in a myriad of ways. They will become familiar with it and its effects in banks, schools, businesses, supermarkets, hospitals, and libraries. But does it follow that because these effects are widespread, the jobs will be as well? Should the masses of our youth be trained for Hollywood because of the prevalence of the movies, or for Detroit because of the widespread effects of the automobile? The question of future employment possibilities is of course an empirical one. There is, at any rate, no direct inference to be drawn

¹ Noble, 605.

² Noble, 605. Actually, sales clerks might be required to use a computer, as many stores perform sales transactions on the computer for purposes of inventory. See also Harriet T. Bernstein, "The Information Society: Byting the Hand That Feeds You," Phi Delta Kappan, 65 (October 1983).

³ Slesnick, 32.
from the social pervasiveness of the computer to the reliable promise of pervasive employment.¹

Even if many jobs required use of a computer, the degree of skill needed to perform the required tasks is probably of a low level in many cases. To once again quote Noble, "smarter machines required less-skilled workers."² As Bernstein notes, "the development of "user-friendly" technology has already had the effect of downgrading, rather than upgrading, the technical knowledge needed for many machine-related jobs."³ Any doubts about Bernstein's claim can be put to rest with a trip to one's local supermarket, where cashiers have at their fingertips high-tech equipment which requires only that they hold products over the optic scanner.

Both literacy and CL are claimed to allow for a more democratic society, as individuals who are well-informed will be more capable of making decisions for the public good (3 b & c of the 'literacy' SAC and 3 of the 'CL' SAC). One obvious difference between literacy and CL is that CL is claimed to contribute to democracy on a smaller scale; being informed about computers will only allow one to make decisions concerning computers, whereas being able to read gives one access to information about many things. But, it must be wondered whether knowledge about computers really allows one to participate in decisions regarding computers and society. First, such a claim assumes that the public is going to be included in decision making. Is the public going to be asked whether it believes the newest computer technology should be used to control this or that military device? Will the public's opinion be considered when the

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¹Israel Scheffler, "Computers at School?" Teachers College Record 87 (Summer 1986): 517.

²Noble, 605.

³Bernstein, 108.
banking industry decides whether to make use of some new technology? Secondly, it is assumed that knowledge gained in a typical CL course (if, indeed, there is such a thing) will adequately prepare one to make such decisions. Although I might be considered computer literate, I daresay I do not have the technical expertise to make decisions such as those suggested (moral and legal issues aside). As Noble explains,

Even if expertise in computers were necessary for informed policy decisions about their design or use, the level of technical knowledge offered in computer literacy classes is many orders of magnitude removed from the understanding of large systems that could conceivably contribute to public deliberation.

Technical understanding or expertise, however, is not necessary for participation in the social control of computer technology. Instead, one needs political understanding and a knowledge of who controls the direction of computer policy, for what purposes, for whose benefit, and for whose loss. There is nothing in computer-literacy education that offers such information or insight. Instead, discussions of "social" questions are typically underplayed and oversimplified, serving as testimonials to such wonders as the automated office, the unmanned factory, and the Star Wars arsenal .... One must ... ask to what extent technological decisions are likely to be subject to democratic process, with or without a computer-literate electorate, in the future. Such decisions are now typically made in corporate or military boardrooms, far removed from public scrutiny, and there is nothing in computer literacy that will magically empower voters to alter the locus of this control.¹

It is believed that both literacy and CL, if they are to be learned, must be taught (5 of the 'literacy' SAC and the 'CL' SAC). Teaching reading and writing is seen as necessary because it is believed that one cannot or will not learn how to read and write without being taught. While this might also be believed of CL, it is clearly believed that it must be taught in order to prevent a widening of the gap between the more and less advantaged students. Slesnick addresses this claim and notes that as a technology is perfected and becomes more prevalent, prices fall. This has happened with televisions and calculators and it is happening with computers. Thus, Slesnick claims that soon

¹Noble, 606-607.
nearly "any individual or school that wants computers will be able to afford them."¹

But, there is an even more important point which must be considered. As they are currently used, computers in schools appear to be doing more harm than good for disadvantaged students. As Slesnick notes,

> We should not be so concerned about which students have or don't have access to computers—it's how the computers are used that makes the difference. When rich kids use computers for programming and practical applications while poor kids use them for punching out answers to rote questions, we exacerbate class disparity by depriving some children of exposure to new material, new ideas and new opportunities.²

And, if it is feared that students with limited or no access to computers will be unqualified for jobs, it must be noted that learning the use of a computer for a specific job can probably be learned fairly quickly. As Noble explains,

> the vast majority of workers who will need to know something about computers, such as travel agents, airline reservationists, or telephone operators, will be able to learn what they need to know about their particular machines in a few weeks or less. In fact, the computer industry has itself begun to question its own workers' need for computer literacy, which, it says, can be developed on the job.³

Of course, students with little or no access might still be at a disadvantage if computer training is used, independent of its necessity, to screen individuals for positions. Noble believes that computers are being used in ways that are creating a growing underclass of displaced and marginal workers. The institutionalization of computer requirements can be seen as a means—perhaps still unconscious and hegemonic—to justify those lost lives by a process of mass disqualification, which throws the blame for disenfranchisement in education and employment back on the victims themselves.

¹Slesnick, 33.

²Ibid.

³Noble, 605.
The campaign for computer literacy includes more than rhetoric and simplistic instruction; it also consists in the accelerating installation of barriers to schooling and jobs by way of credentials and hiring practices. Such problems would be solved not by filling CL courses with disadvantaged students, but by scaling back requirements to equal the demands of the job.

One point of similarity which might hold between literacy and CL is the claim that they both contribute to economic productivity (4 of the 'literacy' SAC and 4 of the 'CL' SAC). I have not seen this point disputed with regard to CL and I would not disagree with the claim that having knowledgeable people who can develop and make use of technologically efficient machines contributes to economic productivity. However, I question whether it is having workers with a low level of computer knowledge/skill (when their jobs might not even require it) is what allows economic growth. Rather, it would seem to be those with expertise in computers (the developers and maintainers of technology) who contribute to it. Once again, a perceived likeness may only be a perceived and not actual point of similarity.

It must also be noted that a subtle difference between the SACs is the tense in which they are stated. While the SAC of 'literacy' speaks to what is presently the case due to a perceived national illiteracy problem, the SAC of the concept of CL warns of what might be the case some time in the future (and we do not know when) as a result of a lack of computer knowledge on the part of our society's members. Inattention to this difference in tenses could also make acquisition of CL seem more urgent. That is, there seems to be in our schools (and society, in general) a belief (fear) that those without computer knowledge/skills will be unable to cope now.

In evaluating metaphor one must also consider the purpose for which the metaphor has been offered. One might offer a metaphor by way of explanation. As Green

\[1\text{Ibid., 611.}\]
remarks, when one speaks of the flow of electricity one is using an explanatory metaphor, implicitly comparing the activity of electricity to the activity of water in a hose or faucet. In this case, the SSM (water) is more easily understood than the PSM (electricity) as thus is helpful in explaining the PSM. As Green explains,

We are familiar with the fact that there is pressure in the hose or in the faucet and that the characteristics of the flow are related to the pressure on the fluid, its volume, and the size of the pipe. Electricity, too, exhibits a "flow." There is a "current" showing a certain pressure—the voltage; having a certain volume—the amperage; and so forth.\(^1\)

Such metaphors cannot be considered good ones if they do not accurately explain the PSM.

It is also possible to use metaphor for heuristic or investigative purposes. Here the metaphor is used not simply to explain the PSM but to further stimulate our thinking. As Scheffler describes it, such metaphors serve as an invitation to exploration. He writes,

The invitation presented by a metaphorical utterance may lead us to rethink old material in the light of new categorizations (the mind as an electronic computer) or to consider newly discovered phenomena in terms already available (black holes in space as vacuum cleaners). Whether the task be to incorporate the novel or to reorganize the familiar, metaphor serves often as a probe for connections that may improve understanding or spark theoretical advance.\(^2\)

Heuristic or investigative metaphors must be evaluated as to whether they are fruitful, i.e., whether they do advance our thinking.

It is not possible to state with confidence that the authors studied in this dissertation intend to use the CL metaphor in either of these ways. In fact, it is doubtful

\(^1\)Green, 60.

that most of these authors are even aware that they are using metaphor. Of course, such a problem is not peculiar to metaphor; as Scheffler points out,

the producer of any utterance, metaphorical or otherwise, may find it difficult or puzzling to interpret what has been said, and be surprised by the result of reflection on the matter. The interpretive role with respect to any utterance is not incompatible with that of producer, even when the purpose of the utterance has been straightforward communication.¹

If the authors are not aware that they are using metaphor, they cannot be said to be using it for any intentional purpose. It could of course be used by readers for explanatory or heuristic purposes if they interpret 'CL' metaphorically. But if the readers are also unaware that 'CL' is a metaphor, they will take the utterance literally and will suppose that it explains something. However, use of 'CL' does not accurately explain the PSM and this is where the danger with the metaphor arises.

Interaction Between the SAC of 'Literacy'
and the SAC of 'Computer Literacy'

Remembering the interactive nature of metaphor, we should now turn our attention to the influence the SAC of 'CL' may have on 'literacy'. It has already been noted that perceptions regarding what counts as literacy have changed over time. As previously noted, literate functionality within society has become of central concern during the last thirty years. Definitions of 'literacy' have increasingly been brought out of the limited realm of reading and writing to include whatever skills are deemed necessary for functioning effectively in society. Literacy in the Information Age is ever more commonly believed to necessarily include computer knowledge.

¹Ibid., 128-129.
Helen Aron, noting the historical development of 'literacy,' claims that "current social and economic factors are in the process of imposing a new requirement upon literacy, i.e., the ability to interact on a rudimentary level with a computer."\(^1\) Paul Delker notes that while "experts" attempt to formulate sophisticated definitions of literacy, these are not necessarily the views taken by people who are concerned with literacy as a national priority.

If we look at the media statements of all types and pronouncements by leaders in various sectors, the most evident clues are that literacy still means ability to work with the printed or written word. That is its root meaning and that is clearly an essential part of our national consensus about literacy. It is also evident that we mean more than reading and that we include in the term writing, speaking and listening, and computing. Implicitly or explicitly there is consensus that problem solving is also a quality to be included in our notion of literacy.\(^2\)

Thomas Sticht expands the definition of 'literacy' even further. He believes literacy to include the notion of "technological literacy" which is defined as

the competence required to engage in complex thinking. It entails possession of the appropriate knowledge and skill to access a continuously changing base of information. Knowing how to use machine technology, such as computers, is important because computers help to store and manipulate information. But the focus must ultimately be on engaging critical thought and teaching people how to continue learning.\(^3\)

Such conceptions of 'literacy' are no doubt generated and deemed legitimate due to belief in the claims stated in (2) and (4) of the SAC of 'CL'. If literacy is to be viewed

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\(^1\) Aron, 8.

\(^2\) Delker, 8.

as "possession of whatever skills a person needs in order to function within their society" and CL is necessary for functioning in society (in managing one's affairs and competing for jobs), then CL will be viewed as a component of literacy. Furthermore, if teaching computer knowledge/skills will help to improve the productivity of the nation, then there is all the more reason to include CL in definitions of literacy (since national economic gain is one of the motives behind literacy programs). Of course, if any of these beliefs concerning CL are suspect, so too, is the inclusion of CL in definitions of 'literacy'.

Summary

In this chapter it has been shown that 'CL' is a metaphor, involving the comparison of the acquisition of computer knowledge/skills (the PSM) and the acquisition of literacy (the SSM). In an effort to understand the concepts being compared, the SAC of both the PSM and the SSM were listed. It was shown that use of the CL metaphor is reasonable in the sense that the SSM is more familiar than the PSM. Furthermore, the metaphor is fitting in that both the PSM and the SSM have to do with the teaching (often in school) of knowledge and skills with regard to some subject matter. It is also fitting in that the notion of fluency levels applies to both CL and literacy. The danger was shown to be the misleadingness of the metaphor. Comparing the teaching/learning of computer knowledge and skills with the teaching/learning of reading and writing lends urgency to CL programs which may not be deserved. Beliefs are formed about CL based on the beliefs about literacy, despite a lack of evidence to support such beliefs about CL.

As long as the CL metaphor goes unrecognized, it is likely that beliefs based on the metaphor will go unchallenged. Educators must become aware of and evaluate the
metaphor before they go about the business of planning and implementing CL programs. Thought must be given to how we view CL, why it is so perceived, and whether our perceptions are warranted, in order to determine whether and how CL should be taught. It is hoped that the analysis found in this chapter will aid in such evaluation.
CHAPTER V
SUMMARY AND CONCLUSION

Introduction

It has been shown that 'CL' is a concept which enjoys great popularity and support despite a lack of clarity regarding its intended meaning. Furthermore, the presumed necessity of CL programs in our schools is taken for granted without benefit of a well-argued rationale. The purpose of this dissertation has been twofold: to shed light on the confusion surrounding 'CL' and to suggest ways in which this confusion can be minimized. As noted in Chapter I, the focus of this dissertation was primarily on three questions: "How is 'CL' defined?", "What are the assumptions underlying definitions of 'CL'?" and "Given the definitions of and underlying assumptions concerning the concept, should CL be taught?"

Summary Remarks

Chapter II focused on the second and third questions. In this chapter it was determined what it means to be literate. While 'literacy' may have once been used only to refer to skills of reading and writing, the term has come to be attached to various subject areas. Thus, we now speak of specialized literacies such as scientific literacy, aesthetic literacy, and CL. One way to get clearer about the meaning of 'CL' (or any other specialized literacy) is to examine ordinary literacy as well as various specialized literacies in an effort to determine what "X literacy" is believed to involve; such a strategy was pursued in Chapter II. The distinctions of Israel Scheffler regarding "teaching/learning that . . .," "teaching/learning how to . . .," and "teaching/learning
to . . ." were used in determining what sort of teaching and learning is required for "X literacy" and, more specifically, for CL.

It was shown that literacy in X is most appropriately viewed as a matter of "learning that . . . " (N) and "learning how to . . . " That is, becoming scientifically literate, aesthetically literate, or computer literate would be a matter of learning relevant knowledge and skills. It was shown that "learning when to . . . " is also important, but it was noted that this is perhaps a part of "learning that . . . " (N). It was also demonstrated that some authors seem to wish to "teach that . . . " (A) but it was argued that such an activity would fall outside the realm of mere literacy.

It was claimed that it is not enough for the teacher merely to know what type of learning is desired; she must also be sure to select the most appropriate mode of teaching. Again, Scheffler's and Green's distinctions were employed in showing that instructing is required in "teaching that . . . " ([N] or [A]), whereas "teaching how to . . . " calls for training. Training focuses on the shaping of behavior, in that the desired outcome is that when the pupil does X, they will do X in the manner in which they have been taught. The teacher provides explanation of the procedures being taught and the student must engage in some thinking, thus, teaching "how to . . . " requires training rather than conditioning. Furthermore, the training is successful if the student is able to do X; doing X regularly is not required for successful training as it is for successful conditioning. Instructing focuses on the shaping of belief and is a matter of engaging in a dialogue with the student, giving reasons and allowing the student to question. While teachers do sometimes indoctrinate their students, instruction is generally the most desirable medium for "teaching that . . . " (A and N), as it gives students an understanding of the subject matter which allows them to reason with and about the topic at hand.
Chapter III provided a more in-depth look at the definitions of 'CL' mentioned in Chapter I. Employing Scheffler's distinctions concerning types of definitions, it was shown that definitions of 'CL' are generally stipulative/programmatic definitions. Authors do not attempt to provide reportive definitions of 'CL' because any definition reporting an agreed-upon ordinary usage of 'CL' would be too vague to be useful. That is, while "Computer literacy is knowing something about computers" could be considered an accurate reportive definition, it does nothing to enlighten us about appropriate CL programs in schools. What is needed in discussing 'CL' from the educator's standpoint is a more precise definition; in attempting to provide such preciseness, the authors discussed in this dissertation have offered stipulative definitions of 'CL'. The definitions also suggest particular sorts of CL programs, and so are also programmatic in nature. It was shown in Chapter III that 'CL' remains unclear due primarily to three reasons: 1) there is a plethora of definitions as an author's dissatisfaction with existing definitions seems usually to result in the stipulation of yet another definition of 'CL'; 2) these definitions generally fail in their stipulative function, and thus, merely confuse the reader; and 3) the definitions usually fail also in their programmatic function as there is often inconsistency between the stated definition of 'CL' and the suggested CL program.

Chapter IV attended to the definitions of and assumptions about 'CL' as well as the desirability of teaching CL. It was shown that 'CL' (and any other specialized literacy) is a metaphor, as the learning of knowledge/skill with regard to computers is implicitly compared with the learning of knowledge/skill concerning reading and writing. Thus, the root concept is 'literacy'. While there are similarities between learning computer knowledge/skills and learning the knowledge/skills of literacy, there are also significant differences. Thus, the metaphor is misleading. For example, it
was shown that CL is believed necessary for nearly everyone's functioning in the Information Age (both in and out of the workplace). Yet, there seems to be inadequate evidence to support such a belief. It is not the case that all jobs now require the use of computers and it is not clear that they will in the future. Furthermore, it was suggested in Chapter IV that most employees could probably learn necessary computer skills on the job within a reasonable amount of time. While I hesitate to use a sample of one, it must be noted that I have recently learned two word processing programs merely by reading manuals and occasionally enlisting the help of friends. And, I would not consider myself one of those people who seems to have a knack for such things. As for computer use outside the workplace, it cannot be denied that tasks such as banking require, or at least make desirable, the use of computers. However, such operations are generally quite simple, having been programmed for a patronage that is not assumed to have a great deal of skill with computers.

It must also be noted that as computer technology becomes more sophisticated, computers are programmed to be increasingly user friendly. That is, they require less, not greater, intelligence on the part of the user. While operation of a computer used to require familiarity with complex procedures and commands, some computers can now be operated by merely touching the screen or passing items over an optic scanner.

Harry Broudy, commenting about technology in general, writes:

Sophisticated technology can be used day in and day out without understanding how it works; indeed, the glory of modern technology is greatest when its demand on the intelligence of the user is least.¹

Broudy illustrates his point by noting the wonders of the refrigerator:

A good example of good technology is the electric refrigerator. Not only does it cool foods efficiently and reliably; but it does so automatically. The decisional demand on the user is reduced to turning a dial and inserting the plug into an outlet. The user does not have to understand the theory of electricity nor the intricate processes by which gases are compressed and expanded to extract heat from air at room temperature.¹

Thomas Green notes that we must distinguish between new technologies which require the user to gain new skills and those which do not. Use of the refrigerator clearly does not necessitate the acquisition of new skills. Even with increasing user friendliness, some computer use probably would require new skills. Even so, Broudy's point is well taken, for computer use certainly does not require as extensive training as it once did.

It should be noted that the rapid changes and improvements in computer technology make even more difficult the task of defining 'CL'. Given that computers are continuing to be made more user friendly, it is difficult to stipulate a definition of 'CL' which will be meaningful for any length of time. If using a computer for word processing presently requires skills X, Y, and Z but will require only X and Y a year or two from now, it will be nearly impossible to keep definitions of 'CL' current.

Green explains that there is a downward drift in the teaching of new technological skills. While they are first taught at a high level, the teaching of these skills eventually works down to a lower level. He writes:

The history of every new technology victorious in the market is the history of the downward drift in the social acquisition of its principles and the skills of its applications. The first computer programmers were the inventors and creators of the hardware. They were persons highly trained in mathematics and engineering. The next generation of programmers were doubtless possessed of training almost as advanced. But surely, the third generation were taught the art of programming without either prior training in advanced mathematics or engineering or in programs of the system designed to produce programming skills. They were trained either by the agencies who marketed the hardware or by those who wished to

¹Ibid.
use it. They could not have been trained by the system because in the beginning of any new technology, there never are such programs in the system. But as the principles of the technology become better and more widely understood and as the required skills become more clearly identified, programs will develop first at the advanced levels of college and then will extend into the secondary and even elementary schools.¹

The task of teaching these skills is usually taken on by the schools. In order for skills to become widespread,

the producers of the technology must either rely on some other existing institutions, or they must undertake to do it themselves. Where schools exist, it will either be done in schools, or else those who market the technology will have to do it through schools or programs of instruction of their own. The preferable solution is for the system to take on the task of developing the skills needed for the creation and maintenance of the technological market.²

Green notes that there are alternatives available, such as "extended indenture, apprenticeship, or home study."³ But as he explains, "if the system is available, it will be used. And it is likely to be used, because it is the most efficient solution to the problem of creating and sustaining the market for any technology."⁴

Scheffler is skeptical about claims that the world of work will increasingly require high level computer knowledge and skills but he is even more troubled about the presumed role of the school in preparing a computer literate workforce. He writes:

Corporations and businesses have frequently argued, with respect to vocational education generally, that schools can best contribute to the general education of their students and to the development of students' social skills and character, leaving the rest to on-the-job experience. Whatever the truth may be on this issue, such alternatives must at least be

¹Thomas F. Green with the assistance of David P. Ericson and Robert H. Seidman, Predicting the Behavior of the Educational System (Syracuse, NY: Syracuse University Press, 1980), 56.

²Ibid., 55-56.

³Ibid., 57.

⁴Ibid.
explored... it is worth noting the Japanese experience, in which schools have so far retained their traditional orientations, while the youth have acquired familiarity with the computer through informal means.¹

Even if the purpose of CL programs is to merely provide general familiarity with computers (rather than job training), Scheffler asks the same question: Why should schools provide such instruction?

Now let us concede that knowledge of the computer will indeed be essential for adequate functioning in the future and, as such, generally desirable. Does it follow that schools should invest a significant effort in this direction? Exactly what type and what level of knowledge are, in fact, thought to be required? Do the requisite abilities presuppose a theoretical understanding of computer science or only one or another degree of operational facility? The way in which such questions are answered makes all the difference in the world in determining the school’s proper role.²

Scheffler seems to be in agreement with Broudy’s "refrigerator argument" and writes:

How many drivers understand the theory of the internal combustion engine? How many telephone or television users have analogous theoretical understanding? Driver education, premised on the public interest in traffic safety, leads no one to exalt "driver science" to the level of a New Basic Skill along with English and mathematics, as A Nation at Risk does for computer science. Yet if only operational facility is involved in either case, why the disparity? It might be suggested that the level of operational understanding required of the computer consumer is significantly higher than that required of the automobile consumer, but a detailed argument would have to be made to this effect. In any case, it would further need to be argued that the school is the preferred locus for acquiring such understanding, rather than out-of-school experience. It is ironic that academic formalists, providing neither argument, often advocate a computer literacy that may require no formal schooling at all, or at best at a level comparable to that of driver education.³

I wish to make clear that I am not anti-computers—having produced this document with a computer, I happen to think that they can be quite useful. Nor am I opposed to

¹Israel Scheffler, “Computers at School?” Teachers College Record 87 (Summer 1986): 517.

²Ibid., 518.

³Ibid.
all CL programs or even CL programs in schools. What concerns me are the assumptions made about CL and the fact that these mere assumptions seem often to be the impetus for action. People are being led by the use of scare tactics to believe that they and their children cannot survive in the Information Age without benefit of some sort of CL program. That it is merely assumed that the schools must provide such programs is equally disturbing.

Of course, even if CL programs for job training are not found to be necessary and/or the schools are not found to be the place for such programs, we may wish to provide CL programs of some sort in schools. After all, curriculum is not always based on need--few people's lives could be said to require taking glee club, for example. The point to be made here is that while the development and implementation of CL programs should perhaps be pursued, the importance of such programs should not be assumed, nor should they be implemented without serious consideration being given to the issues and questions raised in this dissertation. Thus, I propose that the following research be done.

**Suggestions for Research**

Research must center on the second and third general questions pursued in this dissertation--"What are the assumptions underlying definitions of 'CL'?" and "Given these assumptions, should CL be taught?" The conceptual analysis found in this dissertation should prove to be helpful in clarifying the concept, but such analysis must be augmented with empirical research concerning the computer knowledge and skills which are now and will be required in the Information Age. We cannot know whether individuals are literate in X without knowing what knowledge and skills regarding X are necessary. Well-grounded research must be done on the sorts of jobs which
necessitate computer use and on what sort of computer use these jobs require. More accurate projections must also be made concerning future jobs and computer use. And research needs to be done on the prevalence of computer use in personal life (i.e., banking, etc.) and on the level of skill required of the user. It must then be determined what sort of instruction and/or training would best prepare people for computer use in and out of the workplace and where such training and/or instructing would best be provided.

This, of course, brings us to the question of whether CL should be taught. There are really two questions here: "Should CL be taught?" and "If CL should be taught, should it be taught in our schools?" It seems likely that CL aimed at personal uses (i.e., banking, etc.) would be found to be unnecessary, but that CL programs of some sort would be necessary for some jobs. However, it must not be assumed that the schools should perform this service, as it might be the case that business or some sort of community agency would be better equipped to handle such a task. For one thing, schools, being removed from the workplace, may not have a clear understanding of the necessary content of job-related CL courses. Secondly, schools generally do not have the funds to offer students state-of-the-art equipment, which might cause a lag between the skills learned by students and the skills required in the workplace.

There is an even more important issue which needs attention: would the purposes and goals of CL programs be consistent with the purposes and goals of our schools? Serious thought needs to be given to this question, as CL programs are likely to be vocational in nature. It is clear that vocational education is one of the purposes of our schools today, but it must not be assumed that this ought to be the case. If the primary or only purpose of our schools is or ought to be to educate persons in a more broad
sense, then vocational types of programs such as CL courses would be inappropriately placed in the school curriculum.

There is a further point to be made. In Chapter II it was noted that current practice is to distinguish between literacy and functional literacy. This is especially true with ordinary literacy but is also the case with some other types of literacies. This seems to be a legitimate distinction, for it certainly is the case that not all people's lives require the same degree of knowledge and skill in X. However, it does present a problem for those charged with creating literacy programs. If one only teaches the most basic knowledge and skills in X, certain students may find their instruction and/or training to be inadequate. Yet, teaching everything that one could ever need to know about X (if, indeed, that were possible) would certainly go beyond literacy for most students. Thus, it must be wondered how a particular course or sequence of courses can legitimately be termed a literacy program since passing such a program might not prepare one for functioning in society with regard to X. It was noted that in the early grades, the basic knowledge and skills concerning reading and writing are overtly taught in schools, yet these seem to prepare us for reading and writing tasks which lie ahead. If CL is to be taught in schools, we must determine whether there are basic knowledge and skills concerning computers which, if taught, will prepare students to tackle more complicated tasks outside the classroom. This question, of course, leads to matters of course content. Certainly, the particular lessons to be taught is a matter of great importance. But, such decisions should only be made after it has been determined how 'CL' should be defined, what CL programs would legitimately involve in the general sense, and whether, and where, instruction and/or training should be provided.

In Chapter II the notion of teaching the disposition of computer use was discussed. It was noted that this is not a necessary condition of teaching literacy, but
that some educators seem to desire such teaching. What was not discussed is the values aspect of teaching CL. Certainly most teachers wish to encourage their students to look favorably upon the subject matter being taught and would be pleased if students developed dispositions toward the subject. There is no reason to believe that teachers of CL would feel any differently, and there might be some benefits to this. But serious thought must be given to the values associated with technology which are taught or encouraged in CL programs (and in society in general). For example, it could be claimed that the Information Age has brought with it the depersonalization of tasks and services, an increased importance on speed and efficiency, and increased materialism as we try to keep up with the ever-improving technology available to us. Educators must attend to what values might easily be encouraged with the offering of CL programs. They must also give serious consideration to which values ought to be encouraged and must do what they can to keep CL programs from encouraging values which are deemed undesirable.

The analysis and suggestions made in this dissertation should help us view CL programs as a tool, a means for the improvement of society, rather than as ends-in-themselves. So viewed, CL programs will be pursued only to the extent that they are, in fact, useful tools. It has been suggested that CL programs may not be the necessity they are believed to be; empirical research and further analysis of 'CL' must be undertaken in an effort to determine the proper role of and the proper forum for CL.
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