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Toward a philosophy of educational computing.

Timothy O. Martyn
University of Massachusetts Amherst

TOWARD A PHILOSOPHY

OF

EDUCATIONAL COMPUTING

A Dissertation Presented

By

TIMOTHY O. MARTYN

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Timothy O. Martyn

Approved as to style and content by:

Dr. Howard A. Peelle, Chairperson

Howard A Peelle

Dr. Portia C. Elliott, Member

Portia C. Elliott

Dr. Frank C. Grella, Member

Frank C Grella

Dr. Louis Fischer, Acting Dean
School of Education

SPONSORING COMMITTEE

Dr. Portia Elliott, Professor
School of Education, University of Massachusetts

Dr. Frank Grella, Professor
School of Business and Public Administration
University of Hartford

Dr. Howard Peelle, Professor (Chairman)
School of Education, University of Massachusetts

DEDICATION

To Janet, for many reasons

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The editing and typing of this document was entrusted to June Molava and Nancy Thomas. I would also like to express my appreciation for their efforts on my behalf.

ABSTRACT

Toward A Philosophy of Educational Computing

(December 1975)

Timothy O. Martyn, B.A., Providence College

M.A., Trinity College, Ed.D., University of Massachusetts

Directed by: Professor Howard A. Peelle

This document reflects the thinking of a practitioner in the area of educational computing who has endeavored to place his trade within the context of educational philosophy. Being acutely aware of the necessity to specify well-defined objectives for automated systems and recognizing the potential within the computer for actually achieving such objectives, the author argues that the very desirability of the objectives themselves should be given serious attention. This immediately leads to contemplating those eternal questions surrounding the purpose of education. Therefore, it is the author's contention, and a primary theme of this document, that educators involved with computerized systems formulate some conscious philosophy of educational computing. This philosophy of educational computing should be derived from and consistent with some parent philosophy of education.

The author acknowledges that the selection of a parent philosophy of education from one of the many "isms" found in various anthologies of educational philosophy, or perhaps the development of one's own unique philosophic position, is very much a matter of personal predisposition. However, upon considering much of the valid criticism which has been leveled at educational computing, the author adopts existentialism as his parent philosophy. Illustrating that educational computing can be compatible with an existential philosophy of education is the second major theme of this paper. The author demonstrates this compatibility by an analysis of cybernetics (as the science encompassing digital computing) from an existential perspective and argues that there are no intellectual inconsistencies in their positions. Furthermore, it is proposed that the existential educator may utilize cybernetic insights in defense of his philosophic position.

The author concludes by specifying some recent research efforts in the instructional applications of computers which display considerable merit toward the realization of existential objectives.

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INTRODUCTION

The Author's Predisposition

The author of this document speaks of educational computing as a practitioner actively involved in the design and implementation of computerized systems within an academic environment. More precisely, he speaks as a practitioner who some years ago began to look beyond the sphere of design and implementation and seriously ask "WHY?" questions regarding the objectives of educational computing. In pursuing answers to these questions, the professional literature of the educational technologist was of little help.

It appears that, with the best of intentions, those involved with educational computing have spent a disproportionate amount of time and energy toward achieving goals on the assumption that such goals were naturally worthy of realization. As a group, educational technologists have been guilty of a common sin which Charles Silberman has specified as the central problem within American education and labeled "mindlessness," namely, the failure of most educators to "think seriously or deeply about the purposes and consequences of education." In sympathy with Silberman, and being acutely aware of the powerful impact the computer is having on education, the author states that the primary message of this document is to encourage his colleagues to ponder the "WHY?" questions of education,

especially regarding the uses of computers. Specifically, they are encouraged to develop some conscious "philosophy of educational computing" derived from and consistent with a parent philosophy of education.

In this paper a philosophy of educational computing based upon Existentialism is advocated. The reader is invited to examine the author's rationale for selecting Existentialism as the parent philosophy; hopefully, the reader will find this to be persuasive. However, a recognition of the significance of establishing some philosophical basis for educational computing is more important than the selection of a particular philosophy. (For instance, the author would sincerely welcome the exposition of an experimental philosophy of educational computing or a scholastic philosophy of educational computing.) This is not to say that the selection of the parent philosophy is an arbitrary matter; it is a vital issue, but not to be pursued here. In this document, the author, as a practitioner, reflects upon educational computing, and then selects Existentialism as his parent philosophy of education. The tenets of Existentialism are then axiomatic. The intent of this paper becomes the incorporation of educational computing within this philosophy, not vice versa, where the "tail wagging the dog" phenomenon occurs and the technology dictates educational policy. The intellectual challenge taken up by the author is the illustration

that educational computing is not incompatible with an existential education and, furthermore, that by allowing the computer into the classroom under certain circumstances, existential goals may be more readily achieved.

The Audience

This paper is addressed to both the practitioner involved with educational computing and the existential educator. As a practitioner, the author encourages his colleagues to become aware of the necessity for some philosophical perspective, and advocates the merits of the existential position. As an educator sympathetic toward the existential position, he encourages other existential educators to recognize both the potential dangers inherent within educational computing and the positive role the computer can play in promoting a creative, humanistic educational environment. In addressing both groups of educators, the author specifies their common interests and recommends that each group may benefit by recognizing the productive insights generated by the academic efforts of the other.

An Overview

This paper can be perceived as an attempt at a productive cross-fertilization of ideas and concepts proposed by two groups of educators. The first group consists of those educators who are advocates of existentialism as a philosophy of education. The second

group consists of educators who are involved with educational computing. Accordingly, some background information on each group is presented.

Chapter I presents an overview and historical account of the computer as utilized within an academic setting. Chapter III is a brief description of existential philosophy and its educational implications. The reader who is familiar with either or both of these topics may well omit the corresponding chapter(s).

The heart of this paper is contained in the remaining three chapters, and its organization is quite straightforward. In Chapter II, the author indicates the absence of a philosophy of educational computing and argues for the construction of such a philosophy. Chapter IV is the primary focal point of the paper. Here the author examines the science of cybernetics as the theoretical science which encompasses digital computing and attempts to convince the reader that the philosophic insights provided by cybernetics are not incompatible with the basic tenets of Existential philosophy. Furthermore, it is proposed that the Existentialist may find cybernetic insights useful in an intellectual defense of his position. Chapter V concludes with an examination of specific educational policy and practices pertaining to educational computing which the author believes to be consistent with an existential education.

Once I had brains, and a heart also;
so, having tried them both, I should
much rather have a heart.

- The Tin Woodman

CHAPTER I

HISTORICAL BACKGROUND

The objective of this introductory chapter is to provide the reader with an historical overview of the uses of computer technology within an educational environment. It will conclude with a brief description of the current status and futuristic projections of this topic.

A. Educational Computing Defined

Throughout this paper the expression "educational computing" will be used in the generic sense to represent any and all applications of computer technology in the process of education. For the sake of discussion, it is helpful to subdivide educational computing into three categories, according to areas of application. These are: (1) Educational Research; (2) School Administration; and (3) Instruction.

1. Educational Research

The trend toward quantification in educational research, as in all social science research, has increased utilization of the computer in its most basic role, that of a most efficient and accurate calculating device. The computer's ability to process large amounts

of data according to predefined sequences has made the educational researcher evermore dependent upon the computer. He can now perform calculations which, prior to the advent of the computer, would have been impractical due to the effort involved. The application of the computer as a calculating tool within educational research has been the most successful area of educational computing.

2. School Administration

A school system is an organization and school administrators need accurate and timely information about its status for effective operation and management. This is the area of data processing where the impact of the computer has been nothing short of revolutionary. Although the automation of school data processing has progressed slowly, the computer is proving to be an invaluable asset to school administrators.[1] School systems perform functions similar to those of business and industry in such areas as accounting, budget development, inventory control, and payroll. School administrators have sought to automate these procedures as well as others which are unique to school administration. For instance, class scheduling, standardized test scoring, and grade and attendance reporting have been successfully transferred to computerized systems. The application of the computer within educational administration has evolved without much controversy, barring the exception of automated student personnel systems which evoke the privacy issue.

3. Instruction

Research and administration are secondary activities compared to the fundamental purpose of schools: educating students in the classroom. Here, too, the computer has the potential to become a significant factor directly involved in the process of education. This is the area of Computer Assisted Instruction (CAI).

Traditionally, CAI is conceived as a situation in which the student interacts with a computer for a period of time and in doing so obtains some new knowledge. Most CAI systems have been designed to fit the drill-and-practice or tutorial modes of instruction. Also, some CAI systems have employed simulation and gaming techniques. Whereas the applications of computers in educational research and administration are relatively straightforward and well on their way to maturity, the instructional applications of computers are still in an embryonic stage. The above classification of CAI has a multitude of variations, and the educational community has yet to determine which, if any, has merit within the education process.

B. Early Perspectives of Educational Computing: Promise and Problems

During the late 1950's, as the computer was entering the commercial world, some educators and members of the computer industry became aware of the potential applications of the computer within education. Idealistic scenerios were developed calling for research teams composed of educators and computer scientists to design computerized systems which would revolutionize the schoolhouse.[2] The motivation

for this endeavor on the part of the computer industry was obvious--profit. After prototype systems were developed, every school system was seen as a potential customer. Various segments of the educational community also became enthusiastic for different reasons.

School administrators and members of boards of education, being especially sensitive to the rising costs of education, envisioned the computer as a means of saving the taxpayers' dollars. Not only would the computer streamline the administrative functions, but it would also permit more efficient use of teachers' time by freeing them from mundane clerical responsibilities. This could also include drill and practice sessions which were time-consuming but did not require the skills of a professional educator. The hope was that the computer could bring the same cost benefits to education that it was bringing to business and industry.

Associated with the idea of utilizing the computer for a more efficient allocation of the school's resources was the notion that perhaps the entire management and operation of the American school system should be modeled after the American business enterprise system. Advocates of this concept did not expect the schools to turn a profit; however, they did feel that, given the financial investment the American taxpayer placed into education, the schools should at least be able to achieve their objectives.

Shortcomings of the schools were pointed out and comparisons were made to the success of American business enterprise. It was

recommended that not only the computer be incorporated in the school systems but that school administrators begin to think like managers of a business concerned with efficiency of operation. Thus the proposal to utilize computer technology was broadened to mean the adoption of the "systems approach" by educational administrators.[3]

Other educators who saw promise in the computer were proponents of programmed instruction, including those favoring individualized instruction, and educational psychologists favoring behaviorism.[4] They perceived computer technology as a means of achieving their objectives. Conventional CAI systems, presumably implemented on large time-share computing systems, would be superior to any other media used for programmed instruction, would allow the individual student to proceed through the lesson at his own pace, and would be behavioristic in that the student must respond to a stimulus, systematically presented by the computer. The computer, if properly programmed by thoughtful educators, could fulfill all these objectives and was seen as a blessing for future generations of American students.

A last group of advocates of educational computing should be mentioned for the sake of completeness. These were the "gadget lovers." They are difficult to identify because they rationalized their enthusiasm for the computer by articulating any or all of the aforementioned reasons for use of the computer by educators.[5] They were either struck by the mystique of the computer or were simply trying to fulfill some publishing quota.

The computer was not welcomed into the schoolhouse with enthusiasm by all. Many educators and social critics, especially those who were disenchanted with the undesirable by-products of technology and its negative influences on the social structure, perceived the computer as a dehumanizing mechanism and thereby claimed that it should be barred from the schoolhouse. Such threats associated with automation were especially acute during the 1950's. With the development of the computer the threat was extended beyond blue-collar jobs into clerical areas. Teacher unions were sensitive to this situation and therefore tended to be critical towards educational computing. They articulated their criticism in terms of its dehumanizing influences, but their altruistic motivation is certainly open to debate.

C. Historical Events

Earlier in the previous decade, responding more to the promise than the problems within educational computing, the computer industry began exploring methods of developing the potentially lucrative education market. In order to establish marketing contact with the nation's school systems and obtain personnel familiar with education, many computer manufacturers purchased educational publishing houses; i.e., International Business Machines purchased Science Research Associates and General Electric purchased General Learning. The major computer manufacturers also began to finance research into educational computing in order to stimulate interest and awareness on the part of educators. Government and private foundation funding

was also generous, and thus evolved a proliferation of pilot projects in educational computing.

As was mentioned earlier, the applications of administrative data processing and educational research proved to be successful, and the fruits of this success are becoming evident in today's academic institutions. However, while initial evaluation of the instructional applications of the computer has been positive, it has not been conclusive. Whereas the computer is now commonly used in many schools to process clerical transactions, and is being used as a calculating device in math and science courses, its application as an instructional tool is still minimal.

Portia Elliott makes reference to the three major pilot projects in the instructional applications of computers.[6] She identifies Patrick Suppes of Stanford, Donald Blitzer of the University of Illinois (the PLATO project), and Kenneth Stetten of the Mitre Corporation (the MITRE project) as three cautious, yet strong, advocates of CAI who have spearheaded research into instructional uses of the computer. Elliott proceeds to indicate some limitations of conventional CAI as represented by these projects and makes reference to current pilot projects which, though smaller in scope, are stimulating and contain great promise. Chapter V of this paper will examine these applications in detail with reference to the philosophy of educational computing to be developed.

D. Analysis

The objective of this section is to draw some general observations pertinent to the brief history of educational computing. Much of what will be said will be derived from the one truly comprehensive analysis of this subject done by Anthony Oettinger. In 1969 Oettinger published the results of this study which he conducted at the Harvard University Program on Technology and Society. It was a lucid analysis of the then current status of educational computing entitled Run, Computer, Run. Most of his perceptive conclusions are still applicable. Oettinger focused his attention on the typical American school, ignoring both the progressive experimental school, the rural one-room schoolhouse, and the large urban school. In the process he found that, although educational computing held tremendous promise for education, "time and again in the brief history of computers, glowing experimental results have lost their meaning in the translation from pilot scale to useful operating size."[7] Instructional applications of the computer within the typical American school were generally a failure even though the aforementioned research efforts proved successful. In his text, Oettinger presents an extensive and accurate diagnosis of the causes of the overall failure of educational computing. Emmanuel Mesthene synthesizes and reaffirms this diagnosis in the "Foreword" to Oettinger's book:

> Both (the educational hardware and institutional setting, into which it is being introduced) are found wanting. The hardware itself is as yet much more primitive than is generally appreciated, so that fragile, unreliable, and expensive devices often gather dust in the classroom corner once the enthusiasm that greeted their arrival has subsided. Knowledge about how to apply the technology is even more primitive; teaching methods and curriculum remain virtually unmodified by the availability of new devices. The biggest obstacle to the rapid and effective introduction of technology into the schools is the structure of the American school system itself, which, in Oettinger's words, 'seems ideally designed to resist change.'"[8]

It will prove advantageous to categorize those factors contributing to the failure of educational computing into two broad classes. The first class would contain those factors which are external to the educational system. Here we have those problems which would hinder the application of computer technology within any institutional setting. The second class would contain only those factors which uniquely prevent the proper application of computer technology within an educational setting.

1. Prohibitive Factors External to the Educational System

There were a number of perplexing problems associated with the unsophisticated first and second generation computing systems. Computer hardware and communication networks were unreliable from an engineering perspective. Application systems and programs were either poorly designed or restrictive in scope. As a result, human users were unable to effectively interact with the computer. In particular, teachers, students, and administrators suffered the

same inconveniences in communicating with the computer as did users within the business and industrial community. Oettinger presents an excellent analysis of this situation with respect to educational computing:

> Troubles, as we shall see, arise from cost, amount, reliability, maintenance, complexity, comfort, standardization, integration, and content. In short, much longitudinal lead time is still between us and the realization even of glorified clerical functions.[9]

Financing the high initial investment of computing systems was a major concern for any institution, educational or otherwise. The business community required justification of expenditures in terms of clerical savings or valuable information obtained from the computing system. Within education, especially in the instructional applications of computer technology, better instruction, not economics, seems to be the rationalization behind utilizing the computer. Fortunately, adequate government and foundation funding was available to interested schools. However, since the publication of Oettinger's book, the economic situation has completely reversed, and funding for education has diminished drastically. Thus, over the past five years, lack of sufficient funding has limited research into educational computing.

2. Prohibitive Factors Internal to the Educational System

Besides the aforementioned traditional problems associated with computing systems, there exist problems unique to education which prohibit educational computing. The first is the bureaucratic

structure of the American school system. Oettinger describes this problem:

> Within the educational system, it is difficult to find an appropriate audience and, still more difficult, a boss to satisfy. Schools belong to everyone's experience. Consequently, everyone is aware of them and has an opinion about them...Technological change in education is, therefore, most often coupled with the polity within which educational policies and procedures are developed...Whenever some external sector of society or the schools themselves press for change in the schools, then the schools must in turn make their peace with all other linked sectors of society. Without external pressures or alliances the schools themselves rarely initiate change. If change seems undesirable to the schools but the external pressures are strong, the schools, like any institution, tend to adopt evasive tactics which take the form of change without the commitment to its substance.[10]

Closely associated with the bureaucratic problems of the American school system is the problem of educational objectives. Educators simply could not adequately define their educational goals and, therefore, the computer technician eventually designed systems which were unsatisfactory. (A parallel situation exists in business and industry wherein the manager does not know, or is incapable of communicating, his information needs to the systems analyst. As a result, costly and/or ineffective systems are produced.) The question of educational goals is an important one. Oettinger gives it serious attention as a primary factor behind unsatisfactory educational applications of the computer. (See Section 2.1, "Goals Stated," and Section 2.2, "Goals Realized," of Run, Computer, Run.)

We shall return to the matter of educational objectives in the following chapter. It is sufficient at this point to recognize that their absence is a significant factor prohibiting the proper application of educational computing.

E. Computers and Education - 1975

Computer technology has yet to revolutionize education. Rather, as America has continued to evolve toward a more technological society, the school, as a microcosm of that society, has continued to evolve in the same direction. Although the grandiose projections of the 1950's are far from realization, the computer is slowly becoming an integral component of American education.

Within the areas of educational research and school administration, the computer is no longer even novel. For example, graduate students pursuing advanced degrees in educational research are expected to be at least capable of executing statistical programs and many elect courses in computer programming. Students pursuing advanced degrees in educational administration are encouraged to familiarize themselves with the basic concepts of data processing. The fact that proficiency in a computer programming language such as FORTRAN, COBOL, or BASIC is now accepted as fulfilling the language requirement in doctoral programs by many prestigious universities testifies as to the acceptance the computer has received.

Within the instructional area the computer has made steady progress but has yet to reach the level attained within administration and research. The curriculum of many high schools now

reflects courses in data processing and computer programming; and many courses in various disciplines and at all levels use some basic form of CAI in conjunction with the standard classroom experience.[11] Currently, the application of CAI is limited, utilizing primarily the drill and practice or tutorial mode, and is usually associated with quantifiable disciplines. Also, its application is predominantly in those school systems which are located in affluent communities or those few fortunate enough to obtain funding. However, it should be emphasized that such is only the general situation today. There are exceptions, and CAI research and development, although not as extensive as in the previous decade, is more realistic and provocative. This subject will be addressed in detail in Chapter V.

F. Summary and Perspectives for the Future

Two observations are significant in trying to ascertain the future status and impact of educational computing. The first pertains to those factors which were external to the school system and prohibitive with respect to educational computing. Cost, reliability, maintenance, standardization, etc., which were identified by Oettinger as serious problems in 1969, have received the attention of the computer industry. Although these problems have not been eliminated, significant progress has been made. The basic indicators of this fact are the number of computers which are now in use throughout the United States, and the continued decrease in cost associated with the computer.[12] Computer technology and

the science of systems have made major advances over the past five years, and even a conservative futuristic projection would indicate continued progress. The second observation pertains to those factors which were internal to the American school system and inhibited educational computing. Unlike the technological problems which are in the process of being solved, the educational problems remain as Oettinger described them. The bureaucratic structure of the American school system and its lack of well-defined goals continue to hamper educational computing.

Due to technological improvements, the cost of a small computing system can be financed by many school systems. And, because a "good" school has a computer, the computer is becoming less of a luxury and more of a necessity. It is important to emphasize that the evolution toward educational computing is occurring without the sensationalism of the previous decade, but the serious philosophical questions which were raised then still remain unanswered. The internal educational problems of goals and bureaucratic structure serve to slow down the implementation of computers in schools. (Ironically, if one sides with the humanist in rejecting educational computing, these problems serve to its advantage.) However, it is only a matter of time before the computer will make its way into the classroom, and, if the problem of objectives with respect to educational computing persists, the results could be disastrous. Unless educators become aware of the implications of educational computing and establish their objectives accordingly,

the "tail wagging the dog" phenomenon could result wherein the technology dictates the educational policy.

An examination of current educational literature reveals that educational computing is not receiving the attention it did during the previous decade. (Simply, it has "gone out of style.") Yet the issue is even more crucial in that is is no longer purely academic. The technological obstacles are being eliminated. At the risk of crying "Wolf! Wolf!" for the second time, this author recommends that educators give serious attention to their choice of educational objectives in light of the impact of educational computing. More specifically, it is crucial that educators involved with computer technology proceed beyond debating the pros and cons of the computer and formulate what may be called a comprehensive "philosophy of educational computing." Here, this means the establishment of educational policies and practices derived from and consistent with a predetermined philosophy of education. The remainder of this paper is devoted to the development of such a philosophy.

CHAPTER I

FOOTNOTES

1. Louis Bright, Associate Commissioner for Research, U. S. Office of Education, has stated: "Computers have already altered both the techniques and concepts of school administration at elementary, secondary, and higher levels of education." Joseph Margolin and Marion Misch, Eds., Computers in the Classroom (London: MacMillan Co., Ltd.), 1970, p. x.

2. Patrick Suppes' statement is among the most grandiose of futuristic projections. He states: "One can predict that in a few more years millions of school children will have access to what Philip of Macedon's son Alexander enjoyed as a royal prerogative: the personal services of a tutor as well-informed and responsive as Aristotle."

   Patrick Suppes, "The Uses of Computers in Education," Information, (San Francisco: W. H. Freeman and Company), 1966, p. 157.

3. Henry Chauncey, President, Educational Testing Service, reflects this attitude: "Also, with the rising cost of education we shall need to seek more efficient and productive ways of running our schools and colleges, so that we know more accurately what we are getting for our money as we seek that level of quality which we all desire so much for our children. This is known in the jargon as 'more bang for the buck'....Though analogies are never perfect, in the last decade both the military and business establishments, each dealing with people and dollars, have taken a hard look at improved administration, individual productivity, and the cost-effectiveness of their operations, using methods that have come to be known as operations or systems analysis."

   Henry Chauncey in the Forward of John Pfeiffer's New Look at Education: Systems Analysis in our Schools and Colleges, (New York: The Odyssey Press), 1968, pp. vii-viii.

4. See "The Teaching Machine" by George R. Price in Arthur Lewis' Of Men and Machines, (New York: E. P. Dutton and Company, Inc.), 1963, pp. 131-140.

5. Both Marshall McLuhan and Norbert Wiener comment on these individuals from different perspectives. "Gadget lovers" is McLuhan's term. Wiener uses the expression "gadget worshiper." See McLuhan's Understand Media: The Extension of Man (New York: The New American Library), 1964, pp. 51-56, and Wiener's God and Golem, Inc., (Cambridge, Massachusetts: The M.I.T. Press), 1964, pp. 53-55.

6. Portia Elliott, Elementary Mathematics Teacher Training Via A Programming Language, a dissertation on file at the University of Massachusetts, 1973, pp. 19-23.

7. Anthony Oettinger, Run, Computer, Run, (Cambridge, Massachusetts: Harvard University Press), 1970, p. 186.

8. Ibid., p. ix.

9. Ibid., p. 179.

10. Ibid., p. 60.

11. See 1,000,000 Students, published by the Digital Equipment Corporation of Maynard, Massachusetts.

12. For specific details, see Mader and Hagin's, Information Systems: Technology, Economics, Applications, Science Research Associates, Inc., 1974, pp. 33-35.

CHAPTER II

PHILOSOPHY OF EDUCATIONAL COMPUTING: THE ABSENCE AND THE NECESSITY

Before proceeding to develop the proposed philosophy of educational computing, it will be meaningful to illustrate the absence of such from relevant academic literature, and then justify its inclusion. Chapter II is written with these objectives in mind.

A. Absence of a Philosophy of Educational Computing

1. The Absence

The absence of any comprehensive philosophy of educational computing can be observed by examining the literature on computer use in education. However, it will prove helpful to first take a broader perspective and comment briefly on the literature covering computers and society. In general, although much has been written on this topic, one is disappointed in searching for philosophical foundations which provide guidelines for the application of the computer in the social sphere. Harold Sackman's observation is most appropriate on this point:

> All sorts of articles, books, and stories have been written about the impact of computers and society. Some jaded readers may respond instinctively to the title of this chapter ('Computers, the Scientific Spirit, and Evolving Society') as just another Sunday supplement on the thrills, chills, and spills of computers in the scheme of

> things to come. The vast and continuing exposure of the subject in the mass media of communication, although often jarring and tiresome, nevertheless reflects a growing and deep concern, at virtually all social levels, over the implications of computers and for our own and for future societies. There is no coherent philosophy in this literature that proposes the systematic application of computers toward the extension of experimental method in social affairs.[1]

Sackman's "thrills, chills, and spills" is an accurate characterization of most literature on computers and society. However, important exceptions to his statement exist in the writings of Jacques Ellul, Victor Ferkiss, Emanuel Mesthene, Marshall McLuhan, Lewis Mumford, Norbert Wiener, and Sackman himself. These individuals have gone beyond descriptive statements and engaged in thought-provoking analysis of the nature and impact of technology. Of these, only Ferkiss, Sackman, and Wiener have progressed beyond analysis and proposed global philosophical structures to guide future technological development.

Ferkiss describes three basic elements of a new philosophy to guide the creation of technological man: new naturalism, new holism, and new immanentism.[2] Sackman proposes a philosophy of scientific system development based upon two broad cornerstones: the methodology of Dewey's experimentalism and humanistic automation.[3] And, Wiener establishes cybernetics as the only perspective for dealing with social problems.[4]

Returning to the more restrictive area of computers and education, we note that, although some of the aforementioned scholars have made reference to education, none have specifically developed a philosophy of educational computing. A significant portion of the literature

falls into the pragmatic "how to" category which describes computer hardware, educational software, and associated pedagogy. There is also a large body of literature which describes the advantages and disadvantages of educational computing, some of which falls into the "thrills, chills, and spills" category.

The shortcomings of this literature lie in evaluation. The authors' conclusions, pro and con, are typically premised upon some previously assimilated, but inarticulated, philosophy of education. For example, they might conclude that the computer is an effective means of teaching modular arithmetic without formally articulating the value and purpose of teaching modular arithmetic in the first place. Evaluations of educational computing are limited in that it is the effectiveness of the system in achieving some predetermined goal that is measured. Very little is said about re-evaluating the desirability of the goal itself. Nowhere in the literature on computers and education do we find an educator who has explicitly developed a comprehensive philosophy of educational computing derived from and consistent with a consciously articulated philosophy of education. Taking the first steps toward one such philosophy is the primary objective of this paper.

2. The Reasons for the Absence

Two factors are responsible for this absence of a philosophy of educational computing. The first factor is the relatively short history of automatic computing. The high-speed digital computer is just thirty years old. This is too short a time period for the full impact of computing to be recognized and incorporated within a philosophy of education. The second factor is that there is no parent

philosophy of education recognizable within the American school system. This is the primary reason for the absence of a philosophy of educational computing. Grosseman and Howe note the significance of a parent philosophy of education:

> A sound philosophy of education must precede a philosophy of automated systems. Without an educational philosophy and the concomitant goals, any attempt at automation would result in merely mechanizing existing operations with the result of doing needless things faster.[5]

The vast majority of American educators have no such philosophy of education. This point is a central theme of Charles Silberman's Crisis in the Classroom. Silberman criticizes prominent educators for their lack of philosophical perspective:

> The fashion in contemporary writing about education holds that talk about purpose is a frightful bore. Dr. James Conant, probably the most prestigious and influential contemporary student of education, has confessed that a 'sense of distasteful weariness' overtakes him whenever he hears someone discussing educational goals and philosophy. 'In such a mood,' he writes, 'I am ready to define education as what goes on in schools and colleges' --a definition that has prevented him from asking whether or not what now goes on should go on. Martin Mayer, an influential educational journalist, is equally disdainful of talk about goals. 'It is well to rid oneself of this business of the aims of education,' he states flatly in his book The Schools. 'Discussions on this subject are among the dullest and most fruitless of human pursuits.'[6]

Furthermore, Silberman attaches the label of "mindlessness" to the attitude reflected by Conant and Mayer, and concludes that it is the central problem of American education:

> What is mostly wrong with the public schools is not due to venality or indifference or stupidity, but to mindlessness...Teachers, principals, and superintendents are decent, intelligent, and caring people who try to do their best by their lights. If they make a botch of it, and an uncomfortable large number do, it is because it simply never occurs to more than a handful to ask why they are doing what they are doing--to think seriously or deeply about the purposes or consequences of education.[7]

Silberman's challenge to mindlessness requires each individual educator to become acutely aware of his philosophy of education. Every individual has some set of values, a "philosophy," which strongly influences his behavior. However, very often this set of values is unknown to the individual. This condition, unfortunately, applies to the majority of educators. The result is mindlessness. It can be rectified only if a significant number of individual educators begin to "think seriously and deeply about the purposes and consequences of education." They must become conscious of their "philosophy" and begin the process of formulating a real philosophy of education to serve as a guide in developing educational policy and practices.

The formulation of a philosophy of education is a difficult and very often frustrating task which is never really completed. (This topic will be addressed further in Chapter III.) However, at this point, it should be emphasized that a philosophy of education is more than a list of educational objectives. Geoffrey Squires' comment on this point is most accurate:

> Lists of broad educational objectives, such as those developed by the Educational Testing Service for the State of Pennsylvania appear to have very little logical or epistemological coherence - rather they seem to be an accretion of various discrete aims and objectives. There is no integrated picture of man behind them; instead, a multiplicity of roles and skills which may be balanced but have no sense of interior unity.[8]

A second problem with such lists of educational objectives is that they are simply ignored and therefore have little or no relationship to reality. Oettinger refers to this situation in his analysis of educational computing:

> It is, however, worthwhile asking what relation stated goals have to reality. If the two are close, then statements have not only their undeniable political value, but they may also be taken at face value in guiding systems analysis. If, however, reality is at variance with the words, one may expect to find in education the confusion and discomfort attending the simultaneous keeping of two sets of intellectual books. As we shall see, there is a sharp break between rhetoric and reality, with interesting political and technological repercussions.[9]

If the disparity between educational objectives and reality is to be avoided, educators must consciously establish a coherent philosophy of education to serve as a framework within which to develop a philosophy of educational computing. As we shall see in the next section, the evolution of educational technology has made the need for such a philosophy all the more imperative.

B. Need for a Philosophy of Educational Computing

The need for a philosophy of educational computing becomes apparent when one considers the powerful effects computers can have on educational systems. Of course, it is foolish to undertake even the most mundane and insignificant task without some particular objective in mind. Most "modern" educators, as disciples of the systems approach, are very cognizant of this point. However, their emphasis is often directed toward the implementation of the systems approach in behavioristic terms, with minimal attention given to philosophical justification of the system's objectives.

This applies especially to educators involved with educational computing. If educational computing were a mundane venture with trivial impact upon the educational process, there would be little need for such philosophical justification. But, this is not the case. An examination of the literature on computer technology predicts a profound impact by the computer in the near future.

If we agree with Victor Ferkiss in his comprehensive analysis of the impact of technology, the technological revolution is nothing less than an "existential revolution." Ferkiss elaborates on his interpretation of this expression:

> Humanity today is on the threshold of self-transfiguration, of attaining new powers over itself and its environment that can alter its nature as fundamentally as walking upright or use of tools. No aspect of man's existence can escape being revolutionized by this fundamental fact - all his self-consciousness that we call culture, his patterns of interaction that we call society, his very biological structure itself.[10]

The computer is one very significant component of this technological/existential revolution. Its potential impact with respect to education will be examined in detail in Chapter IV. At this point it is only necessary to acknowledge the power it affords those who control the computer. It is the magnitude of this power as applicable to education which creates the need for a philosophy of educational computing. Before elaborating on this statement, it will be useful to examine an analogous situation--in medical technology--which is more pressing and probably more familiar to the reader due to its coverage by the popular media.

The relationship between power and the need for philosophical guidelines is dramatically exemplified within the area of medical technology. Prior to the development of modern medical technology, the Hippocratic oath provided an adequate set of ethical guidelines for the physician to follow. The physician was required to do everything within his power to preserve the life of his patient. Because the physician had such little power relative to the forces of nature, the ethic of the Hippocratic oath was quite workable and rarely presented him with a moral dilemma. This is no longer the case.

Medical technology has virtually created a biological revolution. The physician is now able to preserve life under circumstances which heretofore would have been impossible. This situation raises new questions concerning the quality of life and the very definition of life itself. Research into the area of genetics and the birth of the science of eugenics indicate that the future will only present more difficult questions to be answered.

It is important to note that these questions have always been given consideration by both physicians and philosophers. However, it was always within the realm of the hypothetical. In the actual practice of medicine, it was the simple, but effective, Hippocratic oath which the ethical physician followed. New medical technology has given tremendous new powers to the physician. It has forced a reconsideration of the Hippocratic oath as well. There are many situations where a simplistic interpretation of this ethical code is no longer satisfactory for physicians who sincerely have the best interest of their patients at heart. The power given the physician now forces him to make existential decisions. For example, he is now occasionally called upon to decide if a human life is worth maintaining by extraordinary artificial means. Therefore, either the community of physicians must collectively develop a more workable ethic, or the individual physician must determine his own. In either case, the presence of a new power increases the need for philosophical guidelines.

The evolution of a parallel situation is just beginning in education. The advent of behavioral control technologies will afford those in control of education the power to achieve their educational objectives. Given this power, the need for a philosophy of education becomes all the more imperative.

The digital computer will be a significant component of any comprehensive behavioral control system. As London, in his study of behavioral control, comments:

> While all these new developments affecting individuals are proceeding, computer technology...discovers better and better data-processing methods, making it easier all the time to track and predict virtually any kind of mass behavior trend; this makes it easier, in turn, to forecast, then control, individuals who make up the mass.[11]

Besides its data processing capacities there are many other ways in which the computer can influence the behavior of students. These will be discussed in detail in Chapter IV. Here it is only necessary to emphasize the existential power inherent in the computer. We do so by referring to Norbert Wiener, a giant figure in the area of cybernetics. In God & Golem, Inc., Wiener goes to great lengths to dramatize the power inherent within the computer and, more importantly, the tremendous danger in exercising this power. He cites three simple legends, "Thousand Nights and a Night," "The Sorcerer's Apprentice," and "The Monkey's Paw," to illustrate his point. Quoting directly from Wiener:

> The theme of all these tales is the danger of magic. This seems to lie in the fact that the operation of magic is singularly literal-minded, and that if it grants you anything at all, it grants you what you ask for, not what you should have asked for or what you intend.[12]

Wiener continues:

> The magic of automation...may be expected to be similarly literal-minded. If you are playing a game according to certain rules and set the playing-machine to play for victory if you get anything at all, and the machine will not pay the slightest attention to any consideration except victory according to the rules.[13]

Returning to educational computing, we must recognize that the computer will bestow upon the educator powers of unprecedented magnitude. The availability of such power demands a philosophy of educational computing to guide the educator in determining the appropriate circumstances for its application. This philosophy must be based upon a philosophy of education which gives serious attention to educational objectives. For, with the application of computer technology, there will be greater chance that these objectives will be realized. The future will see the educator confronting the same crisis of choice with which the modern physician is just beginning to grapple. Only at a superficial level is there a distinction in their positions. Both must come to some conclusions, however tentative, regarding the basic questions of philosophy. Yet, unlike their predecessors, they will be forced to make decisions based upon their philosophy. Technology will have removed their choice of philosophy from the realm of the hypothetical.

CHAPTER II

FOOTNOTES

1. Harold Sackman, Computers, System Science, and Evolving Society, (New York: John Wiley & Sons, Inc.), 1967, p. 551.

2. Victor Ferkiss, Technological Man, (New York: New American Library, Inc.), 1969, pp. 202-223.

3. Sackman, Computers, System Science..., pp. 505-599.

4. Norbert Wiener, The Human Use of Human Beings: Cybernetics and Society, (New York: Avon Books), 1973.

5. Grosseman, D. and Howe, P.,(New York: Harper and Row Publishers, Inc.), Data Processing for Educators, p. 283.

6. Charles Silberman, Crisis in the Classroom, (New York: Random House), 1970, p. 6.

7. Ibid., p. 11.

8. Geoffrey Squires, "Education and Information A Framework for Futures," British Journal of Educational Technology, No. 2, Vol. 4 (May 1973), p. 109.

9. Anthony Oettinger, Run, Computer, Run, (Cambridge, Massachusetts: Harvard University Press), 1970, pp. 86-88.

10. Self-transfiguration is the key concept underlying Ferkiss' "existential" revolution. Self-transfiguration is also an important idea associated with the philosophy of Existentialism. Ferkiss uses the term "existential" in a legitimate though restrictive sense of self-transfiguration via technology. Such is the interpretation of which should apply for the remainder of this chapter. However, it is important to recognize its consistency and relevance to the philosophy of Existentialism to be described in the following chapter. See Victor Ferkiss, Technological Man, (New York: New American Library, Inc.), 1969, p. 28.

11. Perry London, Behavioral Control, (New York: Harper and Row Publishers, Inc.), p. 6.

12. Norbert Wiener, God and Golem, Inc., (Cambridge, Massachusetts: The M.I.T. Press, Massachusetts Institute of Technology), 1964, p. 59.

13. Ibid.

CHAPTER III

EXISTENTIALISM AND EDUCATION

A. Existentialism

Existentialism is not a systematic philosophy in the conventional sense. Rather, it is a label representing the philosophic position of a number of individuals who have reacted against the traditional philosophical systems of Western civilization. Or, as Kaufmann has said of existentialism:

> The refusal to belong to any school of thought, the repudiation of the adequacy of any body of beliefs whatever, and especially of systems, and a marked dissatisfaction with traditional philosophy as superficial, academic, and remote from life - that is the heart of existentialism.[1]

The existential movement has expressed itself in literature, drama, philosophy, psychology, and theology. In these areas the following individuals have become prominent as representatives of the existential position: Kierkegaard, Dostoevsky, Nietzsche, Sartre, Heidegger, Jaspers, Camus, Kafka, Beckett, Tillich, Buber, Marcel, and Frankl. There are, of course, significant differences in the positions held by these individuals. In fact, a number have specifically rejected the existential label because of strong disagreement with Sartre, one of the few who acknowledges the term. However, commentators on the exis-

tential movement feel justified in classifying these writers together because of their collective rejection of traditional systematic philosophy and their willingness to address common themes. These themes surround the subjective dimension of man, a subject which is either rejected or ignored by modern scientific philosophies. Strain emphasizes this point:

> Existential thinking focuses on the notion of paradox, despair, anxiety, absurdity, faith, hope, and love to indicate a man's personal relationships to the world, to others, and to himself.[2]

It is beyond the scope of this chapter to provide the reader with a comprehensive perspective of Existentialism. Such a perspective, though not vital to understanding the remainder of this paper, is recommended and thus the interested reader is encouraged to consult the bibliography for further information. What immediately follows is only the skeleton of existential thought as specified by Jean-Paul Sartre in his Existentialism and Humanism. Most Existentialists would probably accept the following statements as valid but might soon disagree if they engaged in a serious discussion on their interpretation. Sartre is quoted to illustrate the following four concepts which are considered to be intrinsic to Existentialism:

1. Existentialism is first and foremost a philosophy of man as a subjective being.

> Man is nothing else but that which he makes of himself. That is the first principle of Existentialism. And this is what people call its 'subjectivity,' using the word as a reproach against us. But what do we mean to say by

> this, but that man is of a greater dignity than a stone or a table? For we mean to say that man primarily exists - that man is, before all else, something which propels itself toward a future and is aware that it is doing so. Man is, indeed, a project which possesses a subjective life, instead of being a kind of moss, or a fungus, or a cauliflower.[3]

2. Man is free to choose; in fact, man must choose.

> Subjectivity means, on the one hand, the freedom of the individual subject and, on the other, that man cannot pass beyond human subjectivity. It is the latter which is the deeper meaning of existentialism. When we say that man chooses himself, we do mean that every one of us must choose himself.[4]

3. Man is responsible for his choices.

> Thus, the first effect of existentialism is that it puts every man in possession of himself as he is, and places the entire responsibility for his existence squarely upon his own shoulders.[5]

4. Choosing and being responsible for his choices involves anguish.

> The existentialist frankly states that man is in anguish. His meaning is as follows: When a man commits himself to anything, fully realizing that he is not only choosing what he will be, but is thereby at the same time a legislator deciding for the whole of mankind - in such a moment man cannot escape from the sense of complete and profound responsibility.[6]

The concepts of subjectivity, free choice, responsibility, and anguish are central to existential thought. The approach to these concepts varies among individual existentialists and very often, as we shall see, leads to other related concepts involving the existential state of man. In order to pursue this discussion of existentialism

further, it will be most helpful to borrow a structure recommended by Van Clev Morris in his text entitled Philosophy and the American School.[7] Here he advocates describing a philosophy in terms of its ontology, epistemology, and axiology. We shall do so, and also make extensive use of his insights bearing on the relationship of existentialism to education.

B. The Ontology of Existentialism

According to Morris the goal of ontology is to answer the question: "What is real?" Among the existentialists, Martin Heidegger has given this question the greatest attention.[8] However, since Heidegger's writing is probably the most complex of all the existentialists, we turn again to Sartre for a clearer explanation of existential ontology. He attempts to define the common element within all existential thought:

> What they have in common is simply the fact that they believe that existence comes before essence - or, if you will, that we must begin from the subjective.[9]

From this simple ontological statement, "existence comes before essence," Sartre proceeds to derive his aforementioned conclusions concerning choice, responsibility, and anguish as they necessarily relate to man. Sartre's position is accurately described by Morris:

> We can, say the Existentialists, develop all kinds of interesting theories concerning essence and existence in the universe at large. But when we come to Man we are stumped. Traditional philosophies have always assumed the priority in time of the essence of man over his existence...

> Existentialism begins by turning this priority upsidedown: In Man, existence precedes essence. We first are; then we attempt to define ourselves...as we perform this and that activity, make this and that choice, prefer this, reject that, we are actually in the process of defining ourselves, of providing the essence for which we search.[10]

According to the Existentialist, man cannot find an answer to the disturbing question: "Who am I?" There is no answer to be discovered by an ontological investigation. Each individual human being must create his own answer; he does so by the choices he makes. And, because there is no external agency to guide him in this project, he alone is responsible for the results of his choices. Herein lies the source of anguish which must accompany human choice.

C. The Epistemology of Existentialism

Epistemology, in the formal sense of the term (the study of the origin, nature, methods, and limits of knowledge), has not received much attention from existential philosophers. This situation is consistent with their ontological position and not due to any lack of insight or motivation to investigate the subject. Morris explains:

> Now when we use the word choice it is to be understood in its largest and fullest meaning. Making a choice is not confined to deciding to do something. It also includes deciding to believe something, to accept something as true. Hence we are confronted at the outset with the epistemological significance of the Existentialist ontology, namely, the existential freedom of man in choosing his own truth. Each man is his own supreme court of epistemological judgment, and he is, therefore, in an ultimate sense, absolutely on his own when it comes to deciding between candidates for truth.
>
> . . .

> All this suggests that the Existentialist has little to offer in a way of a method of knowing, a systematic epistemology. Rather, he is concerned with pointing out that in all knowing--sense perception, logical demonstration, scientific proof, intuition, revelation--it is the individual self which must make the ultimate decision as to what is, as a matter of fact, true.[11]

While attesting to the validity of the various methods by which man comes to know both himself and the universe, the existentialist strongly rejects any philosophical position which claims man can acquire an understanding of himself by purely objective methods of investigation. More specifically, the existentialist is at odds with those philosophers who claim that the scientific method is the best or the only way man can come to know himself. In acknowledging and giving priority to the subjective dimension of man, the existentialist asserts that man can and does come to know himself in a sense that cannot be incorporated within the scientific method. This condition establishes a duality in modes of knowledge. Morris simply calls these "Mode One" and "Mode Two," defining them as follows:

> To put this plan in plain language, we can say that in Mode One I am conscious of an existential world (somewhat in the manner of the Realist;...), and that in Mode Two I am also conscious of my consciousness of this world. I somehow know my own existentiality.[12]

Morris identifies science as a Mode One type of knowing. However, for all its successes, the existentialist places a higher priority on the Mode Two form of knowing, even though this may be called a retreat into mysticism or poetry:

> Nevertheless, the Existentialist insists on the validity, indeed the primacy, of 'Mode Two' knowing. Each one of us recognizes this knowing within himself. Although we cannot report on it concerning other people, we certainly cannot deny its existential presence within our own being. If this be poetry, let it stand. For there is a kind of knowing in poetry, after all. Poetry is not sterile of epistemological content.[13]

Thus we see that the epistemology of the existentialist is an open-ended affair, the only definite assertion being the admission of some form of a subjective (Mode Two) path to knowledge.

D. The Axiology of Existentialism

Axiology, the study of ethics and aesthetics, is, for the existentialist, dictated by his ontological position. Ultimately, it is the individual who must determine what is good and beautiful. This may involve an unpopular individual act of conscience of a revolt from the public norm in the creation or appreciation of a work of art. The individual may elect to be guided by some code of ethics or aesthetic standard. However, he must first freely choose the particular code or standard, and, in so doing, is responsible for this choice.

The absence of any pre-existing set of guidelines to aid in ethical or aesthetic decision-making implies that existential axiology, at its most fundamental level, is value free. This is not to profess amorality or aesthetic indifference. In fact, especially in the realm of ethics, the exact opposite is true. Morris emphasizes this point in his discussion of comparative axiologies:

> If Experimentalism has given over a lion's share of its time to value theory, we may safely say that Existentialism is almost obsessed with it. For Exis-

> tentialism is principally a value theory, a philosophy according to which everything must pass through a funnel of choice. And since choice if fundamentally an exercise in valuing, the entirety of philosophical content in Existentialism may be described as axiological.[14]

Recognizing the existential given fact of necessary human choice without any pre-existing standards of value, the existentialist professes that it is by exercise of this choice that axiological values are determined. Quoting again from Morris:

> Let us, says the Existentialist, go the whole way in ethical theory and simply say what we must say, namely that our values consist of our own choices. In choosing we make our values out of nothing. No God, no pope, no society can tell me what I must value.[15]

It is the recognition of this reality which leads to the existential notion of anguish. Individual existentialists, confronting the anguish of choice, have taken varying positions on ethical situations and problems. Any attempt to generalize their conclusions is doomed to failure. However, it would be safe to say that, because the focal point of existential philosophy is man, the literature of existentialism has a strong flavor of humanism. Sartre, in response to critics who claim existentialism is unjustifiably obsessed with the dark side of human existence, has specifically described existentialism as a kind of humanism:

> Many people are going to be surprised at what is said here about humanism. We shall try to see in what sense it is to be understood. In any case, what can be said from the very beginning is that by existentialism we mean a doctrine which makes human life possible and, in addition, declares that every truth and action implies a human setting and a human subjectivity.[16]

E. Science and Technology: The Existential Perspective

In general, existential writers tend to emphasize the negative dimension of science and technology:

> In terms of its content, modern existential thinking focuses on the human person in a technological and scientific age. Many existentialists are pessimistic about modern life and indicate that utopianism based on science is an illusion. They believe science and technology have brought human beings loneliness and alienation rather than peace and progress. The institutional organization of science, by and for the state, has dehumanized man.[17]

For sure, the existentialist is aware of the absurdity of the modern age. Thanks to the ingenuity of the technocrat, heads of state now engage in "rational" discussion about over-kill weapons systems. Realizing that there exists no force inherent in the nature of the universe which necessarily dictates the continued existence of man, and yet being deeply committed to the preservation of this fragile being, the existentialist experiences greater anxiety in the insane presence of over-kill weapons systems than one who harbors the humanist's vision of an anthropocentric universe.

This negative perspective of science and technology is justifiable. However, an outright rejection of science and technology is not the only legitimate position an existentialist may take. This subject warrants further investigation. The final chapter will do so within the context of educational computing.

F. Existentialism and Education

Partly due to the fact that existentialism is a very recent philosophy, not much has been said explicitly on the subject of education by the major existential writers. Among the leading existentialists only Martin Buber has given more than a passing reference to education. However, secondary commentators on existentialism and philosophers of education have examined the educational implications of existentialism. What follows is a brief description of the various dimensions of education upon which some consensus of opinion among existential educators exists.

1. The Aims of Education

Philosophers of education are most consistent regarding the objectives of an existential education. The goals of education are basically the goals of existential philosophy itself. Mitchell Bedford, in his text, Existentialism and Creativity, enumerates twenty-two such goals according to four leading existential philosophers: Soren Kierkegaard, Martin Buber, Karl Jaspers, and Jean-Paul Sartre. Eleven of these goals, common to all four writers, are listed below:

1) The starting point for self-knowledge is in subjectivity. Man can never divorce himself from the subjective.

2) Man must undertake a search for stability, he must not take things for granted, his behavior must be purposive; he must be purposive, he must will himself to be, he is sustained becoming.

3) Man must seek to know himself.

4) Man can alter his situation, elaborate himself; man has free choice, he is not in a final situation, he is free to create.

5) The authority of man's action must be based on his own choice. There are no compelling external situations.

6) Man must accept his limitations, his fastidiousness, his ultimate situations.

7) Man must accept the fact that life contains tragedy, that he must be anxious, that he is problematic to himself.

8) Man is conscious that he exists. He can reflect - or is reflection - on his existence. He can transcend his physical limitations. He becomes what he is not.

9) Man is dependent upon the judgment of others for maximum self-knowledge. Others help to shape his being.

10) Man should learn to exist within his community; he needs love; he should avoid a crowd.

11) Man must not force his convictions on other people, although he will aid them to want to know themselves.[18]

The aforementioned educational objectives are various aspects of the main existential goal, which according to Bedford is "Man must come to know himself."[19] Thus we see that the educational objectives are similar to those of the human potential movement with their desire to educate the whole man. The significant difference in these two approaches to education is that existentialism emphasizes the individual in a radical manner in comparison with humanism. It is also worth reiterating at this point Sartre's exposition of existentialism as a kind of humanism. Therefore, although the humanist and existentialist may differ regarding the ontological status of man and the cosmos, their educational objectives are almost identical.

2. The Curriculum

Given the strong humanistic flavor of the existential educational objectives, most existential philosophers of education recommend that the "humanities" dominate the curriculum. This position is articulated by Morris:

> The Existentialist school would probably start from the 'humanities' end of the curriculum to develop its program. That is, it would tend to emphasize those subject matters in which private choice and decision have greater prominence, namely, the arts, philosophy, literature, creative writing, the drama, etc. This follows from the view that the subjective growth of the individual is the most important kind of growth.[20]

This is not the only position held by existentialists about the curriculum. If one acknowledges freedom and responsibility within the student, as the existentialist does, it would be inconsistent to demand that the student be limited to a curriculum with any permanent bias whatever. Dupuis and Nordberg express this opinion as being held by other prominent existentialists:

> It is worth noting, however, that Nietzsche, Kneller, and Ralph Harper do not demand that history, science, mathematics, and the like be thrown out of the curriculum. Their criticism is leveled at the impersonal, cold, and dry-as-dust approach to subject matter found in schools.[21]

They continue:

> The existentialist is not so much concerned with the actual courses or subjects in the curriculum as he is with what the teacher and (most especially) the student does with them. The exercise of existential freedom within the curriculum is more important than the curriculum content.[22]

It is this second position on the curriculum which will be advocated in the next chapter where educational computing will be incorporated within the existentialist's philosophy of education.

3. Student - Teacher Interaction

Both the student and the teacher are to be recognized as individual human beings engaged in the serious enterprise of education. Their relationship should be one of sincere human communication and not restricted by unnecessary formal structures. Harper specifies the nature of this relationship:

> But whenever there are these three elements, the teacher, the pupil, the curriculum, there is the possibility of education. Whenever two are together with a third thing, which takes both out of themselves, there is education. And the only difference between pupil and teacher is that the teacher leads, while the pupil is moved. But he who is moved now may in the next sentence, even in his moving, lead his teacher, who then becomes the pupil.[23]

This implies that education is a natural process which is in no way contingent upon the formal notion of "schooling." Yet, planned education must take place somewhere, and it is the teacher who is responsible for establishing the educational environment. Buber elaborates on this point:

> The world--that is, the whole environment, nature and society--'educates' the human being: it draws out his powers, and makes him grasp and penetrate its objections. What we term education, conscious and willed, means a selection by man of the effective world; it means to give decisive effective power to a selection of the world which is concentrated and manifested in the educator. The relation in education is lifted out of the purposelessly streaming education by all things, and is marked off as purpose.[24]

This "selection of the effective world" for the student is a delicate matter. The educator must establish conditions and carry out a dialogue with the student which will engender the existential growth of the student, yet avoid imposing his own convictions upon the student. Again we refer to Harper:

> The good teacher aims to produce, not replicas, but men and women who stand apart from him even more distinctly than when he first met them. The good teacher does not want imitators but, rather, men and women who through their education have experienced the shock of discovering the infinite depths of the world and truth without giving up any of the partial truths they have encountered along the way... A teacher knows he has succeeded only when he has evidence that his pupils can hold something to be true that he himself is convinced is true, without having come to this truth by imitating the teacher, by reasoning, or by any other powers of persuasion, including the persuasion of example.[25]

As with the curriculum, there is no single specific methodology which the existential educator employs to achieve his objectives. In part this is premised on the fact that each student is to be confronted as the unique individual who he is. The teaching techniques should be dictated according to the particular needs and desires of the individual student. However, even though there is no absolute methodology associated with an existential education, existential philosophers have made several recommendations which are worthy of consideration.

Bedford echoes the methodology of the experimentalist in noting that "learning is accomplished by doing, action, and applying the lesson material."[26] Morris, being consistent with the existential epistemology,

agrees with Bedford while dramatizing the subjective dimension of the student's experience:

> First of all, whatever method of teaching is selected and emphasized, it must be one which recognizes that the learner learns from the inside out, so to speak. This means, among other things, that the learner in school must be encouraged to identify with his subject matter, to identify with it emotionally so that he can announce a personal reaction to it.
>
> . . .
>
> Therefore, in every subject matter (if we retain the subject curriculum) a real effort must be made to involve the learner directly. He must get personally tangled up in the subject matter.[27]

Kneller sees student participation in simulations as a legitimate technique toward stimulation of personal reactions. He describes his approach in teaching ancient history to seventh-graders:

> I stress the men themselves who were responsible for these events. I consider them as actors playing out their respective roles in the great encounters of politics. I divide the different parts among my class--Julius Caesar, Pompey the Great, Brutus, Mark Anthony, Cicero, Octavianus. To relive the past, we must cease to be its spectators and become instead its agents.[28]

Kneller also recommends the revival of the Socratic method as a technique to encourage a personal response on the part of the student. However, Buber is the existentialist who has the most to say regarding the dialogue between the student and teacher. His concept of an I - Thou dialogue (vs. an I - It conversation) goes beyond the Socratic method in encouraging a deep, sincere, subjective communication between

the student and teacher. This is more than a methodology for Buber; it is the essence of his philosophy.[29]

The aforementioned educational techniques appear to be amenable to an existential education although existential educators have had little to say regarding the particulars, e.g., student's age, level of intellectual and emotional development, culture, sex, etc., in their application. To a certain degree this may be intentional. The existentialist is reluctant to specify educational algorithms, for it is the teacher's responsibility to come to know his student subjectively, as an individual, and to make decisions accordingly. Perhaps the only maxim which can be offered to the teacher is that he must set an example himself. He must be actively and consciously involved in his own existential growth. Without this prerequisite, any methodology is doomed to failure.

G. Educational Computing

The issue of educational computing has not been investigated within the context of an existential philosophy of education. However, given their general distrust of science and technology and radical emphasis on the subjective dimension of man, it is reasonable to conclude that existential educators would be inclined to reject, rather than accept, the computer into the schoolhouse. Yet, this tenuous conclusion merits further examination. The issue of educational computing is too complex to permit a simplistic good/bad judgment. (This is not to deny the legitimacy of the existential educator rejecting the computer after serious consideration.) Likewise, the often-heard opinion,

"the computer is a tool; it's neutral; it depends on how it is used," is overly simplistic.

The remainder of this paper is devoted to a clarification of the issue of educational computing as it pertains to an existential philosophy of education.

CHAPTER III

FOOTNOTES

1. Walter Kaufmann, Existentialism from Dostoevsky to Sartre, (New York: The World Publishing Company), 1970, p. 12.

2. John Strain (ed.), Modern Philosophies of Education, (New York: Random House), 1971, p. 283.

3. Jean-Paul Sartre referenced by Morton White in The Age of Analysis, (New York: Mentor Books), 1955, p. 124. (Quoted from original source Existentialism and Humanism by Sartre.)

4. Ibid., p. 125.

5. Ibid., pp. 124-125.

6. Ibid., p. 126.

7. Van Clev Morris, Philosophy and the American School, (Boston: Houghton Mifflin), 1961.

8. See Heidegger's Sein and Zeit, translated by John Macquarrie and Edward Robinson as Being and Time (London; SCM Press, and New York: Harper and Row, 1962).

9. Sartre in White...p. 122.

10. Van Clev Morris...p. 74.

11. Ibid., pp. 166-167.

12. Ibid., p. 168.

13. Ibid., p. 172.

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CHAPTER IV

TOWARD AN EXISTENTIAL PHILOSOPHY OF EDUCATIONAL COMPUTING

A. Why Existentialism?

The first and most reasonable question the reader may ask is "Why an 'existential' philosophy of educational computing?" The answer to this question is threefold: (1) Existential thinking focuses on problems unique to the twentieth century--in this case, the computer; (2) Misapplication of educational computing threatens existential/humanistic values; and (3) The author professes a personal predisposition in favor of the existential creed. Let us examine each reason in more detail.

The first reason for favoring existentialism stems from this paper's concern with the digital computer, an invention of the twentieth century, and perhaps the most powerful and versatile tool yet developed by man. The computer, while it has solved many of man's problems, has also presented man with new problems which he has not encountered historically. (For example, a citizen's right to privacy is now threatened by computerized data banks.) Existentialism is a philosophy of the twentieth century and addresses itself to problems which are developing during this period.

Quoting from Harper:

> A man born in the twentieth century has problems which were not problems for a man living one hundred or seven hundred years ago. And existentialism directs one's attention to this fact.[1]

This position is also articulated by Bedford who claims that the twentieth century has had a "catastrophic effect on the development of human personality." In offering evidence for this opinion, he describes three conditions which, as illustrated below, can be associated with misuse of the computer:

> 1) There is a great leveling process underway, and there is a tendency to think only in abstractions or generalities.
>
> 2) The age is one of mechanization, objectification of man and organizations - Man is a cog in the wheels.
>
> 3) The individual is no longer held responsible for what he becomes. He is enmeshed in a feeling of helplessness.[2]

It is the potential dangers associated with educational computing that gives rise to the second reason for advocating an existential philosophy of educational computing. In the following section it will be demonstrated that the many differing criticisms so often leveled at educational computing have a common thread; namely, each problem can be perceived as a threat to some important existential value. (This situation could conceivably justify outright rejection of educational computing by existential educators. This author is not sympathetic toward such a negative response. However, this is not to deny its validity.) This author contends that an educational environment permeated with an existential atmosphere is a safeguard against the dangers inherent in educational computing. The philosophical rationale behind this conclusion will be examined thoroughly in Section C.

The last and most important reason for advocating an existential philosophy of educational computing is a personal one. Simply, this author chooses to echo the attitude of Bugental who, in defending existentialism as the philosophic foundation of his humanistic approach to psychotherapy, says:

> In the simplest, most candid terms, the existential perspective simply feels right. As I read what others have written about the existential perspective, as I employ it in my own work, there is a sense of closure and even, at times, of elegance.[3]

The brief description of existential philosophy presented in the previous chapter stands as the foundation for the philosophy of educational computing to be developed here. It will serve as this author's set of "axioms" because of its appeal in being consistent with his personal perspective of man and the cosmos.

B. The Negative Dimension of Educational Computing: An Existential Perspective

In this section the various dangers of educational computing will be enumerated. Most of these have already been specified by critics of educational computing. Our intention here is to illustrate that, upon inspection, one can detect a common thread in this criticism: Each insensitive application of educational computing promotes conditions which are contrary to existential objectives. It is important to recognize that these pitfalls are not overt as in the case of nuclear weapons or industrial pollution. Rather, their influences are subtle, falling primarily in the realm of

psychology, possibly even to be thought of as causing psychic destruction. It is beyond the scope of this paper to perform an in-depth analysis of each topic examined here. The intention here is to simply make reference to the particular negative dimensions of educational computing and document their relevancy to existential philosophy.

1. Educational Data Banks

The issue of computers, data banks, and information storage and retrieval systems as they relate to a citizen's right to privacy has been the topic of much discussion for which there exists a growing body of literature.[4] Records maintained by educational institutions would necessarily be a significant component of any truly comprehensive data bank. Most discussion of the privacy issue is political and sociological, reflecting its close association with the establishment and maintenance of a totalitarian society. Obviously, such a society, regardless of its political philosophy, would be repugnant to the existentialist. However, the presence of computerized data banks can have a psychological impact other than detering rebellious activity by fear of detection. In this section we specifically examine the negative influences pertinent to educational data banks. We focus on this issue as it affects both the teacher and the student.

a. Negative Influences Upon Educators

The existential educator is expected to be acutely aware of and willing to accept the responsibility for the important deci-

sions he must make which affect the lives of his students. The basis of his decisions should be a knowledge of his students as individuals, not as quantifiable objects. However, the modern trend is toward the scientific approach to decision-making. This has made the computer a welcome tool. And, to the degree that it has made possible the manipulation of data in a manner which was heretofore impractical, it has reinforced and perpetuated the scientific cult.

Those who defend use of the computer in decision-making emphasize that the computer only provides information for a human agent who should always have the final word. In principle, this position is correct. If the individuals who make final decisions are sympathetic with existential values and do not become enchanted with the mystique of the computer, the information provided them could prove to be a legitimate tool for responsible decision-making. Unfortunately, man is a fragile being who may seek to avoid the anguish of making a decision. Our cultural values are the "hard-nosed" analytic approach to problem-solving. Therefore, the individual who conforms to that cultural pressure and formulates an opinion primarily on the basis of computer output will be subject to less criticism than one who does not, in the event of disaster.

The authors of Technology and Values at the Harvard University Program on Technology and Society, while making no statements advocating existentialism as a philosophical system, do reflect an awareness of the existential state of man and the dangers

inherent in computer decision-making:

> The frailty of man in making decisions increases with the growing complexity of the world and the diminution in individual identity and responsibility. Today man can more easily escape the freedom and responsibility of choice through the use of the computer. After all, who can be held responsible for a decision by a computer? Man looks for someone or something outside himself that has the qualities he feels lacking in himself--solidity, infallibility, and so on.[5]

Erich Fromm, a psychoanalyst associated with the existential movement, has made a comprehensive study of man's tendency to avoid responsibility in his Escape From Freedom.[6] He asks the following questions and answers them affirmatively:

> Can freedom become a burden, too heavy for man to bear, something he tries to escape from? ... Is there not also, perhaps, besides an innate desire for freedom, an instinctive wish for submission?[7]

Fromm proceeds to examine the mechanisms of escape. He specifies three: authoritarianism, destructiveness, and automation conformity. It is the third mechanism of escape, automation conformity, which he says is of the greatest social significance. Fromm describes this particular mechanism as the solution adopted by the majority of "normal" members of modern society and defines it as follows:

> To put it briefly, the individual ceases to be himself; he adopts entirely the kind of personality offered to him by cultural patterns; ... The person who gives up his individual self and becomes an automation, with millions of other automations around him, need not feel alone and anxious anymore. But the price he pays, however, is high; it is the loss of his self.[8]

Returning to educational computing, we now ask two questions: (1) Will school administrators submit to the tendency to escape from freedom

and conform to the scientific cult of modern management to the point that they lose perspective of their existential responsibility as educators? and (2) Will the computer, in serving to perpetuate standardized testing, measurement, and objective record-keeping, influence educators to make important decisions regarding students without "knowing" each individual student in the sense advocated by existential philosophers of education? Unfortunately, this author answers "yes," tentatively, to both questions and speculates that such is already happening.

b. Negative Influences Upon Students

Guiding the student in his search for self-identity, helping him in his struggle for an answer to the question "Who Am I?" is a paramount concern of the existential educator. Quoting from Morris:

> The educator's task is to place at the disposal of the young as many different 'climates' as he can conceive of: ...From these 'climates' the youngster's own selfhood will create its own climate: It will select out of this endless continuum of possible human experiences what it considers relevant to its fulfillment as a unique and ultimate human self.[9]

The student will make many errors in his choosing, for which he is responsible and may suffer. But no mistake is absolute in the sense that he cannot again choose, and thus redefine himself. This is the essential process of self-

definition. The individual, because of his subjective dimension, is open-ended; he never defines himself in an absolute sense; rather, he is always "becoming," continually defining himself through his choices. Again we refer to Morris:

> There is a kind of 'infinity' to the Existentialist conception of self so final and absolute as to prejudice in advance any 'definition' we might draw up of the Perfect Man. One of Existentialism's central tenets is that the Idea of Man is not yet finished. We help make this Idea with our lives, with our choices.[10]

Now, returning to the issue of educational data banks, it is obvious that such could permanently hinder an individual's efforts at re-self-definition. Therefore, it becomes more difficult to follow the old American tradition of "going West to get a clean start on life." The maintenance of an education file on the student contributes to what Schachtel calls a "paper-identity." (Schachtel does not address the automation dimension of this problem. He speaks of passports, driver's licenses, etc., but the key characteristic of a paper-identity is that it is something fixed and definite.) Schachtel's central point is the association of a paper-identity with alienation, a major concern of the existentialist:

> Such paper-identity seems far removed, at first glance, from the current concern of psychoanalysts, philosophers, and other students of the contemporary scene, with man's search for and doubt in his identity. But actually it is quite central to it. It is a telling symbol of alienated identity. It is a kind of identity which is the product of bureaucratic needs of commerce and administration.[11]

It is one thing, and bad enough, to have a paper-identity tagged onto an individual by a bureaucracy. However, the real tragedy occurs when the individual, in his "escape from freedom," accepts and acknowledges this identity. Schachtel, reflecting the concern of an existentialist, describes this tragedy:

> In our own and many other societies the loss of identity takes place without the terror of the concentration camps, in more insidious ways ... They tend to accept the paper-identity as their real identity. It is tempting to do so because it is something fixed and definite and does not require that the person be really in touch with himself.[12]

From an existential perspective the acceptance of a false objectified identity is the most dangerous pitfall to be associated with the continued expanded data banks by school administrations. It could serve to saddle the student with a fixed, definite identity--a package of adjectives similar to those describing the quality of meats in the butcher shop--which, unfortunately, only a few of the strong-minded fully reject.

2. Computer Assisted Instruction (CAI)

In this section the expression "Computer Assisted Instruction" is used in the restrictive sense, implying the traditional drill and practice and tutorial modes only. (Other modes of CAI have been suggested, and these will be examined later.) At this point our intention is to illustrate that CAI, as it has been conventionally conceptualized and implemented, is not easily compatible with an existential education.

The first and most conspicuous conflict arises because most traditional CAI systems are developed within the framework of a behavioristic model. The computer, usually via a remote terminal, presents some information and a question (the stimulus) to the student. The student answers the question (the response). The computer then examines the student's answer relative to the objective of the lesson, presents its evaluation (positive or negative feedback) to the student, and starts the cycle over again by selecting and presenting more information and questions. Barry et al., comments on the restrictiveness of this approach:

> ...Much of the work in educational computing has been done by people who narrowly construe "computer-aided instruction" as an extension of programmed instruction, and the computer as a successor to the Skinnerian teaching machine.[13]

Many favoring the scientific approach to behavior are satisfied with the traditional form of CAI. However, the existentialist completely rejects the behavioristic model of man. For the existentialist, man is more than a "black box" whose

behavior can be conditioned and thus predicted by establishing the appropriate environmental conditions. Given the conflicting concepts of man held by the behaviorists and the extentialists, it is reasonable that their educational objectives would differ, as they in fact do. But CAI is not an educational goal; it is a methodology by which an objective is achieved. Thus an interesting and important question presents itself. Is it permissible for an educator to borrow the techniques of a philosophy of education contrary to the one he identifies with? Specifically, should the existentialist utilize tools of the behaviorist? Although there is no unequivocal answer to this question, it seems reasonable that the existentialist would be skeptical of their benefit. We will return to this issue in discussing educational methodology in the final chapter.

A second concern with respect to traditional CAI is that of control. Within the behavioristic model it is the computer, not the student, that has primary control during the student-computer interaction. Even the teacher has a secondary role. Elliott,in her discussion of three representative CAI projects, identifies this situation as a negative aspect of traditional CAI:

> Student and teacher control in these projects is limited. Students have some control over work sequences, over auxiliary materials they will use, and when they will start and stop. Teachers, in the same vein, have some authority over which 'pre-packaged' materials they will give to students, and in some cases, they control the amount of time students will spend at terminals.

> Lessons are doled out to students on a reward-punishment basis -- if the sequence is correct, branch to the next sequence; if incorrect, try again. And, rigid roles are prescribed for teachers using this computerized material.[14]

In that the existential educator prefers the student to have a maximum control over his educational experience, he would agree with this criticism. A small group of educators, recognizing this problem, have begun to investigate alternative modes of CAI which turn over control of the learning experience to the student. In Chapter V we examine their efforts with respect to existential educational philosophy.

3. Indirect Psychological Influences

In the two previous sections we examined the existential implications of administrative data banks and CAI. These are circumstances in which some overt action is taken--a student's file becomes part of an educational data bank or he participates in a CAI lesson. The student is directly affected by the presence of a computer. Here we propose to examine the more subtle influences of the computer within an educational environment. We ask: Does the computer, by its mere presence, have a psychological impact on students, and, if so, what is the nature of this influence? We answer this question affirmatively. However, it must be stressed that this is a tentative answer. The question is complex and has not been researched. What follows should be

considered only as the speculations of this author and his rationale for such.

We begin by acknowledging some merit to Marshall McLuhan's thesis, "the medium is the message," and then proceed to speculate upon the "message" intrinsic to the computer. McLuhan, in his Understanding Media, issues a strong warning to beware of the naive notion, so often heard with respect to the computer, that technology is neutral and it is how it is used that is important:

> The electronic technology is within the gates, and we are numb, deaf, blind, and mute about its encounter with the Gutenberg technology, on and through which the American way of life was formed. It is, however, no time to suggest strategies when the threat has not even been acknowledged to exist. I am in the position of Louis Pasteur telling doctors that their greatest enemy was quite invisible, and quite unrecognized by them. Our conventional response to all media, namely that it is how they are used that counts, is the numb stance of a technological idiot.[15]

McLuhan has much to say about the subtle influences of electronic technology. It is our intention here to bypass the intricate detail of McLuhan's work, and simply emphasize his point that electronic technology is not simply some neutral tool, to be used for good or evil purposes. We ask: What message, what values does the electronic digital computer communicate by its mere presence in our environment? Our investigation is similar to that of the cultural anthropologist who endeavors to draw conclusions about an ancient civilization by examining

the physical artifacts of that civilization.

Although it is possible to find many "messages" within the computer, the most obvious is the high value our culture places on the objective scientific approach to problem-solving. More specifically, the computer can be visualized as the twentieth century epitome of rationalism. And, to the degree that the computer finds enthusiastic acceptance within the school, the message of the value of rationalism is transmitted to students.

The existentialist would be concerned about the impact of the message of rationalism upon students. Carruth effectively articulates the existential position on rationalism:

> Existentialism is a recoil from rationalism. Not that existentialists deny the role of reason, they merely insist that its limits be acknowledged. Most of them would probably like to think their speculations are eminently reasonable, yet not rational; and they emphasize the distinction between terms.[16]

As was mentioned in the previous chapter, very little work has been done by the prominent existentialists in the area of epistemology. They are inclined to accept various methods of arriving at truth, including rationalism, but also insist on a subjective path to truth. (This was labeled "Mode Two" by Morris.) However, one leading existentialist, Martin Heidegger, has examined the nature of thinking, and his analysis is significant within the context of educational computing. Heidegger

distinguishes between two types of thinking, calculative thinking and meditative thinking:

> Whenever we plan, research, and organize, we always reckon with conditions that are given. We take them into account with the calculated intention of their serving specific purposes. Thus we can count on definite results. This calculation is the mark of all thinking that plans and investigates. Such thinking remains calculation even if it neither works with numbers nor uses an adding machine or computer. Calculative thinking races from one prospect to the next. Calculative thinking never stops, never collects itself. Calculative thinking is not meditative thinking, not thinking which contemplates the meaning which reigns in everything that is.[17]

Heidegger defines man as a "meditative being" and indicates that his obsession with calculative thinking is symptomatic of man's flight from the essence of his humanity. Thus, although Heidegger does not address the impact of educational computing, it seems reasonable to conclude that he and other existentialists would take an opposing position if the computer were to dominate the educational environment in perpetuating the value of calculative thinking at the expense of meditative thinking.

The fact that educational technology can affect the atmosphere of the school has not been generally recognized. Charles Silberman in Crisis in the Classroom is an exception. He quotes Emmanuel Mesthene, Director of the Harvard Program on Technology and Society, who seems to echo McLuhan:

> 'What's good for educational technologists, Emmanuel Mesthene dryly warns, 'is not necessarily good for education.' The problem is part of a more general one. 'Our technologies today are so powerful, so prevalent, so deliberately fostered, and so prominent in the awareness of people,' Mesthene argues, 'that they not only bring about changes in the physical world -- which technologies have always done -- but also in our institutions, attitudes and expectations, values, goals, and in our very conception of the meaning of existence.'[18]

Although neither Silberman nor Mesthene identify themselves as existentialists, their concern with values, goals, and the meaning of existence as it relates to educational technology reflects a sympathy toward the existential position.

Next, we proceed to an even deeper level and speculate upon the possibility of the computer influencing the student's concept of identity. Previously, when discussing Schachtel's notion of a "paper-identity," we were concerned with the student coming to identify himself with the image protrayed by the information contained in a data bank. The content of the data bank may influence the student to conceive of himself as bright, dull, introverted, extroverted, creative, etc. It should be noted that each adjective depicts a quality which has historically been unique to human beings. Thus, even if the student came to picture himself as lacking in creativity, he was at least an uncreative human being. We now suggest what, upon initial inspection seems almost preposterous, namely, that the presence of the computer can be instrumental toward influencing the child to

incorporate a mechanistic self-image.

We begin by indicating that the issue of man being likened to a machine cannot be all that preposterous in that it has received the attention of serious philosophers during the seventeenth and eighteenth centuries as a theoretical issue. And, since the advent of actual mechanical "thinking" machines, most recently exemplified by the general-purpose digital computer, this idea, called mechanism, has been revived by modern philosophers of science.[19]

However, in that philosophers have also discussed angels dancing on the heads of pins, mere discussion of mechanism does not necessarily imply philosophical significance. Our immediate interest is psychological, not philosophical. We are concerned with an individual developing a warped sense of identity; that of a machine. (It is certainly questionable whether those philosophers who defend mechanism really believe that they themselves are machines.) Dramatic evidence that a human being can actually assume such a mechanical self-image has been documented by Bruno Bettelheim in the case of Joey, a "mechanical boy":

> Entering the dining room, for example, he would string an imaginary wire from his 'energy source' - an imaginary electric outlet - to the table. There he insulated himself with paper napkins and finally plugged himself in. Only then could Joey eat, for he firmly believed that the 'current' ran his ingestive apparatus.[20]

Bettelheim indicates that Joey's story has general relevance to understanding emotional development in a machine age, and comments:

> It is unlikely that Joey's calamity could befall a child in any time and culture but our own. He suffered no physical deprivation; he starved for human contact.[21]

It should be emphasized that Joey is an extreme case of schizophrenia who suffered severe emotional deprivation before seeking comfort and safety in the identity of a machine. What is pondered here is nothing as dramatic as a future generation of children adopting the identity of robots. What is of interest is the cultural phenomenon which set the stage allowing Joey to assume the identity of a mechanism. We ask: Does that phenomenon, presuming that it does exist, have any influence, however subtle, upon the development of self-identity in "normal" children? And, of greater pertinence with respect to educational computing, would not the presence of "intelligent" machines serve to amplify this phenomenon?

We assume an affirmative answer to the first question and leave the determination of the specifics to the social psychologist. An answer to the second question, of course, presumes the existence of "intelligent" machines -- or, at least the future existence of such machines. By adopting a strictly behavioristic interpretation of intelligence, we can and do make this assumption.[22] The impact of this assumption of man's self-image is profoundly related by James Slagel:

> The presence of intelligent machines will show man that he is not the only intelligent creature. The effect of this on man's image of himself will be even greater than the effect of man's realization that he inhabits a minor planet revolving around a minor galaxy, or the realization that he evolved from lower forms of life. One of his more cherished, if not his most cherished, claims to uniqueness, that is, his intelligence, will be matched by a "mere" machine.[23]

Scholarly discussion and debate surrounding the existence and implications of intelligent machines have been published in academic journals during the past three decades. However, this literature was esoteric from the viewpoint of the layman. Although there exists little evidence upon which to draw conclusions regarding the layman's response to intelligent machinery, the public reaction to an article about "Shakey - The First Electronic Person" in a recent issue of Life Magazine indicates that it is a disturbing notion for many people.[24] The average person prefers to believe that human beings are special and any attempt to alter this belief is met with resistance. This "being special" is easily demonstrated by his intelligent behavior. He feels confident in this belief and is comfortable with it. Indeed, it is a part of the individual's identity as a human being.

We now return to the question of young children coming into contact with machines which behave intelligently. While the adult with a healthy established identity either denounces the machine or attempts to philosophize his way around the issue, the young

child does not have an established identity which intrinsically rebels against a mechanistic model of himself. With a sense of concern, we ask if a child should not be sheltered from the computer to some degree, especially during his early educational experiences? Howard Peelle is one of the few educators to entertain the potentially negative influences of an artificially intelligent CAI system:

> The controversy becomes more heated with the mention of artificial intelligence, particularly mechanical mentors. What fate will befall education when machines become capable of sensitive and intelligent interaction with human beings? Rosenthal's studies of self-fulfilling prophecy might suggest that children of tomorrow will mold to a new orthodoxy - one of expected precision, pre-packaged behavioral objectives and programmed responses. Will students neglect humanistic values and perhaps even emulate the computer?[25]

That educational computing, more specifically, artificially intelligent CAI systems, may subtly influence the child to adopt a mechanical self-image, is certainly open to debate. However, given the adverse implications of a mechanistic self-image, it is worthy of consideration.

Perry London, in examining the machine model of man within the general context of behavioral control, comments on the danger of this model:

> The theoretical trouble with calling a man a machine begins when it is clear that someone believes the statement is true, and not merely a figure of speech; the practical trouble begins when anyone can act as if it were true, whether he believes it or not.[26]

London continues by examining the dangers of the mechanistic model of man from a humanistic perspective of morality:

> There are two important reasons for fearing the easy application of mechanistic theory to morality: it may encourage an impersonal approach to human beings, and it may discourage personal responsibility for one's conduct.[27]

Although London does not identify himself as an existentialist, his concern for a personal approach to people and responsibility for one's actions are essentially that of the existentialist. And, for just the same reasons, the existentialist is critical of the machine model of man. Thus, to the degree that an intelligent CAI system communicates this model of man, it would be unwelcome by an educator who is advocating an existential philosophy of education.

C. Philosophical Insights: Beyond the Negative Dimension of Educational Computing

In this section the question is raised: Why not, in light of the aforementioned dangers inherent in educational computing, simply deny the computer entrance to the school house? The author, while acknowledging the legitimacy of this response, decides not to endorse such a course of action. The remainder of this chapter is devoted to articulating the philosophical rationale behind this decision.

We begin by emphasizing that the potential dangers specified in the previous section were psychological, not philosophical. Educational computing could subtlely influence both students and educators to lose

of their existential condition. However, educational computing does not overtly present an intellectual argument that can effectively persuade those individuals to reject the existential position.

In our concern with the indirect negative psychological influences of educational computing, we must speculate on the cause of susceptability to these influences. The author contends that the primary source of this problem is the void with respect to an established conscious philosophy of education. Into this void creeps the unspoken "philosophy" of pragmaticism, efficiency and objectivity of our modern culture (see Chapter II). To avoid this condition, the author recommends the adoption of an existential philosophy of education. If the prerequisite existential environment were established, the pitfalls associated with educational computing would be minimizing. This is an important "if." It is a primary motivation behind this author's advocacy of an existential philosophy. For, ultimately, it is the absence of such a philosophy which sets the stage for the aforementioned negative psychological influences.

In developing a philosophy of educational computing, it is imperative that there be no inconsistencies between the basic existential tenets as outlined in the previous chapter and the philosophic insights provided by the science of cybernetics. Here we briefly describe cybernetics as a broad theoretical framework encompassing digital computing. Unfortunately, because cybernetics is a science, and existentialism is often associated with anti-scientific sentiments, many educators draw the erroneous conclusion that cybernetics and existentialism are intellectually incompatible. In the following

sections the author will attempt to further and draw upon cybernetic insights in defense of the existential position. This is not to say that there is any necessary association between these two bodies of knowledge. The author intends only to convince the existential educator that cybernetics does not present a philosophical challenge to his position. Then he may be convinced to give the computer a chance within his classroom.

Before we examine these philosophical issues, it is worth stating a "realistic," though nevertheless existential, objection to rejecting educational computing. In general, the existentialist acknowledges the impossibility of establishing a vacuum devoid of influences contrary to his position (in particular, this applies to educational computing). In fact, it is his unwillingness to accept and his naive or simplistic approach to education, or life in general, that sets him apart from the traditional philosophers. And he recognizes that existential growth of the individual can only occur when the individual confronts, struggles with, and overcomes influences which are dehumanizing.

While we are discussing this issue philosophically, Pandora's Box has been opened. The computer is here and it cannot be banished into non-existence. The existential educator, in accepting this reality, must therefore meet the challenge and learn to control the computer. He must also guide his students in their association with educational computing. The pitfalls of educational computing can be minimized by establishing an educational environment which reflects an existential

philosophy of education. They cannot be completely eliminated. Thus, the existential educator must move beyond these pitfalls by developing an understanding of the computer within his philosophical perspective.

1. Cybernetics: An Introductory Overview

During the 1940's and 1950's Norbert Wiener and his associates at the Massachusetts Institute of Technology began investigating analogies of control between animals and machines. He named this new science "cybernetics," which he derived from the Greek term "kybernetike" meaning the art of steersmanship. Wiener's definition of cybernetics as "the study of control and communication in the animal and the machine" has become the standard.[28] During the same time period that Wiener was laying the foundation of cybernetic theory, the digital computer was being developed. The computer, being the most sophisticated control and communication mechanism ever invented, proved invaluable in cybernetic research.

In the broadest sense of the term, "cybernetics" is the study of control and communication per se, without reference to specific scientific disciplines. However, research in artificial intelligence and automata theory has often been equated with cybernetics.

Artificial Intelligence (A.I.) involves the programming of computers to perform tasks which require some measure of "intelligence." Examples of such programs already developed are those which play checkers, solve algebra and calculus problems, and prove mathematical theorems.[29] According to Minsky, A.I. involves the application of

algorithmic and heuristic techniques to global problems of search, pattern recognition, learning, planning, and induction.[30]

Whereas researchers in A.I. endeavor to actually construct programs which behave intelligently, those involved with automata theory focus on the abstract structure of various classes of computers. Theirs is a theoretical investigation of the formal properties of computers without immediate concern toward the actual construction of the "machines" they study. Arbib offers a more precise definition of automata theory as "the pure mathematics of computer science...concerned with understanding the capabilities and limitations of whole classes of automata."[31]

The relevancy of cybernetic concepts extends far beyond the esoteric areas of artificial intelligence and automata theory. Neurophysiologists, psychologists, management theorists, and practitioners within other scientific disciplines have found cybernetic models useful when examining communication and control functions within their respective disciplines. Wiener himself, in his The Human Use of Human Beings, argues for the most comprehensive application of cybernetic thought, that of the social sciences. He states:

> It is the thesis of this book that society can only be understood through a study of the messages and the communication facilities which belong to it; and that in the future development of these messages and communication facilities, messages between man and machines, between machines and man, and between machine and machine, are destined to play an ever-increasing part.[32]

Given that cybernetics has such a profound impact in providing new models for both the physical and social sciences, it is only

natural that philosophers begin their examination of this new subject. We turn our attention to the issues raised by these lovers of wisdom in the following two sections.

2. Existential Man vs. Mechanism: A Cybernetic Perspective

You will recall that in Chapter III the point was made that existentialism is first and foremost a philosophy of man--specifically, man as a subjective being. The task of the existential philosopher is to examine this unique and profound dimension of man. In this section we focus upon the science of cybernetics, in particular the area of artificial intelligence, and speculate upon its implications with respect to our subjective notion of man. Kenneth Sayre, in his Philosophy and Cybernetics, effectively articulates the nature and significance of this issue:

> Given the ability of machines to learn, act purposefully, and perform tasks which with the human agent require mental skills, it is unavoidable that the question arises whether man himself is anything more than a cybernetic system, constructed of organic rather than inorganic parts... . The question of the significance of artificially intelligent mechanical systems is one of the most pressing philosophical issues of the present day.[33]

Sayre, in presenting his own analysis of this question argues as a philosopher of science, not an existentialist. However, this author, while taking the existential position, finds Sayre's analysis both enlightening and appealing. His conclusion--that mechanism is not subject to empirical verification--is consistent with the existentialist, but in no way belittles or sets limits upon cybernetic research.

Much of what follows in this section is dependent upon Sayre's excellent analysis.

In attempting to evaluate the "organic machine" concept of man, Sayre specifies a crucial distinction between two propositions which he labels A and M:

> Mechanism may be represented by the thesis (M) that all men are machines. Arguments both for and against mechanism, on the basis of cybernetic considerations, owe their persuasiveness to the logical relations between M and the thesis (A) that machines can do everything men can do. Although M entails A, the converse does not hold, for it is possible that men and machines do the same things but do them in irreducibly different ways.[34]

Some philosophers, in challenging the validity of M, have tried to identify some human behavior which a machine was incapable of duplicating. Then, having shown A to be false by counterexample, they would evoke a "not-A, therefore not-M" argument to disprove M. The logic is valid. The debate centers around the identification of a given behavior to establish a counterexample to A.

This author, speaking from an existential position, does not attempt to disprove A (and thus M) by aligning himself with those who, like Hubert Dreyfus, claim to have found such counterexamples.[35] Instead, the bold assumption is made here that at some point in the future a machine will indeed be able to duplicate all human behavior. This statement is premised upon current and projected successes in A.I. and the theoretical possibility of such as indicated by automata theory. At this point in time, this assumption is at best scientific speculation which must await significant engineering advances for verification.

The existentialist, by postulating the subjective dimension of man, does not endeavor to reject M by empirical demonstration of a counter-example to A. Rather, he believes that it is more effective to accentuate Sayre's distinction between A and M. This captures the crucial difference between DOING (A) and BEING (M). Noting this important philosophical distinction, this author concurs with Sayre regarding the impossibility of empirical verification of M.

> ...the remarkable advances in artificial intelligence over the past decade do not in themselves alter the philosophic status of the mechanist thesis. Mechanism remains a matter of philosophic persuasion and has not been altered into an issue admitting definitive settlement by empirical considerations.[36]

It is important to recognize that Sayre's position is that of a scientific philosopher. Cybernetics, being a science, is bounded by the limitations of the scientific method. It can only legitimately ask and answer questions which are subject to empirical verification by sense observation. All other questions are considered meaningless. What men and machines can DO is empirical and therefore meaningful. What man IS is a metaphysical question and therefore meaningless within the domain of the philosophy of science. The existentialist, being of a different "philosophic persuasion" than the scientific philosopher, finds this question not just meaningful, but of central philosophic concern.

3. Existentialism and Cybernetics

The intention of the previous section was to illustrate the absence of any intellectual inconsistency between the science of cybernetics and the existential concept of man. Although the existentialist may be justifiably concerned over the psychological impact of the cybernetic revolution, he should not perceive cybernetics as a philosophical threat to his position. Cybernetics is a science. It is not a philosophy, even though it may be subject to philosophic interpretation. And, as we shall see in Chapter V, science, in general, and therefore cybernetics in particular, poses no threat to the existential position.

The purpose of this section is to examine some of the results of cybernetic research. Here we will do what is not permitted within the structure of pure scientific research, namely, place philosophical interpretations upon the conclusions of the cybernetics. Our intention is to illustrate that, assuming one has already made the "leap" into existentialism, cybernetics, rather than merely being tolerated, may be viewed positively. Specifically, existential interpretations will be attached to cybernetic conclusions to reinforce the existential position with respect to the issues of rationalism, intelligence, and behavior.

a. Rationalism

Earlier in this chapter we referred to Carruth in specifying the existential position regarding rationalism - "Existentialism is a recoil from rationalism. Not that the existentialists deny

the role of reason, they merely insist that its limits be acknowledged."[37] The existentialists' claim is traditionally based upon their awareness of significant philosophical insights found only within the subjective domain. A classic example of this attitude was found in Blaise Pascal, himself gifted with a brilliant rational mind. Pascal was both the father of probability theory and, of more direct interest, the inventor of the first mechanical adding machine. Barrett, in his Irrational Man, classifies Pascal as an existentialist. He draws the distinction between Pascal's thought and that of other philosophers who discussed existential themes but are better described as precursors of existential thought. Barrett's primary reason for categorizing Pascal as an existentialist is Pascal's bold distinction between the mathematical mind ("l'esprit de geometrie") and the intuitive mind ("l'esprit de finesse"):

> What Pascal had really seen, then, in order to have arrived at this distinction was this: that man himself is a creature of contradictions and ambivalences such as pure logic can never grasp... By delimiting a sphere of intuition over against that of logic, Pascal had, of course, set limits to human reason.[38]

All existentialists, in the spirit of Pascal, assert the existence and priority of the intuitive mind and, in doing so, postulate limitations to the purely rational path to philosophic truth. However, it also happens that the limitations of the rational method can be demonstrated by application of the rational method itself. In the early 1930's, Kurt Gödel established two theorems in the realm of metamathematics which are of profound significance to the philosopher of science. Essentially, Gödel was able to demonstrate two important limitations to any purely rational system of thought. The essence of these two theorems, which have become known as Gödel's Incompleteness Theorems, is best illustrated by Howard DeLong, who has "translated" them into both the languages of physics and psychology:

Gödel's First Incompleteness Theorem:

Language of physics - There is no consistent machine which can be programmed to produce all the true and only true sentences of arithmetic.

Language of psychology - There is no consistent human capable of formulating a program, which if carried out, would produce all the true and only true sentences of arithmetic.

Gödel's Second Incompleteness Theorem:

> Language of physics - No consistent machine can be programmed to prove its own consistency.
>
> Language of psychology - No consistent human can prove his own consistency.[39]

Gödel developed his limitative theorems within the framework of the philosophy of mathematics. With the advent of the digital computer, and thus automata theory, parallel proofs of Godel's theorems were developed by automata theorists. The existentialist, in examining the implications of the digital computer, should be aware of Gödel's theorems as reinforcing his position on rationalism. However, few existentialists have given any indication of such. DeLong comments that, "So far as I know, the leading existentialists are completely innocent of any knowledge of the limitative theorems."[40]

This author has found only one exception to DeLong's observation. Barrett, taking an existential perspective, comments on the implications of Gödel's theorems:

> Gödel's findings seem to have even more far-reaching consequence, when one considers that in the Western tradition, from the Pythagoreans and Plato onward, mathematics as the very model of intelligibility, has been the central citadel of rationalism.

> Now it turns out that even in his most precise science - in the province where his reason had seemed omnipotent - man cannot escape his essential finitude: every system of mathematics that he constructs is doomed to incompleteness. Gödel has shown that mathematics contains insoluble problems, and hence can never be formalized in any complete system. This means, in other words, that mathematics can never be turned over to a giant computing machine; it will always be unfinished, and therefore mathematicians - the human beings who construct mathematics - will always be in business. The human element here rises above the machine: mathematics is unfinished as is any human life.[41]

Thus we see that there are inherent limitations within the rational method. However, it should be recognized by the existentialist that it is to the credit of rationalism for displaying its own limitations. Also, it should be recognized that these limitations imply that mathematics will always remain an unfinished enterprise - an unending, rich and exciting domain for the creative mind to explore.

These limitations are the subject of our existential interpretation of rationalism. Again we turn to Barrett for his analysis:

> But since mathematics can never be completed, it might be argued that Gödel's findings show us that there are no limits to mathematical knowledge. True, in one sense; but in another sense it sets a more drastic limitation upon mathematical knowledge, since mathematicians now know they can never, formally speaking, reach bottom; in fact, there is no rock bottom,

> since mathematics has no selfsubsistent reality independent of the human activity that mathematicians carry on. And if human reason can never reach rock bottom (complete systematization) in mathematics, it is not likely to reach it anywhere else. There is no System possible for human existence, Kierkegaard said a century ago, differing with Hegel, who wished to enclose reality within a completely rational structure; the System is impossible for mathematics, Gödel tells us today.[42]

It is important to avoid the error of concluding that Gödel's demonstration of the limitations of the rational method, and thus of computing devices, provides proof of man's superiority to machines. Gödel's theorems apply to the method per se, not to the agent which employs the method. Thus, Gödel's theorems cannot be referenced as an illustration of a fundamental difference between men and machines. They can only demonstrate limitations to a method of investigation about which existentialists have long held reservations. Again, if the existentialist claims to have knowledge of phenomena beyond the rational, then he does so by virtue of his "leap" into this philosophic domain of subjectivity, not by rational demonstration.

b. Intelligence

In the previous section we examined rationalism, a particular epistemology which has appealed to Western philosophers in their pursuit of truth, and made reference to Godel's Incompleteness Theorems to reinforce the existentialist's contention regarding its limitations. We now expand our range of interest to focus on intelligence *per se*.

The underlying epistemology may be rationalism, empiricism, or some blend of these two. Our intention is to argue the existential point that intelligence is neither the primary nor uniquely identifying characteristic of man. Here the term "intelligence" is to be interpreted in a strictly behavioristic sense, equivalent to Heidegger's "calculative thinking." It is distinct from Heidegger's "meditative thinking," which has no immediate or necessary behavioristic manifestations and is representative of the subjective dimension of man which is unique to him alone.

The argument is simple and direct. If research into A.I. indicates that beings other than man--in this case, the digital computer--are intelligent, then intelligence cannot be interpreted as the primary identifying characteristic of man which sets him apart from the rest of creation. Slagel captures the essence of this argument in the following comments:

> The presence of intelligent machines will show man that he is not the only intelligent creature. The effect of this on man's image of himself will be even greater than the effect of man's realization that he inhabits a minor planet revolving around a minor sun in a minor galaxy, or the realization that he evolved from lower forms of life. One of his most cherished, if not his most cherished, claims to uniqueness, that is, his intelligence, will be matched by a 'mere' machine.[43]

A hint of the logic behind this argument can also be detected in an amusing essay by Bertrand Russell entitled "An Outline of Intellectual Rubbish":

> Aristotle, so far as I know, was the first man to proclaim explicitly that man is a rational animal. His reason for this view was one which does not now seem very impressive; it was, that some people can do sums. ...Nowadays, however, calculating machines do sums better than even the cleverist people, yet no one contends that these useful instruments are immortal, or work by divine inspiration. As arithmetic has grown easier, it has become less respected. The consequence is that, though many philosophers continue to tell us what fine fellows we are, it is no longer on account of our arithmetical skill that they praise us.[44]

Although it would be inaccurate to call either Russell or Slagel existentialists, the existentialist should appreciate the logic in their statements as supportive of his position.

The presence of "intelligent" machines has stimulated much discussion regarding the nature of intelligence. The continued

success in A.I. research has forced a changing definition of intelligence, influencing J. P. Echert, a pioneer in the development of the digital computer, to comment: "I've finally been forced to adopt the definition that thinking is what computers cannot do. This definition is very workable since it changes from year to year as computer progress is made."[45]

If one presumes, as this writer does, that at some point in the future computers will be capable of simulating any type of intelligent behavior, then Echert's definition of "thinking" becomes null for those who would only acknowledge the existence of "calculative" thinking. This is fine to the existentialist, for in postulating the existence of "meditative" thinking, man is still valued because he is uniquely "man" - a meditative/subjective being - not because he demonstrates the useful quality of intelligence in a behavioristic sense.

c. Behavior

In the previous section it was argued that the existence of intelligent machines reinforced the existential contention regarding the secondary position of behavioristic intelligence (calculative thinking) as a characteristic of man. Here a parallel argument is proposed by finally extending the domain of discourse from intelligent behavior to behavior <u>per se</u>.

From a strictly philosophical perspective, the existentialist holds that man is "defined" by what he IS (a subjective being), not by what he DOES (behavior). And, once man IS - exists aware of his subjectivity - he further defines himself via his choosing. This is not to say that behavior is not important. Rather, just the opposite is maintained. However, it is man as a subjective being who initiates the behavior by a nonbehavioristic choice. And it is man as a subjective being who experiences the existential anxiety in choosing and who is responsible for the consequences of his choosing. Thus, behavior per se, is considered secondary to subjective choice by man.

Now, turning our attention toward a specialized area of A.I. research, that of robiotics, we can reinforce the existential position on behavior. Arguing in a vein similar to that proposed in the previous section on intelligence, we state that it is erroneous to seek a definition of "humanity" in terms of behavior alone. Of course, it is the assumption that robots will actually evolve to the androids of science fiction literature which is the weakest link in this position. And, admittedly, this is at best scientific speculation at this point in time. Yet, it is not speculation without foundation. Researchers at Stanford have already constructed a robot which was "science fiction" only a few decades ago.[46]

Although the behavior of this robot, and all others built to date, is quite unsophisticated in comparison to human behavior, it should persuade most observers that no more than a few hundred years of technological evolution will be necessary for robots to catch up to humans.

Only future events will definitively establish the behavioristic equivalence of men and machines. The dogmatic empiricist will demand the actual construction of such an android. However, it is of tremendous importance that there exists no theoretical barriers to this task. This has been demonstrated by automata theorists in proving the logical equivalence of a finite automata (a formal computer) and a neural net (a formal model of the nervous system).[47] Essentially, this means that the construction of robots capable of simulating human behavior is exclusively an engineering problem, albeit a formidable one. Seymour Papert, one of the more creative individuals in CAI research, has specifically argued this point in refuting Hubert Dreyfus, a philosopher who claims that there are limitations to the potentiality of AI research.[48]

In arguing against the priority of behavior within an ontological investigation of man, there are other cybernetic insights which the existentialist may draw upon.

The problematic relationship between a system's structure and its behavior is of central concern to the cybernetician. Although his goal is to predict the behavior of a known structure, and conversely, to determine a system's structure by examining its behavior (the "black box" problem), the cybernetician is among the first to acknowledge the perplexing nature of this relationship.

Charles Dechert precisely articulates this enigma:

> It is entirely possible, of course, that structurally diverse systems may effect identical transformations, and that structurally identical systems of a sufficient degree of complexity may produce very different outputs on the basis of identical inputs.[49]

Therefore, in recognition of this condition, the existentialist can effectively argue against those who advocate mechanism ("All men are machines") if and when robots are constructed which are behaviorly equivalent to human beings. Men and machines "may effect identical transformations," but they may still be "structurally diverse systems."

In this section we have been using the term "behavior" in the conventional sense as the layman would interpret it. Next we focus upon the psychology of strict stimulus-response "behaviorism" as professed by Skinner.

Clearly, the existentialist is at odds with the behaviorist model of man. In fact, it is for this reason that some

psychologists of the rival "third force" human potential movement have turned to existentialism in search of a philosophical foundation for their psychological position. Abraham Maslow, often referred to as the father of this recent movement in psychology, credits the existentialists for offering a more acceptable image of man than those proposed by both the Freudians and behaviorists. He states, in an essay entitled "What Psychology Can Learn from Existentialists" that:

> We can, and should, pick up their greater emphasis on what they call "philosophical anthropology," that is, the attempt to define man, and the differences between man and any other species, between man and objects, and between man and robots. What are his unique and defining characteristics? What is so essential to man that without it he would no longer be defined as man?[50]

The existentialist and many humanistic psychologists postulate the subjectivity of man as capturing his uniqueness. They must postulate this because it is impossible to demonstrate in the scientific sense. Actually, it is the Skinnerian behaviorist who is capable of offering a scientific defense of his stimulus-response model of man. However, the existentialist may again find some interest in a cybernetic rejection of the stimulus-response model. We turn to Michael Arbib who argues against this model:

> In short, we cannot expect a full understanding of human mental processes if we follow those psychologists who view the organism as responding passively to a series of stimuli in a way which can be manipulated by some schedule of reinforcement. Rather, we must include a description of the internal state of the system which determines what the organism will extract from its current stimulation in determining its current actions and modifying its internal state.[51]

Arbib, in arguing for the necessity of some internal state within an organism, proposes the cybernetic model as being superior to the stimulus-response model. He certainly is not defending the existential "model." His position is entirely within the scientific area. However, he does effectively challenge the purely behaviorist model of man - something for which the existentialist should be grateful.

D. Concluding Comments

The primary intent of this chapter has been to outline the potential dangers to an existential education inherent within educational computing and then move beyond those dangers. The approach was to illustrate that the problems exist within the realm of psychology, and that an examination of the philosophic insights provided by cybernetics displayed no necessary inconsistencies with existential tenets. Thereafter, it was claimed that the existentialist, in placing his own interpretation on cybernetic advances, could reinforce his own contentions regarding the secondary philosophic importance of rationalism, any form of behavioristic intelligence, and finally, behavior per se.

Turning to the educational implications of this analysis, we simply note that the underlying concepts of an existential education remain unaltered. However, in the areas of educational policy and practice, those existentialists who would bar the computer from the school house can only claim personal preference as their justification. Since the computer is not necessarily incompatible with an existential education, this author, as an advocate of existential philosophy, can legitimately research and recommend specific educational policy and practice pertaining to educational computing. The next and final chapter is devoted to this purpose.

CHAPTER IV

FOOTNOTES

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CHAPTER V

EDUCATIONAL POLICY AND PRACTICES

This concluding chapter is devoted to the examination of specific educational policy and practices which the author feels to be consistent with the philosophy of educational computing presented in Chapter IV. In particular, the issues of educational curriculum, methodology, and administration will be treated.

The author recognizes that the concepts of curriculum, methodology, and administration usually imply the presence of some educational institution which further implies a collectiveness and rigidity contrary to the individuality and openness advocated by existentialists. Therefore, the reader is advised to interpret these terms in the most unrestricted sense.

The reader should also bear in mind that the priority of freedom within an existential educational experience practically eliminates the exposition of specific educational policy and practices for adoption by all existentialists. (This helps to account for the fact that very little has been said by existential educators beyond the outlining of general philosophical principles.) Therefore, what follows should in no way be perceived as absolute or dogmatic. Rather, the discussion of curriculum, methodology, and administration, as they relate to educational computing, is no more than an elaboration of the position of one person, the author, and his rationale for its compatibility with the existential creed.

A. Curriculum

In this section the author intends to defend the legitimacy of computer science *per se* within the curriculum of an educational institution committed to existential principles. The contention that the curriculum be exclusively oriented toward the humanities (in a restricted sense) is rejected. Rather, the openness of the curriculum, and the freedom within it, as articulated by Dupuis, is reaffirmed:

> The existentialist is not so much concerned with the actual courses or subjects in the curriculum as he is with what the teacher and (most especially) the student does with them. The exercise of freedom within the curriculum is more important than the curriculum content.[1]

The author firmly believes that computer science can be presented to students at both the elementary and secondary levels in such a manner that the goals of the existential educator are not jeopardized, but realized. This position is grounded in the assumption that the educator comprehends and, somehow effectively, communicates to his students a valid "humanistic/existentialistic" perspective of science in general, and cybernetics in particular. The following discussion of science and cybernetics is presented to convince the reader that computer science, as is any area of scientific investigation, is a uniquely human enterprise with a significant, subjective dimension. In other words, computer science can, and should be, presented to the student as a subject within the humanities (in the broadest sense of the term).

1. Science: An Existential Commentary

To effectively argue for the inclusion of science in the academic curriculum of an existential education requires a comprehensive analysis of the scientific method and its historical evolution. Such is beyond the scope of this paper. Instead, a brief discussion of (a) the relationship of science and technology, and (b) the domain and limitations of the scientific method is presented by referring to prominent scholars and specifying their conclusions. Readers, and especially existential educators, are strongly encouraged to investigate the original sources referenced for a more thorough analysis of these issues.

a. Technology and Science

One reason that existentialists and other humanists take a disparaging view of science, and thus discourage its inclusion within the curriculum is due to their distress and anger at the dehumanizing conditions of the twentieth century, made possible, promoted, and aggravated by modern technology. They make the accurate observation that current technological advances have their source in prior scientific research. Generally, the scientist makes a discovery pertaining to natural phenomena; the engineer then draws upon this new scientific knowledge to produce some new technology.

Although it is technology that is the "villain," criticism is often leveled at both science and technology. Strain's comments are restated as being representative of this position:

> In terms of its content, modern existential thinking focuses on the human person in a technological and scientific age. Many existentialists are pessimistic about modern life and indicate that utopianism, based on science, is an illusion. They believe science and technology have brought human beings loneliness and alienation rather than peace and progress. The institutionalization of science, by and for the state, has dehumanized man.[2]

In arguing the legitimacy of science within the existential curriculum we begin by emphasizing that, even though modern technology is often derived from scientific research, science and technology are indeed distinct. Next, and perhaps more important, is the little-recognized fact that technology based upon science is a uniquely modern phenomenon; there is no necessary correspondence between the two. Lynn White, a historian with particular interest in medieval technology, informs us that:

> Until the middle of the nineteenth century there were remarkably few connections between science and technology, and the influence of technology upon science seems to have been greater than the reverse. Science through the ages was purely an intellectual effort to comprehend nature; technology was the practical attempt to use nature for human purposes. While a few individuals, like Friar Roger Bacon, and Galileo, were interested in both, they showed little interplay between their practical and theoretical concerns.[3]

Thus we see that technology is not a necessary by-product of scientific investigation. Rather, it is the obsessive pragmaticism of our modern culture which compels technology to immediately follow scientific advances, and even initiate the scientific research in the first case. Lilly sadly informs us of this situation:

> In the American tradition, one rushes to the end of a research project digging up all the basic facts needed to apply the results practically to some technological advances. This seems to be the major basis for research in America today: a practical result.[4]

Returning to the issue of science within the existential curriculum, it is this writer's contention that science, as a search for truth--the goal of both the existential philosopher and the real scientist--should be emphasized within an existential education.

The pragmaticism, which dominates the experimental curriculum, would be minimized. This would not mean the elimination of engineering from the curriculum. It would imply that the spirit of science as an effort to comprehend the natural world would prevail. Hopefully, this spirit would influence the community of scientists and engineers to avoid the current tendency of immediately applying scientific progress toward technological endeavors. The applications of science would require a thoughtful decision, in the existential sense involving personal responsibility and anxiety, before the engineer applies his skills.

b. The Domain and Limitations of Science

A second reason proposed by existential/humanistic educators for de-emphasizing science within the curriculum is that the scientific perspective offers too narrow a view of man and the universe. It is this author's intention to draw an important distinction between science per se and that brand of philosophy of science which claims that truth can only be approached via scientific investigation and that only scientifically verifiable statements can be considered to be philosophically meaningful.

It should be noted then that a justifiable rejection of the latter restrictive philosophy of science

in no way implies a rejection of science itself. It only implies the rejection of a particular philosophical disposition toward science. The position stated herein is that, although the existential educator is naturally of a different philosophical persuasion, science can and should be part of the existential curriculum.

The rationale for this position is derived from what this writer believes to be a legitimate interpretation of science. It is one thing to postulate the philosophical significance of a domain broader than the scientific; this is sufficient for the confirmed existentialist. It is another thing to "objectively" analyze the scientific method and, in doing so, simultaneously illustrate both its limitations and its subjective/creative dimension: this will not only reaffirm the existentialist, but perhaps will also convert the experimentalist.

A thorough exposition of the legitimate domain and limitations of the scientific method is a comprehensive undertaking. An excellent reference in this respect is Thomas Kuhn's The Structure of Scientific Revolution. Here we only highlight Kuhn's observations and comment on their relevancy to existential epistemology.

Modern science has as its goal the determination of truth with respect to the empirical world. Thus, naturally, any statements made by the scientist must be subject to empirical verification. However, science is more than just a collection of facts. It has a theoretical component which requires the scientist to define a set of axioms, which he claims to be empirically verifiable, and then deduce theorems from these axioms, which likewise must be empirically verified. In this respect, the scientist parallels the rational processes used by the mathematician. And it is here that the scientist must acknowledge the incompleteness of his system which Gödel demonstrated by his Incompleteness Theorems.[5]

The recognition of the theoretical deductive element within the scientific method also exposes the necessity for creative thought in the selection of initial axioms. (Kuhn specifies the beginning of a scientific revolution to be the "discovery" of a new set of axioms which are logically consistent and the theorems derived prove to be a more accurate description of the empirical world.)

Therefore, due to its rational component, we see that science not only suffers (and enjoys) the same incompleteness as mathematics, but it also requires

a similar type of creative mind to produce a rich set of initial axioms. It is this openness and creativity with respect to both science and pure mathematics which justify their position within the existential curriculum. And, granting the tremendous challenge in doing so, it becomes the responsibility of the existential educator to acquaint the student with this dimension of science. Unfortunately, most educational institutions, existential and otherwise, display little awareness of this situation.

The existential educator should also be aware that Kuhn's analysis of science implies an interpretation of the concept of truth which parallels his own in removing the notion of one absolute reality for the human mind:

> We may, to be more precise, have to relinquish the notion, explicit or implicit, that changes in paradigm carry scientists and those who learn from them closer and closer to truth. ...We are all deeply accustomed to seeing science as the one enterprise that draws constantly nearer to some goal set by nature in advance. But need there be any such goal? Can we not account for both science's existence and its success in terms of evolution from the community's state of knowledge at any given time? Does it really help to imagine that there is some one full, objective true account of nature and that the proper

> measure of scientific achievement is the extent to which it brings us closer to that ultimate goal? If we can learn to substitute evolution-from-what-we-do-know for evolution-toward-what-we-wish-to-know, a number of vexing problems may vanish in the process.[6]

Kuhn's analysis of the scientific method effectively demonstrates the limitations of this method in the determination of truth, and even questions the existence of "truth" as an objective reality. Unfortunately, the existentialist often overlooks such an analytic verification of his position, which he has simply assumed.

The previous comments on the distinction of science and technology and the limitations of science in capturing "truth" are on the intellectual level and thus should be acknowledged by both the scientist and the existentialist. Karl Jaspers, in his essay, "Philosophy and Science," asserts the recognition the philosopher must afford the scientist. Yet, he also recognizes that truth extends beyond the domain of science. The following statements by Jaspers provide an insight into the relationship he sees between science and philosophy:

> There is no tenable philosophy outside the sciences. Although conscious of its distinct character, philosophy is inseparable from science. It refuses to transgress against universally binding insight. Anyone who philosophizes must be familiar with scientific method.
>
> Any philosopher who is not trained in a scientific discipline and who fails to keep his scientific interests constantly alive will inevitably bungle and stumble, and mistake uncritical rough drafts

> for definitive knowledge. Unless an idea is subjected to the coldly dispassionate test of scientific inquiry, it is rapidly consumed in the fire of emotions and passions, or else it withers into a dry and narrow fanaticism.[7]

Jaspers emphasizes the importance of recognizing the limits to the scientific method:

> Moreover, anyone who philosophizes strives for scientific knowledge; it is as though the most significant insights could be achieved only through man's quest for the limit at which cognition runs aground, not seemingly and temporarily, but genuinely and definitively, not with a sense of loss and despair, but with a sense of genuine internal evidence. Only definitive knowledge can make definitive nonknowledge possible; it alone can achieve the authentic failure which opens up a vista, not merely upon the discoverable existent, but upon being itself.
>
> In accomplishing the great task of dispelling all magical conceptions, modern science enters upon the path that leads to the intuition of the true depth, the authentic mystery, which becomes present only through the most resolute knowledge in the consummation of nonknowledge.[8]

Jaspers briefly summarizes his position:

> To sum up: The sciences do not encompass all the truth but only the exact knowledge that is binding to the intellect and universally valid. Truth has a greater scope, and part of it can reveal itself only to philosophical reason.[9]

It is this attitude of Kuhn, the philosopher of science, and Jaspers, the existentialist, which should be recognized by existential educators and communicated to students where science enters into the curriculum. However, it is just this attitude which C. P. Snow, in his essays on "Two Cultures," has lamented as being absent from the culture of modern Western civilization. His comments provide insight into a situation which,

unfortunately, many scientists and existentialists continue to perpetuate:

> Over the years I became convinced that the whole of Western society was being polarized, with the literary intellectuals at one pole and the physical scientists at the other. Between the two was mutual incomprehension, and the chance of talking across this gap was getting less and less. This polarization resulted in immense loss to each group, and in fact posed a great danger for our society as a whole.[9]

Snow comments that it would be wrong to be too impressed by this historical trend and gives his reasons why efforts should be made to reverse it:

> If they are illiterate in science, then they are going to take those decisions like a lawyer reading a brief. That's a terribly bad way to make a decision.[10]

Snow continues by stating his main reason for combating this scientific and literary polarization:

> My main reason is much simpler, much more emotional, much more involved in what I feel about the whole of the human species. This absence of intellectual communication is a symbol of the tendency of our kind to find methods of ceasing to talk... These in the long run mean death.[11]

The concern Snow expresses in the decision-making process, and the lack of communication resulting in death for the human species, has an existential ring. With guarded optimism, he sees education as being the only process by which the polarization trend may be reversed. It is a challenge which the existential educator

must accept, from both a philosophic position as specified by Jaspers, and a realistic concern for human survival as specified by Snow.

2. Cybernetics: An Existential Commentary

Given that science should have a legitimate position within the existential curriculum, it follows that the collection of academic disciplines encompassed by cybernetics should be investigated by elementary and secondary students. The issue raised at this point concerns the specific contribution cybernetics has to offer as a subject within an existential curriculum. Although the following comments should provide some insight into this matter, this topic is examined with the primary intention of setting a challenge before the existential educator.

Cybernetics, in its broadest interpretation, is defined as the science of control. In capsulizing this perspective of cybernetics as proposed by Stafford Beer, Peter Schoderbek notes its interdisciplinary application:

> Cybernetics is seen as the science whose object of study is control. It aims to study the nature of control per se, control common to many fields of investigation. Hence, its interdisciplinary nature, hence its relevance to industrial, social, economic, mechanical, and biological systems.[12]

The existentialist, in his concern for the individual as a being capable of free choice and, therefore, being in control of his own behavior, should find the science of control of interest. Unfor-

tunately, most cybernetic research has a distinctly non-existential orientation. It has primarily emphasized the objective over the subjective, the collective over the individual, and goal achievement over desirability of said goal. Although this approach may be necessary and entirely justifiable within the pragmatic sphere, it is too restrictive within the existential. Geoffrey Squires accurately expresses the nature of this situation in stating that "the trouble with information-processing is that it implies, at present, a very mechanistic and reductionistic view of how people work."[13] The existentialist is challenged to bring his own perspective to cybernetics and hopefully move beyond this mechanistic, reductionistic approach. Squires, in specifying the broad range of control systems, believes this is possible, and credits John Lilly as being representative of this approach:

> Systems, after all, are found in biology and ecology, as well as in engineering and operations research. As for information-processing and the language of computing generally, writers like Lilly can apply it to the human organism without doing violence to notions of choice, affectivity, religious experience and the like. Indeed, Lilly's work can be seen as pioneering in this respect.[14]

This author chooses to echo Squire's endorsement of Lilly. Lilly's Programming and Metaprogramming the Human Biocomputer is a fascinating, although esoteric, attempt to tackle the mind-body problem, utilizing the vocabulary of the computer scientist while avoiding mechanism.[15] While Lilly's ideas must be judged on

their own merit, they do provide a model of an extension of cybernetic concepts into the humanistic domain.

Another attempt to extend cybernetic concepts beyond mechanism can be found in the writing of Gregory Bateson. R. D. Lang, a leading existential psychiatrist, credits Bateson for achieving a major theoretical advance in analysis of schizophrenic experiences:

> This was the 'double-bind' hypothesis, whose chief architect was the anthropologist Gregory Bateson. This theory...represented a theoretical advance of the first order... Bateson brought this paradigm of an insoluble 'can't win' situation, specifically destructive of self-identity, to bear on the internal communication pattern of families of diagnosed schizophrenics.[16]

Bateson claims that his double-bind theory has its base "in that part of communications theory which Russell has called the Theory of Logical Types."[17] Essentially, Bateson perceives the double-bind concept as a cybernetic concept. He has applied this and other cybernetic concepts in the fields of psychology, anthropology, and epistemology. In recognition of the productivity of the cybernetic model, he states:

> I think that cybernetics is the biggest bite out of the fruit of the Tree of Knowledge that mankind has taken in the last 2,000 years.[18]

Yet, Bateson also displays the wisdom of not becoming infatuated with this model:

> Cybernetics has integrity within itself, to help us not to be seduced by it into more lunacy, but we cannot trust it to keep us from sin.[19]

Bateson, in an existential vein, warns us of the threat to human responsibility if we focus only on cybernetic inventions (e.g., computers). Only by taking a more global perspective of cybernetics does he see "the means of achieving a new and perhaps more human outlook, a means of changing our philosophy of control, and a means of seeing our own folly in wider perspective."[20] Lilly and Bateson are unique examples of scholars capable of utilizing cybernetic concepts without coming into conflict with the existential position. Both can be perceived as pioneers in extending the cybernetic model into the domain of humanistic thought.

Turning to a more conventional issue, the position of computer science within the curriculum, we ask if there are any existential insights to be discovered there. This question is answered affirmatively by referring to the previous chapter. There it was shown that artificial intelligence can lead the examiner to a re-evaluation of the philosophic significance of intelligent behavior. And, within the discipline of automata theory, there can be found certain limitations to machines. While recognizing that neither of these disciplines verifies the existential position, they do illustrate the existential issues and provide food for thought.

The next section examines the role of educational computing as a methodology. Before turning to this topic, it is important to note here that one particular technique of utilizing the computer to teach traditional elementary and secondary subjects involves computer programming on the part of the student. We will examine this in detail below. It is mentioned here for the purpose of noting an overlap between the inclusion of computer programming within the curriculum and computer programming as a useful methodology for teaching certain cognitive skills.

B. Methodology

In the previous chapter concern was expressed over the potential negative implications of traditional CAI designed according to the behavioristic model. These programs usually incorporated the drill-and-practice, or the tuotrial mode, with the dominant feature being that the student was under the control of the system. From an existential perspective, this is undesirable as a general methodology.

In this section the reader will be exposed to the efforts of a relatively small group of educational technologists whose research is premised on models other than behaviorism. While none of these individuals could be labeled "existentialist," their efforts are directed toward a more humanistic approach to CAI, and to the degree that existentialism is a humanism, the methodologies proposed by these individuals are compatible with an existential education. It should be noted that the primary intent of these alternative modes of CAI is the same as traditional CAI: the teaching of cognitive skills. However, their salient asset is that they attempt to do so without jeopardizing the affective dimension of an existential/humanistic

educational experience.

Although a variety of educational computing experiences are proposed by these individuals, there is an underlying concept common to all their work. Namely, the student controls the computing system, and thus controls his educational experience, not the opposite as in behavioristic modes of CAI. A most appropriate way to capture the spirit of this approach is to quote Seymour Papert's introductory comments in his "Teaching Children Thinking":

> The phrase 'technology and education' usually means inventing new gadgets to teach the same old stuff in a thinly disguised version of the same old way. Moreover, if the gadgets are computers, the same old teaching becomes incredibly more expensive and biased toward its dullest parts, namely, the kind of rote learning in which measurable results can be obtained by treating children like pigeons in a Skinner box.
>
> The purpose of this essay is to present a grander vision of an educational system in which technology is used not in the form of machines for processing children, but as something the child himself will learn to manipulate, to extend, to apply to projects, thereby gaining a greater and more articulate mastery of the world, a sense of the power of applied knowledge, and a self-confidently realistic image of himself as an intellectual agent.[21]

Papert, working with elementary school students, has developed a number of interesting projects to implement his idea of placing the computer under the control of the student. In most cases the student actually programs the computer in order to concretize and elucidate his thought process. In order to facilitate

the writing of programs by children, he has developed a special programming language called LOGO and a unique peripheral device, a turtle-robot which the children can control via instructions written in LOGO. By writing programs to manipulate the behavior of the turtle (it can move along the floor and is equipped with light, sound, and writing mechanisms), the student can observe an embodiment of his procedure designed to achieve a particular goal (e.g., make the turtle draw a polygon on the floor). A very simple, but significant, point is that the student comes to interpret misbehavior by the turtle as a "bug" in his program, something to be fixed and tried again, thereby avoiding the negative experience of "being wrong." Papert has also had students write simple heuristic AI programs that play games of strategy (e.g., NIM), and even has had students write traditional CAI programs based on the premise that the best way to learn something is to teach it.

By turning the computer over to the student, one is more inclined to become involved in a project which encourages a personal commitment toward some goal. This personal involvement in an educational experience is favored by both experimentalists and existentialists. That such involvement also parallels the work pattern of the artist, the existential ideal, is specified by Papert:

> The most exciting single aspect of the experiment was that most children acquired the ability and motivation to work on <u>projects</u> that extend in time

> over several days, and even weeks. This is in marked contrast with the usual in mathematics classes, where techniques are taught and then applied to small repetitive exercise problems. It is closer, in ways that are essential to latter argument here, to the work style of some art classes where children work for several weeks on making an object; a soapcarving, for example. The similarity has several dimensions. The first is that the duration of the process is long enough for the child to become involved, to try several ideas, to have the experience of putting oneself in the final result, to compare one's work with that of other children, to discuss, to criticize and to be critized on some basis other than 'right or wrong.' The point criticism is related to a sense of creativity that is important in many ways...including its role in helping the child develop a healthy self-image as an active intellectual agent.[22]

Another educator sympathetic toward student control of compu terized learning is Howard Peelle of the University of Massachusetts. Peelle is an advocate of a "glass box" approach to computer instruction which synthesizes ideas put forth by Seymour Papert and IBM's Kenneth Iverson and Paul Berry. He describes this concept:

> In this approach, short, quickly comprehensible computer programs are given to elementary school children for their direct viewing. Each program embodies a concept, a procedure, or an interrelationship, and is written as simply and clearly as possible. Here the inner workings of the program are visible and, hence, become a basis for learning.
>
> This approach uses a computer program more as a 'glass box' than a 'black box.' The formal definition of such a program serves to reveal and elucidate concepts; that is, by observing the structure of the program and its behavior,

> key understandings may become transparent to the student.
>
> In contrast to conventional computer-assisted instruction (CAI), this glass box approach allows the student significant control over his learning processes. Making the full power of the computer accessible to the learner is 180° from the kind of CAI characterized by programmed instruction or drill-and-test sequences.[23]

Peelle illustrates the glass box concept with examples from the areas of traditional CAI, psychology, cybernetics, and computer art. His description states that "student-initiated, student-responsible, success-oriented" activities can result from a more imaginative approach to educational computing.

A third educator worthy of recognition for his contributions in the instructional applications of computers is Thomas Dwyer of the University of Pittsburgh. Dwyer, probably more than any other educator actively involved with educational computing, emphasizes the significance and priority of sound educational principles. In an article entitled "Some Principles for the Human Use of Computers in Education," he ties educational computing into the humanistic approach to education:

> The purpose of this paper is to provide a personal view of some principles that are derived from the humanistic point of view, but which are intended as a guide for programs exploring the use of computers in education. It is my conviction that this simple ordering of priorities - principles first, application second - is the real key to successfully tapping the full potential of the new technologies.

> The most common mistake is to use the machines to emulate classroom procedures that have come out of expediency, not thoughtful reflection. This is precisely why principles are needed; a rationale, based on a fresh look at what it is we are about, is the horse that should pull the technological cart.[24]

Dwyer proposed five principles to be adhered to in the design of computer learning experiences.[25] In doing so, he echoes the spirit of student-controlled learning advocated by Papert and Peelle in noting that each of his five principles is "based on a belief in the value of learner control of certain key aspects of his education."[26]

The humanistic principles described by Dwyer have been incorporated in a secondary National Science Foundation supported mathematics educational project known as Project Solo. In this project, the student engages in what Dwyer calls "learner-devised processing" by writing, debugging, and executing computer programs, and, at a higher level, engages in "learner-organized processing" which involves program design and construction for learners other than himself.[27]

In examining the methodologies proposed by Papert, Peelle, and Dwyer, we note two common sentiments. On the negative side, there is dissatisfaction with conventional CAI systems patterned after the behavioristic model of learning. On the positive side, there is the intention to turn the power of the computer over to the student and allow him to control and become responsible for his own educational experience. It should be added that

advocating student control does not necessarily banish traditional CAI as a methodology. It is the issue of control, not technique, which is paramount. Thus, under certain circumstances, the student may freely elect to initiate a CAI program to guide his learning experience. The most important restriction is that he maintain the option of changing that experience.

By stating that traditional CAI may be permitted within an existential education, we have given an affirmative answer to a question raised in the previous chapter. There we pondered the advisability of an existential educator utilizing the methodology closely linked to an opposing philosophy of education. (We assume that the computer is more closely associated with the philosophies of realism and experimentalism.) The important qualification in this affirmative response is that the existentialist has the sensitivity to detect and inhibit the "tail wagging the dog" phenomenon.

That an existentialist may successfully utilize the techniques of an opposing theory is illustrated by Bugental in his psychotherapeutic practice. Bugental, an existentialist, rejects the psychoanalytic metapsychology of Freud, yet freely borrows clinical techniques associated with Freudian psychoanalysis. Bugental properly credits the success of these techniques but specifically comments that "In regard to these borrowings from psychoanalytic theory, it should be noted that I particularly emphasize the clinical aspects rather than the conceptual and theoretical."[28]

We conclude our discussion of methodology by emphasizing that it would be presumptuous to state that the authors just referenced are advocates of an existential philosophy of education. If a philosophical label were to be attached to them, based on their writing, "humanistic experimentalist" (in the spirit of John Dewey) seems most applicable. Their research is primarily concerned with the development of cognitive skills in students by placing them in humanistic, open-ended and stimulating environments which contain computers.

Although this paper does not examine their methodologies in detail, the reader is strongly encouraged to investigate the references cited. The philosophical position advocated in this paper is existential, not experimental. Therefore, the development of cognitive skills is perceived as secondary, and the epistemology supporting the growth of cognitive skills is open-ended. Yet, within the existential position, the development of cognitive skills is very important. And speaking from this position, this writer strongly endorses the methodologies mentioned herein. First, because they appear to be most promising in promoting cognitive growth. Second, and more importantly, because they appear to do so without doing violence to the existential concern with the subjective "I" in each student. Therefore, while the aforementioned authors may be indifferent to the existential position, the existential educator may freely adopt their proposed methodologies.

C. Administration

In considering the appropriate role of computer technology in educational administration, we should begin by addressing the notion of educational administration *per se* within the perspective of an existential philosophy of education. Unlike educational curriculum and methodology, which must exist in some form, no matter how flexible and open-ended, it is possible (and perhaps very desirable) to engage in an educational experience without an administrative superstructure. The classical one-room school house and many progressive alternative schools function quite well without the services of administrators. (Let us say that an educational situation has an administration when it utilizes administrators--individuals who are not teachers in the sense of being directly involved with the student's exposure and response to the curriculum--for example, superintendents, principles, counselors, security officers, etc.)

Recall that the existentialist is concerned with the *individual* student and his immediate human "I - Thou" relationship with the teacher. Therefore, the existential educator is not sympathetic toward education occurring within the context of a school *system* with its institutional, organizational, bureaucratic structures. Somehow, institutions, organizations, and bureaucracies tend to become self-serving entities in which the individual is reduced to a cog in a mechanism for achieving some collective goal. It is within the context of system that schooling becomes mistaken for education. The student is perceived as raw material entering the school system, being processed by that system,

and outputed (sic) in a mold specified by the requirements of our economic institutions.

It is institutions, organizations, and bureaucracies that basically need administering by some administration; ideally, individuals require no such administration, and it is the administration of a school system, not the individual student, that necessitates the maintenance of an automated data processing system. Therefore, in light of this situation, the existential educator may legitimately reject the establishment of an administrative computing system. In fact, to the degree that the computer promotes systemization by making it possible, the existentialist is likely to resist administrative data processing.

While acknowledging the validity of existential resistance to any form of administrative data processing within an educational setting, this author chooses to adopt a more qualified position, which is based on the recognition that the essential problem is the institutionalization of the educational process, not automated data processing per se. It is also based on the existential proposition that the educator must realistically recognize the situation he finds himself in. He is alive, here and now, in twentieth century America, and education is encompassed in bureaucratic structures. A choice must then be made: either to make a radical break with the institutionalized school, or try to maintain an existential integrity "within the system." Either choice is valid. The former would involve participation in an alternative educational environment without an inhibiting administration, and thus no administrative data processing. The latter choice--the personal choice of this writer--is not so clear-cut and requires some important

qualification.

To begin with, the existential educator who chooses to become involved with administrative computing should be aware that he must maintain a delicate balance. It is practically inconsistent, to be philosophically opposed to systematized education, yet willing to participate to a certain degree. The author's resolution of this situation involves the proposal of guidelines, not the presentation of a tactical solution.

First, such an educator must remain aware of his philosophical position. If he is involved in an educational institution, his goal, be it romantic and highly improbable, is the evolution of that institution toward an existential environment. While the attainment of this objective may verge on the impossible, the only hope lies in the second proposed guideline: the educator's personal involvement with his students must be of an existential nature. Granting that this may be very difficult, it should not be impossible. The educator can function in a humanly responsible manner toward his students, regardless of the institution's failure to do so. Herein lies the strength and hope of the existential creed. The individual educator may not have it within his power to initiate a crusade toward institutional reform; but neither does the institution have ultimate control over his decisions. He does have the potential to make many decisions and establish associations in a humanistically existential manner. The institutional environment may work against this, while an alternative environment may promote such. Yet, in the same way that an existential environment cannot guarantee that the individual educator

will become existentially-oriented, neither can an institutional environment necessarily inhibit the existential practice of the committed educator.

We conclude this discussion of administrative data processing within an existential education by stating that each independent application must be closely examined and evaluated. It seems reasonable that there exists no danger in a school administration employing computer technology to handle situations which may be classified as logistical. This would include such standard functions as payroll, accounting, budgeting, and inventory control. One should view with strong suspicion any systems which could serve as a basis for a data bank for student performance. The potential negative impact of such was specified in the previous chapter. However, there is no specific set of guidelines to follow.

Accordingly, the educator is bound to judge each application on its own merits, and the environment in which it will be utilized. This may place the educator in the position of making some very difficult and unfavorable decisions. Existentially, he is bound to do so. Ultimately, although he is within the system, he is not a part of it.

CHAPTER V

FOOTNOTES

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2. John Strain (ed.), Modern Philosophies of Education, (New York: Random House), 1971, p. 208.

3. Lynn White, Dynamo and Virgin Reconsidered, (Cambridge: The M.I.T. Press), 1968, pp. 161-162.

4. John Lilly, The Mind of the Dolphin: A Nonhuman Intelligence, (New York: Avon Books), 1967, p.147.

5. See Section B.3.a. of the previous chapter for a brief discussion of Gödel's Theorems and further references.

6. Thomas Kuhn, The Structure of Scientific Revolutions, 2nd edition, (Chicago: The University of Chicago Press), 1970, pp. 170-171.

7. Karl Jaspers, "Philosophy and Science," in Reality, Man, and Existence: Essential Works of Existentialism by H. J. Blackham, (New York: Bantam Books), 1965, p. 152.

8. Ibid., p. 152.

9. Ibid., p. 155.

10. Ibid., p. 314.

11. Ibid., pp. 314-315.

12. Peter Schoderbek (ed.), Management Systems, 2nd edition, (New York: John Wiley and Sons, Inc.), 1971, p. 55.

13. Geoffrey Squires, "Education and Information: A Framework for Futures," British Journal of Educational Technology, No. 2, Vol. 4 (May 1973), p. 112.

14. Ibid., pp. 112-113.

15. John Lilly, Programming and Metaprogramming the Human Biocomputer, (New York: Julian Press), 1972.

16. R. D. Lang, The Politics of Experience, (New York: Ballantine Books), 1967, pp. 113-114.

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19. Ibid., p. 476.

20. Ibid., p. 477.

21. Seymour Papert, Teaching Children Thinking, LOGO Memo #2, M.I.T., October 1971, p. 21.

22. Ibid., p. 8-1.

23. Howard Peelle, "Computer Glass Boxes: Teaching Children Concepts With 'A Programming Language (APL)'" in Educational Technology, Vol. XIV, No. 4, April 1974, p. 9.

24. Thomas Dwyer, "Some Principles for the Human Use of Computers in Education" in International Journal of Man-Machine Studies, Vol. 3, No. 3, 1971, pp. 220-221.

25. Ibid., pp. 221-224.

26. Ibid., pp. 221.

27. Ibid., p. 226.

28. J.F.T. Bugental, The Search for Authenticity, (New York: Holt, Rinehart, and Winston, Inc.), 1965, p. 16.

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