A CRITIQUE OF COMPUTER-MANAGED INSTRUCTION IN THE LIGHT OF KEY PRINCIPLES OF ADULT EDUCATION

by

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ABSTRACT

Recent developments in computer technology have greatly increased the attractiveness of computers as a significant resource for adult educational purposes. Until the last two or three years, computer-managed instruction was feasible only on large, expensive mainframe computers. Now, however, relatively inexpensive but very powerful microcomputers can be linked through a local area network creating completely independent learning systems using advanced educational technology. The number of comprehensive computer-managed instruction (CMI) systems in use is growing rapidly.

The thesis argues that a richer conceptual model of CMI is needed which displaces the current centrality of the technology and places the emphasis where it belongs: on key principles of adult education. This thesis is an effort in that direction.

A major CMI program, the Pathfinder Learning System, has been used to illustrate the advantages and disadvantages inherent in such learning programs designed for adult basic education (ABE).

The positive features include both management of learning activities and management of many administrative tasks, which free the instructor for more productive activities. The disadvantages fall into four categories. The major disadvantage is the disempowerment of the learner, which is most clearly evident when the orientation to learning which directs the Pathfinder system is examined through the conceptual framework provided by

principles, goals and ideals of accepted adult education theory and practice. Other disadvantages are also explored.

The thesis argues that modifications can be made which mitigate many of the disadvantages so that CMI systems such as Pathfinder can be incorporated into defensible educational programs for adults.

The thesis begins by establishing some background, goals, and parameters for the critique that follows. Chapter Two describes the nature and key features of CMI systems, and in particular, those of the Pathfinder Learning System. Chapters Three and Four outline, respectively, the major advantages and disadvantages manifested in the Pathfinder Learning System for use in ABE.

In the final chapter, principles and conditions are presented which may enhance the delivery of CMI learning by nesting it within an adult education design that places greater emphasis on empowering the learners to become more self-directed.

DEDICATION

This thesis is written in celebration of the courageous and dedicated men and women who people the ABE classroom--all of them learners.

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CHAPTER ONE: INTRODUCTION

Recent developments in computer technology have greatly increased the attractiveness of computers as a significant resource for adult educational purposes. Until the last two or three years, computer-managed instruction (CMI) was feasible only on large, expensive mainframe computers. Now, however, relatively inexpensive but very powerful microcomputers can be linked through a local area network creating completely independent learning systems using advanced educational technology which can be delivered to even the most remote community. The number of comprehensive CMI systems in use is growing rapidly.

The computer-managed milieu is one about which most adult basic education (ABE) educators have scant knowledge, and one for which little has been done to prepare them for what appears to be inevitable, increasing involvement.

The writer's introduction to CMI resulted from a consulting contract late in 1989 for work with a Native Indian cultural centre. The cultural centre had itself contracted to "sensitize" the reading and writing components of a comprehensive CMI program, the Pathfinder Learning System. This Canadian system was developed primarily for ABE, and was field tested in four test centres across Canada in 1989.

The main task of the sensitizing team was to examine each of the five hundred and thirteen assignments of the Pathfinder reading and writing module to determine whether there were any offensive references to Native Indians, and if so, to replace the offending materials.

The cultural centre subsequently purchased the complete Pathfinder Learning System (nine linked computers, management software, and learning materials) as a major resource for a three-year pilot project to develop a learning centre for Native Indian adults. The writer was contracted to introduce an initial group of sixteen students to Pathfinder in a sixteen-week trial run, and later, to repeat that procedure with two subsequent groups.

This experience of curriculum sensitization and orienting the students generated mixed feelings about the CMI system. There appeared to be strongly disempowering, alienating elements in the system or in the way it was being used; but on the other hand, it was obvious that most students were very enthusiastic about this new approach to schooling.

This thesis has been an attempt to reflect on those conflicting feelings and elements, to seek out the goals, principles and strategies reflected in the current emphases in adult education, and to critique, in the light of those values, the adequacy of CMI (as exemplified by Pathfinder) as an adult learning system.

The scope of the critique presented in this thesis is limited. It does not address questions of cost effectiveness, quality or effectiveness of individual courses, or comparisons of features amongst the major competing CMI programs on the market--all of which are critical considerations for the potential purchaser. Rather, this work centres primarily on how well one representative CMI program, the Pathfinder Learning System, conforms to accepted practices, principles and goals of adult education.

After describing CMI, its antecedent concepts, and three different CMI formats, the paper presents a number of advantages and disadvantages discernible in the Pathfinder Learning System. The positive features include both the management of learning activities (which make possible a high degree of individualization to suit learners' differing learning needs), and management of many administrative tasks, thereby freeing the instructor for more productive activities.

The disadvantages fall into four somewhat overlapping categories. The overriding disadvantage is the disempowerment of the learner. This disempowerment is most clearly evident when the narrow orientation to learning which directs the Pathfinder system is examined in the light of principles, goals and ideals of accepted adult education theory and practice.

The salient conclusion of this critique is the need to displace the current focus on the technology and the narrow view of education embodied in Pathfinder with an emphasis instead on the principles of sound adult education. The paper concludes with examples of ways to make CMI conform with accepted ideals, goals and principles of adult education.

CHAPTER TWO: PATHFINDER: A COMPUTER-MANAGED INSTRUCTION SYSTEM

This chapter explains the nature of CMI, and in particular, explores the Pathfinder Learning System. The chapter has four major sections and a summary. The first section defines CMI and related terminology, and briefly explores two key principles of CMI, mastery learning and individualized (programmed) instruction.

Section two examines four major elements that combine to constitute a CMI program: the two major functions of the management system (instructional and administrative), the graphical user "interface," and the subject matter content. Examples are given to illustrate these elements.

Section three looks at three examples of CMI which illustrate both the varying formats and scope of the medium.

The fourth section describes a comprehensive CMI program, the Pathfinder Learning System, which manages extensive learning materials for a program of studies that encompasses approximately the third- through twelfth-grade levels in five different subjects. This detailed description of Pathfinder provides the necessary background for Chapters Three and Four which present a critique of CMI as exemplified by the Pathfinder Learning System.

I. Computer-managed instruction

In 1982, Naiman defined CMI as a management aid that helps keep track of students' schedules, academic and attendance records, and test scores (cited in Mandell & Mandell, 1989, p. 55).

This early definition is restricted to the administrative management functions of CMI in which the computer is used as an electronic record-keeping and scheduling device. Since that time, these administrative functions have been maintained, and more complex educational functions have been added. Using the British equivalent term, computer-managed learning (CML), Watson (1987) describes several instructional management functions while also expanding the administrative management beginnings to broaden the definition of CMI. She says that the task of CML is:

> that of using the computer to manage the learning sequence. The computer can define the student's task, identify appropriate teaching materials (that may, or may not, be computer based), mark the work, record the results, issue reports, and assess, in the light of this performance, the next appropriate task. (Watson, 1987, p. 11)

In simplest terms, CMI is the accepted term in North America for computer-based learning programs which manage both the learning sequence and related educational and administrative functions, including testing, sequencing of learning activities for individualized learning, and record keeping.

Some would argue that the primary purpose of CMI is to help track and document student learning (Lockhart, Abrams, & Many, 1990, p. 232). To be more accurate, this statement must be completed with the rider "in order to individualize that learning," to reflect what appears to be the primary purpose of the comprehensive CMI systems which have recently emerged, and which are the focus of this thesis.

Confusion about what exactly is implied by this term arises because of loosely used terminology. Computer-assisted learning (CAL) is widely used,

particularly in England, as the umbrella term for the use of the computer as a teaching/learning device. CAL is distinguished from other uses of the computer, such as making complex mathematical computations or building large data bases for developing demographic statistics, and so on. In turn, CMI is a distinct area or subset of CAL, that of using the computer to manage the learning sequence. Similarly, computer-assisted instruction (CAI), particularly in the form of drill and practice, can be considered a subset of CAL (Watson, 1987, p. 11). Since CAI can be a managed resource within some CMI programs (such as Pathfinder), it would then be considered a subset of that CMI system.

Numerous other terms and acronyms are used, often interchangeably, to designate the different functions of the computer for educational purposes. Some of the terms include computer-based education (CBE), computer-based learning (CBL), and computer-aided (or assisted) instruction (CAI). The differences between training, learning, instruction, and education are important ones which become obscured in the acronyms and loosely used terminology.[1]

The term CAI is widely used in a generic sense in North America for single disk educational programs, and will be described in detail in a later section of this chapter. This paper will use the two terms CMI and CAI, and while continuing to differentiate between them, will not further address

[1] See especially Knowles (1984), also Barrow (1990), and Brookfield (1986), for discussions of these differences.

the on-going issue of terminology. The concern of those who prefer greater precision is acknowledged.[2]

Precursors of CMI: Individualized instruction and mastery learning

CMI has its roots in two approaches to learning which pre-date the development of the microcomputer: individualized instruction and mastery learning (Lockhart, Abrams, & Many, 1990, p. 232). Because of their importance to the development of CMI, a brief examination of these two approaches follows.

Individualized instruction (also known as auto-instruction, programmed instruction, or programmed learning) has as key goals individualized and self-paced learning, applying a science of behaviour to teaching and learning through principles of reinforcement of learning, and the construction of carefully arranged sequences of learning leading to pre-identified terminal performances (Galloway, 1976, pp. 214-227).

Before the advent of computers, learning materials for use in individualized instruction consisted of programmed books and learning machines having certain characteristics, seven of which are summarized below:

> There is a logical, step-by-step progression of the material; the learner is required to respond frequently; prompts and cues are built into the material to ensure correctness of responses; answers are immediately available; reinforcement for correct responses occurs with every step (frame); the material progresses so gradually that few, if any, errors occur; and with each succeeding step, there is a gradual shaping of the learner's

[2] See Watson (1987) for an extensive discussion of terminology.

> responses toward the terminal behavior until it is performed without assistance. (Galloway, 1976, p. 229)[3]

This type of learning material is also compatible with mastery learning, the second major concept which forms the foundation for the CMI approach to skill-building.

Mastery learning adopts a behavioural approach to learning. For example, Galloway's account of mastery learning builds on principles derived from Bruner's ideas about forming instructional strategies, Ausubel's suggestions for causing learning to be meaningful, and Skinner's rules of behaviour for making instruction effective and efficient (Galloway, 1976, pp. 3-5).

Galloway relies most heavily, however, on the mastery learning instructional approach developed by Benjamin Bloom, which was based on the theoretical work of John Carroll. It assumes that most students can learn well if they are given enough time to learn and if instruction is optimal for them. A major principle of mastery learning is that students learn what they practise. Towards this end, material is arranged in small steps in a sequential and cumulative manner, and relies heavily on repetitive exercises to reinforce learning. The learner must master the objectives of one level before proceeding to the next, and therefore frequent testing with corrective feedback is central to this approach (Galloway, 1976, pp. 4-6).

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[3] See Skinner (1963, 1968), and Bloom (1968) for extensive discussion of programmed instruction and teaching machines, and the behavioural approach to education.

Building on mastery learning and individualized learning principles, CMI uses the capability of computers to manage highly fragmented sequences of material, provide frequent tests and virtually instant feedback, and calculate the number of correct responses to determine whether to require additional corrective material or to advance the learner to the next level.

There is a near-perfect match between the kinds of functions that computers perform so well and the principles behind programmed instruction and mastery learning. The name given to this match is computer-managed instruction (CMI).

II. Four elements of CMI

There are four overlapping elements which work together in various ways to comprise the total CMI program. These are the two major functions of the management system (instructional and administrative), the graphical user "interface," and the subject matter content. A brief introduction of these elements is given here, and further elaboration is provided both later in this chapter and in those which follow.

CMI instructional management functions

Besides the actual teaching of material to students, there are many managerial duties associated with effective instruction. The functions involved in management of instruction include (a) preparing, administering, marking, and analyzing pre-tests and post-tests which determine the learner's readiness to undertake a given set of activities at an appropriate

level of difficulty, (b) identifying the next learning task in the light of (mastery) performance of the previous task, and (c) selecting appropriate materials and activities for undertaking the learning task.

Ideally, the teacher would want each student to be working at his or her individual learning level, pace and chosen learning style, and would want to be able to offer alternative learning formats and materials to accommodate those differences. Different rates of required mastery may also be desirable in the different subjects or units, or to challenge the very bright learner or encourage those who are slow. The ideal is rarely realized because of the complexity and onerous demands of instructional management tasks. Instead, teachers usually compromise by grouping students for instruction and providing one-on-one instruction only as time permits.

Sophisticated CMI systems, on the other hand, attempt to address all of these management of instruction functions, thereby freeing the teacher for more productive levels of activity such as instructional interaction with students--in other words, maximizing teaching time and minimizing preparation and record-keeping time.

These instructional management functions in respect of program content are made possible through a computerized bank of data relating to learning activities, learning materials on which the activities are based, and test questions which flow from those activities. The learning activities are coded and indexed into discrete, hierarchically arranged fragments of learning, with corresponding test items which are also coded and indexed.

CMI instructional management systems present a sequence of learning which allows individual users to work at their own pace, to make continuous progress at an appropriate level of difficulty, to select from numerous choices of learning approaches and activities, and to receive instant feedback on their responses. Sections three and four of this chapter describe the complex instructional management design used in several different comprehensive CMI programs to accomplish this major goal of these systems.

CMI administrative functions

The second major element of CMI is the management of administrative functions. These functions are distinguished from management of instruction because they are not directly related to preparing for or dealing with instructional issues, but rather involve the more general operations of the system. Record keeping, data management, tracking of learners' progress through the program, and report generation are typical administrative functions of CMI programs. These activities often require typing basic information (e.g., student name, age, reading level) into the computer so that the administrative functions can be performed automatically.

A sophisticated administrative management system can manipulate a wide range of data concerning individuals and groups of learners to generate reports and statistics. Examples include tracking the number of assignments completed, calculating the length of time each learner spent on any assignment, tabulating test items passed or failed by all or any learners,

and listing (in ascending or descending order) ages at entry or education of learners at entry. The variety and amount of data which can be generated in report form is formidable and, as Mandell and Mandell (1989, p. 56) caution, may result in an overload of information which buries instructors in paperwork rather than freeing them from it as initially expected.

An additional feature of CMI administrative functions is that they are often tied to automated instructional management functions. For example, test results used to determine the next instructional activity (instructional management function), are also written to the data bank so that a record of the student's total test results can be generated (administrative function).

User interface

The third element of CMI concerns the interaction of the user and the computer, referred to as "user interface."

The administrative component of the management system and the computer-based learning activities are usually accessed through a system of "menus" and commands which combine with the graphics "environment" (screen design) of the CMI program to produce the format of the user interface. For example, on start-up in the computer, a program may present the user with an initial screen with a list of five numbered items, such as:

1. Begin a new unit
2. Continue last assignment
3. Take a test
4. Print test result
5. Quit

Most menus and commands are activated by clicking on the computer mouse or by pressing special function keys, or simply by "entering" a number which corresponds with a menu choice. Often, the choice entered will activate a sub-menu. In the example above, entering the number "1" could lead to a sub-menu which lists the ten units available for study, one of which could be chosen by entering the appropriate number.

Similarly, the learning program itself will typically present information on which questions are based which the user can answer with a simple Y or N for yes or no, one word answers, numbers, or a click of the mouse. By entering the answer, automated sequences are activated which give immediate feedback, often prompting for a correct answer or moving the program to the next learning fragment if the answer is correct.

Simplicity of the interface operations, particularly for the first-time user and for those who are intimidated by technology, may lower learner apprehension. Conversely, programs that learners find difficult to "navigate" may reinforce resistance to their use and to the use of computer programs in general.

CMI subject content

The fourth and central element of the instructional program provided through CMI is the content. There is little point in developing management systems unless there is something to be managed, and the purpose of the other three elements is to provide a mechanism for delivering the content of the learning program itself.

Drill and practice, tutorials, simulation, problem solving, and games provide the formats for subject matter content virtually across the curriculum. The next section of this chapter expands upon the content element of CMI programs.

III. Format and scope of CMI: Three examples

Three examples of CMI are examined here to illustrate major differences in format, and the possible scope for presentation and management of learning programs through the medium of CMI. The three examples are CAI (which has already been briefly described), PLATO, and the Pathfinder Learning System.

CAI: CMI in microcosm

CAI can be thought of as elemental CMI. CAI programs are usually contained on single computer floppy disks which demand very little computer knowledge to operate. The learner interacts directly with the learning materials presented by the computer, and so CAI programs are almost by definition "interactive," while CMI programs are not necessarily so. The difference in levels of interactivity is a major distinguishing characteristic between comprehensive CMI systems such as PLATO and CCC which, on the one hand, are virtually entirely interactive, and Pathfinder on the other, which is largely non-interactive. These differences are explored in the subsequent two sections of this chapter.

CAI learning activities may take several different forms, the most common of which are (a) drill and practice, as in a spelling program;

(b) tutorials, as in teaching rules of grammar; (c) problem-solving lessons, as in estimating distances; (d) simulation, as in a science lesson on earthquakes; and (e) games.

Increasingly, these forms are merged so that aspects of each may appear in a single CAI program. For example, in one simulation of a biosystem of wolves and mice, the learner manipulates a number of variables which affect the population levels of these animals. Tutorial, simulation, problem solving, and game elements are involved in the program, and with sufficient practice, control of the end results of the simulation can be increased.

Thousands of self-contained CAI programs are available, usually on single disks, as are for example, some commercial disks designed for school children and targeted for the home market at a price of about fifty dollars. Others, created as "shareware," can be copied at the public library or from electronic bulletin boards. Many such programs exist for spelling, vocabulary building, speed reading, arithmetic skill-building, and for virtually every school subject at every grade level.

Typically, a variety of levels of difficulty is offered, both so that the program can be used by a range of learners and so that an individual can increase skill-building in some depth. The content is somewhat arbitrary inasmuch as it does not usually conform to the prescribed curriculum of any particular jurisdiction.

Some of these approaches to CMI are fairly extensive, consisting of series of disks at different levels of difficulty or as different units of a

subject. IBM, for example, has a series of disks at varying levels of difficulty for spelling, reading for comprehension, punctuation, and other language arts. They also have mathematics, science and social studies disks with each disk covering a single topic such as algebra, trigonometry, cell division, earthquakes, volcanoes, and so forth. Typically, there is no "meta management" since each disk is a discrete item using its own limited management functions.

A classic example of CAI is the *Spell It Plus* program developed by Davidson Associates, Inc. in 1989. Of the drill-and-practice variety, the program nonetheless has game-like features and uses animation and sound to reinforce positive responses and lessen the discouraging effect of wrong answers.

Spell It Plus offers direct instruction of lists of words of various levels of difficulty for the learner to master. The learner has a choice of five formats of direct instruction: presentation of spelling list by word (which flashes the word, separates it into syllables, then requires the learner to type it correctly before the next word is flashed), presentation of word by definition, word used in sentence context, anagram format, and finally a game which requires the learner to indicate whether the word is spelled correctly or incorrectly in a race with a hurdle-jumping frog.

The instructional management function allows the learner to control the speed at which the words are offered, the level of difficulty of the learning activity (four levels: Novice, Intermediate, Wizard, and Grand Champion), and a choice of ten word lists (at each level of difficulty) which

involve different spelling rules or characteristics (e.g., foreign derivations, "ie-ei" words, and homonyms). As well, the instructional management function allows the learner to choose from the five instructional formats already described. The instructional management function also tracks each individual's progress (the program requests learners to type their names when they "sign on"), repeating individually misspelled words until they are mastered, and retaining information about each learner's progress so that the learner can carry on from where he or she left off in a previous session rather than having to repeat the entire lesson as some CAI programs do.

A number of administrative management functions are also available. For example, scores can be printed for each activity in which a learner has been engaged. Lists of misspelled words from each activity can be produced. As well, some programs include time spent on each activity.

CAI, then, offers direct, interactive instruction through a variety of instructional methods. Instructional management functions of CAI permit individualization of pace, level of difficulty, and a variety of choices of direct instruction formats. Some administrative functions are also available to track and chart learner progress.

These features are more sophisticated in comprehensive CMI programs, but remain fundamental to their operation.

PLATO: Comprehensive, self-contained CMI

There are CMI systems that combine features of CAI and CMI in elaborate configurations. One example is the well-known PLATO system (Programmed Logic for Automatic Teaching Operations), in which many

sequential learning programs, perhaps hundreds of times larger and much more complex than the spelling program described earlier, can be operated for hundreds of different learners simultaneously.

The PLATO system which was initially developed on, and for use with, a mainframe computer (indeed, a fourth CMI format), is entirely computer-based inasmuch as virtually all student work is done at the computer terminal in the same manner as CAI.

Because PLATO initially required a mainframe computer for its operation, the system has until recently been based at universities or large sponsoring corporations. Recent advances in computer technology have opened the way for the PLATO system to be modified to run on the much more portable, much less expensive microcomputer. Typically, a group of microcomputers are linked to a central computer "file server" which stores the programs and management system software on a large "hard disk." Such systems lend themselves to distance learning, since the central computer can be accessed by modem through telephone connections.

Computer programs such as PLATO place huge demands on computer memory and storage, and therefore individual programs are presently limited in depth and scope and some content may not be any more comprehensive than that found on CAI disks, while other programs are many times larger. What is different is that test results and other administrative information for all PLATO programs are centrally stored and accessible for report generation, a major consideration which is not possible with discrete CAI disks. Laser disk (compact disk) technology is increasingly

merging with computer-based learning, offering a potent solution to the technological handicaps such as limited storage and memory which presently hinder computer-based educational programs such as PLATO. PLATO-type CMI programs, which include the CCC Instructional System (Computer Curriculum Corporation) which is similar in design, can be thought of as elaborate CAI.

Pathfinder: An "Integrated Learning System"

A third type of CMI program is represented by a recently developed (1989) Canadian program, the Pathfinder Learning System. The major difference between Pathfinder and PLATO lies in the amount of non-computer resources that are components of the Pathfinder system. Unlike PLATO-type CMI programs where virtually one hundred percent of the work is carried out at computer terminals, in Pathfinder only about ten percent of student work is similarly interactive.

Most Pathfinder learning tasks are undertaken through the use of books, SRA and other kits, video tapes, CAI disks, and audio tapes; but, in common with all CMI, these learning tasks are all computer managed. With the exception of the CAI tasks, student work is undertaken away from the computer. Because of this multi-media approach to learning resources, the acronym ILS (Integrated Learning System) has come into recent use to differentiate systems such as Pathfinder from those which are virtually totally computer-based as is PLATO. The term ILS is inaccurate, however, since the subjects which form the program content are not integrated (a disadvantage explored in Chapter Four) and, further, each subject uses its

own learning resources. A more meaningful term might be "Managed External Resource System" (MExteRS?) for Pathfinder-type CMI, and "Managed Internal Resource System" (MInteRS?) for PLATO-type systems with their self-contained software programs.

Pathfinder is described in detail in the next section of this chapter.

IV. The Pathfinder Learning System

The detailed description of Pathfinder that follows falls into five main sections: the overall system, learner placement in the system, access and navigation through the system, the hardware and material components, and the hierarchical structure of the learning program. Many of the administrative and instructional management functions are detailed in the discussion of the advantages and disadvantages of Pathfinder contained in Chapters Three and Four.

General overview of Pathfinder

The Pathfinder curriculum is designed for adult learners, particularly those who have not completed high school graduation. Five subjects (Courses) are offered: Reading/Writing, Mathematics, Science, Social Studies, and Employment/Life, covering grades three through twelve. The content for the five subject areas has been based on Ministry of Education curriculum guidelines of the eleven English-speaking provinces and territories.

Student computers (called workstations) are linked to a central file server which contains the management system software for both instruction

and administration of the program. The computer tracks each learner's progress through the system, assigning learning tasks in each course based on pre- and post-test results. The tests are generated and scored by the computer, and move the learner on to a new set of assignments only when eighty percent mastery is attained on the post-test.

Placing the learner in the system

To generate tests or assignments for any learner, the computer must be coded with the student's reading level so that the assignments in any of the five courses will fall within the student's reading range. Accordingly, students must initially be tested in reading so that that information can be entered into the system. The reading range must be adjusted if assignments contain reading material too difficult or too easy for the learner, and adjusted over time as the learner's reading improves. Pathfinder is not designed for use with students whose reading range is below grade three, and will therefore not accommodate the needs of learners at the pre-literacy level. Reading is a necessary skill for progress through the almost nine hundred textbooks used to cover the five subject areas.

In addition to entering the student's reading level, the instructor must place the student at the beginning of a course or at some arbitrary stage within each course. A manual provides information codes which, combined with the management menus on the computer, allow instructors to move students quickly and easily anywhere in a course to individualize learning or to accommodate learner interests.

Access to and navigation through Pathfinder

Each learner is provided with an identity number and password which permit access to an individualized file. Once admitted by the computer, the user is offered a series of menus which provide easy use of the system. The user simply types the single digit number code of a chosen menu item. The menus allow students to choose among subjects in which they are registered, get an assignment or update information on assignments. The system responds by presenting an appropriate sub-menu, or the next assignment, pre- or post-test in the learning sequence.

Assignments typically consist of a set of instructions indicating the books, kits, video tapes, or software to be used--all are coded--the pages to be read, and the questions to be answered or activity to be carried out. A typical Pathfinder directive would look something like the following: "Find book RWP 025, read pages 14-17, and do exercise A on page 18." Essential tasks within the assignment are coded REQ (for "required"), but learners can do as many or as few tasks as they feel necessary to master the skill in question. Supplementary assignments can be requested if the skill is still not clearly understood, and these are always generated at a lower reading level.

Learners advance through the system at their own pace, choosing whichever subject they want to work on, and within the subject, exercising some choice as to the learning materials.

System hardware and learning material components

The standard Pathfinder configuration consists of eight student workstations (IBM PS/2 Model 25 computers with mice) linked by Novell NetWare to a ninth computer (IBM PS/2 Model 70 computer) used as a file server which holds the complex (software) program needed to run the administrative and instructional management system. Two printers, two video cassette recorders, and three audio cassette machines and headphones complete the hardware contained in the system.

Only about ten percent of Pathfinder activities require the use of the computer (for using the CAI disks). The vast majority of activities are undertaken through the use of books and other materials. Table 2.1 provides a breakdown of these materials.

Table 2.1: Pathfinder Learning Materials

Subject	CAI	Books	Audio	Video	Kits	Total
Employment/Life	1	309	0	7	8	325
Mathematics	11	111	0	0	5	127
Reading/Writing	20	309	12	4	7	352
Science	15	76	0	7	5	103
Social Studies	11	87	0	5	2	105
Total	58	892	12	23	27	1012

The library of books contains a reference section (dictionaries, a thesaurus, grammar texts, atlases), but consists mainly of standard textbooks and workbooks to which assignments are made. Because

assignments must match student reading levels, several different books must be available for any given assignment topic to provide for this range.

Many of the assignments provide alternatives which allow students to choose between print and other media. A biology lesson might refer to assignments in a textbook, a CAI disk, a section of one of the kits, and a video tape. Learners can then choose a learning style which they favour.

In addition to their subject-based Pathfinder assignments, students can spend time learning computer applications such as word processing, spreadsheets, and data bases, since Pathfinder comes complete with *MS Works* (an "integrated" computer applications program) ready for students to learn and use.

As well, additional software, video tapes and other related material can be purchased or borrowed for use with the supplied hardware, but cannot interact with the Pathfinder management system. Therefore, time spent on these supplementary activities goes unrecorded.

Structure and functioning of the Pathfinder curriculum

Typical of the CMI genre, each subject in the Pathfinder curriculum has been analyzed and curriculum developed in a hierarchy of levels. The hierarchy for each Pathfinder course is divided into strands, topics, objectives, and ultimately, outcomes. The manual used for training instructors to use Pathfinder defines the terminology for the curriculum organization as follows:

1. *Strand*: the broadest division of content within a particular course.

2. *Topic*: a logical breakdown of strand content which varies from course to course.
3. *Objective*: a related group of skills, the level at which pre- and post-testing occurs.
4. *Outcome*: the smallest stated learning skill. (Pathfinder installation and training workshop, undated, p. 6.2)

To illustrate, the Reading and Writing *Course* has five *Strands*, broken down into nineteen *Topics* with sixty-one *Objectives* and a total of three hundred and five *Outcomes*. The following is an example of this fragmented hierarchy which can be visualized as a pyramid viewed from above:

1. *Course*: Reading and Writing (1 of 5 Courses in the Pathfinder Program).

2. *Strand*: Words and Phrases (1 of 5 Strands in the "Reading and Writing" Course).

3. *Topic*: Written Expression (1 of 4 Topics in the "Words and Phrases" Strand).

4. *Objective*: Expand vocabulary for word usage (1 of 8 Objectives in the "Written Expression" Topic).

5. *Outcome*: Build and use related forms of words (1 of 10 Outcomes in the "Expand vocabulary for word usage" Objective).

The extensive Pathfinder hierarchical and sequential structure defines the total skill content seen as necessary to provide skill building (equivalent to that found in Canadian public school curricula for the five subjects) from approximately third grade to the end of grade twelve.

Skill building concepts (outcomes) are indexed to appropriate sections of the books and other materials which "teach" and exercise the individual

outcome skills at a given reading level. Test items based on these materials are similarly indexed. A coding system is programmed into the instructional management system which can then be used to generate pre- and post-tests and assignments from the indexed outcomes and test items. In this manner, the complete curriculum is computerized and made ready for use.

Movement through the system is largely controlled through pre- and post-testing. A pre-test is administered every time a student is moved to a new objective (that is, the fourth level). The test questions assess competence in each of the outcomes (fifth level, at which student assignments are made) falling under that objective. A typical test would draw two test items from each outcome. In the earlier example drawn from the Reading and Writing Course, the objective contains ten outcomes. The pre-test in this case would therefore consist of twenty questions. Since mastery level is set at eighty percent, students would skip to the next objective if they had fewer than five wrong answers (and be offered a pre-test at the new objective level). However, if they had five or more incorrect answers, they would be assigned exercises which would eventually lead to a post-test when all outcome assignments had been completed. Work would be assigned only to those outcomes in which mistakes had been made on the pre-test, and in this way, the system is designed to ensure that learners are working on areas of weakness, and not on concepts already mastered.

An additional feature of Pathfinder is that of "paths." Most courses have three paths: the Comprehensive, GED, and Basic paths. Placement in the Comprehensive Path means that the learner moves through every

outcome in the course at the assigned reading level, but requires a grade five reading range as a minimum. The GED Path, on the other hand, includes only material required to prepare the learner for skills tested on the General Educational Development Test (GED), and requires a minimum reading level of grade seven. The Basic Path reviews the most elementary skills at a reading level of grades three and four only. This path moves a student through the full range of topics within each strand as a preparatory step for repeating them later at the higher reading level spiral in the other two paths.

Instructors have the flexibility to customize or individualize course content and materials by overriding the management system. For example, the program can be modified to offer assignments in a single strand of a single subject for a student who wants, say, to upgrade intensively in algebra only. Learners can be placed in a program which is highly individualized to accommodate not only reading level, but breadth and depth of learning at every outcome in any course.

Furthermore, additional paths can be created by local users. For example, a fourth path could be created which might include only the grammar outcomes within Pathfinder. Alternatively, paths can be created to add materials not presently existing in the system, and so could include a path for first year college English, or a path for Native Indian literature. This would be a complex task requiring some technical assistance, although many of the decisions regarding materials for assignments could be made locally, as opposed to similar modifications to the PLATO system where a

relatively larger proportion of the learning program design requires knowledge of computer programming.

Chapter summary

CMI is the accepted term in North America for computer-based learning programs which manage both the learning sequence and related administrative functions, including testing, sequencing of learning activities for individualized learning, and record keeping. The primary purpose of CMI is to help track and document student learning in order to individualize that learning.

Most comprehensive CMI programs consist of four interrelated elements: an instructional management system, an administrative system, the "user interface," and subject content.

CMI systems vary in sophistication and scope. Elemental CMI systems are found in CAI programs. More comprehensive systems are exemplified by PLATO which manages internal, computer-based resources, and Pathfinder which uses CMI to manage extensive external resources.

The Pathfinder Learning System is an example of a highly flexible computer-managed instruction system which employs computer technology to manage the many tasks of administering a highly individualized, complex learning program for adults. The learning program is a highly structured, hierarchical and sequential arrangement of skill-building tasks which utilize more than one thousand books, kits and other media to which the learning assignments are made. Only ten percent of the learning activities actually

require computer time. All of the materials and the curriculum activities are managed by a computer program which has the capability of keeping track of students' progress, generating tests, assignments, and reports as students work their way through the program.

CHAPTER THREE: MAJOR ADVANTAGES OF CMI AS EXEMPLIFIED BY THE PATHFINDER LEARNING SYSTEM

The Pathfinder Learning System is new, and in many respects, state-of-the-art, using high quality equipment and materials. Pathfinder appears to be of sufficient overall quality so that it can fairly be used as an exemplar of comprehensive CMI systems. Thus, examining this functioning CMI resource is a vehicle for gaining a more insightful understanding generally of this type of educational technology. The analysis offered here is based on the writer's year of experience in working with Pathfinder.

In this chapter, six major advantages of using the Pathfinder Learning System in the ABE classroom are discussed. The next chapter presents the disadvantages.

The chapter is divided into six sections. Since some of the advantages are seen as broad categories which subsume a number of related advantages, the relevant sections are further divided into subsections. (It should be added that some features are not easily categorized since some of their characteristics can as easily be viewed from perspectives offered by other categories.) Section one outlines individualization of learning made possible by Pathfinder in four complementary ways. Section two describes innovations in Pathfinder, and the advantage of such innovations for ABE. Section three examines the capacity Pathfinder has for expanding the resources it manages. The fourth section describes the expansibility of the individualizing "paths" within the system. Sections five and six describe additional advantages relating to areas of computer superiority over human abilities.

I. Individualization of learning

CMI was developed from the guiding principles of programmed instruction which had individualized learning as its major goal. Pathfinder has embraced individualization in full measure. Four aspects of Pathfinder individualization are: placement and pace flexibility to address differences, pre- and post-test features, flexibility of scheduling, and management features facilitating individualization.

Placement and pace flexibility to address differences

ABE students typically vary significantly in such characteristics as educational background, length of time out of school, age, work experience, confidence, clarity of goals, social adjustment, subject matter interests, and so on (Mezirow, Darkenwald & Knox, 1975, pp. 37-54). They also appear to vary in their motivation, persistence and other learning attitudes; in intellectual considerations such as mental quickness, concentration and memory, and such learning considerations as personal organization and efficiency; and in physical characteristics such as visual, hearing and co-ordination skills. Addressing these often immense differences is one of the greatest challenges facing the ABE instructor, and is perhaps the single most significant contribution CMI offers to education, and likely the most substantial rationale for its use.

Pathfinder uses initial testing to place each student at an individual entry level which may well vary from subject to subject. Once placed, learners progress at their own pace. Independent pacing is a most significant factor, eliminating the boredom experienced by bright students in

non-individualized pacing situations who are shackled to the slower pace of the group, or conversely, the frustration experienced by slower students who are constantly pressured to keep up with the others. The freedom to work at one's own pace also places the responsibility to progress where it should most properly exist--on the individual learner.

Pre- and post-tests contribute to individualization

Students can progress at their own pace because the CMI system uses pre- and post-tests based on mastery learning to regulate individual student progress through the objectives in each course. Since assignments are based on the test results in the sense that no exercises are required where students achieve eighty percent or higher on the test for those outcomes, students will not waste time on material already mastered. Therefore, assignments address weaknesses as revealed by the testing. The post-tests provide a rapid check on students' progress in the assigned work, and because they are automated, culminate in a profile of each student's learning history through each course. This immediate feedback to students on how well they have mastered their assignments is most desirable, and consistent with the findings that student performance will improve if there is continuous confidential feedback on achievement, including test results (Mezirow et al., 1975, p. 149).

Flexibility of scheduling

In Pathfinder, students can work not only at their own pace, but depending on the operation of the site hours, can schedule their studies to suit their convenience--part-time, full-time, mornings, evenings, twice

weekly, or whatever is most suitable. This consideration is of some consequence, since ABE students are often single parents, part-time employees, or have complications of one kind or another that interfere with full-time day schooling. One Pathfinder site was planning to operate twenty-four hours a day, offering their learning program as a resource in many ways analogous to a library service, permitting students to study whenever they chose. It is unlikely that such a degree of individualization would be as easily accomplished without a computer-managed system to take care of the cumbersome details, a task which exploits best use of computer technology.

Management features facilitating individualization

The flexibility of Pathfinder's management system provides additional capabilities for individualizing learning. In several different ways, assignments can be made more or less challenging for the learner. Since material is available at several different reading levels, the same concepts can be accessed at a more or less challenging level, depending on the degree of difficulty students have comprehending them. For example, a student who has difficulty understanding a social studies unit on map reading at the grade nine reading level may also study these concepts at an easier reading level.

The management system also permits adjustments for the degree of mastery required on pre- and post-tests for each student. The default is eighty percent mastery, but students (or instructors) may prefer a more or less rigorous standard of performance. Furthermore, the tests can be

adjusted for three levels of difficulty--advanced, normal, and easy--providing additional challenge for bright students and encouragement for slower learners.

A third individualization variant built into the system is that of path alternatives. The several paths allow choice of depth of learning, since the Comprehensive path requires students to undertake each outcome in each objective not passed in their pre-tests. The General Educational Development (GED) path, on the other hand, bypasses material not considered essential to the GED and moves the learner more quickly through the materials. Additional paths can be chosen or created to select other variables (e.g., fewer outcomes, "easier" materials, or computer-assisted instruction material only).

Pathfinder provides a fourth adjustment which allows the instructor to place the student either in "automatic mode" whereby the management system moves the student outcome by outcome through each objective or in "manual mode" which allows the student to determine the order in which he or she chooses to work on the outcomes among those required under each objective.

Finally, the instructor can easily move students to different strands or topics within any course. A student tired of working on punctuation, for example, can quickly be moved to poetry in the Reading and Writing Course.

II. An innovative approach both to CMI and ABE

Mezirow et al. (1975, p. 24) found that three-fifths of the urban ABE directors in their study believed that educational technology holds great promise for improving instruction. Computer use in educational institutions at all levels has increased substantially in each of recent years (Mandell & Mandell, 1989, pp. 6-8) and is now "fairly well entrenched at all levels" in Canadian schools. For many students, computers are associated with modern learning and carry with them the mystique of future-oriented technology.

It would be fair to speculate that many ABE students would look upon a computer-equipped classroom as one which is forward-looking, impressive because of the expensive technology, and motivating because of the new approach to learning it offers. Clearly, it offers not just a second chance at education, but a new and interesting approach to what, for many, was an exercise in failure.

Pathfinder is a repository of innovative ideas in the fields both of CMI and ABE. By harnessing many resources through a central computerized management system, Pathfinder offers ABE a unique and powerful educational tool. Because students can choose between different media formats (e.g., books, video, CAI, a variety of kits), they may be more enticed to pursue their studies than if they were restricted to one medium.

The rich variety of learning materials allows further individualization of learning to suit students' preferred "learning style." Although books account for the largest single kind of learning materials, adult learners who

have resistance to learning from print or who prefer a more visual approach to learning can use provided alternatives such as CAI and video cassettes. For all students, the variety of resources offers a change of pace as well as a reinforcement of book-learned skills. For many, there is a sense of prestige in working with high technology, and a sense of accomplishment in becoming "computer literate," however minimally. Some students who would not otherwise care to spend their time improving rote spelling skills will spend many hours at computer disks which use innovative and sometimes amusing techniques for holding interest. Other attractive features of CAI are the interactivity it offers students, and the instant responses they receive to their answers.

Students are highly aware that computer-managed instruction is a far different approach to education than they have experienced in the past. The physical presence of the networked computers dominates their first impressions. The writer's experience has been that relatively quickly, students overcome whatever intimidation they might have felt about using computers. After brief introductory instruction, students are able to sign on, choose a subject area, and get right to work.

One of the reasons that they can do so is that Pathfinder has taken care when constructing the interface to keep it simple. Students are not required to memorize any commands, only to remember their (usually two-digit) sign-on number and password. Pathfinder then presents a series of "menus" which allow students to select a course, get an assignment, and have it printed out.

At that point, the menu allows them to sign off, and they can leave the computer, pick up their assignment at the printer, and follow instructions regarding which books or other learning materials they need to find for the exercises assigned.

Students require neither typing skills nor computer knowledge in order to use Pathfinder productively. Because of this simplicity, students gain an almost immediate sense of control over the machine, and confidence in their abilities to succeed in this technological environment. Several students suggested that it felt good to be able to brag to their friends about using the computer at school. Many ABE learners have low levels of self-esteem, and it is clear that self-esteem is raised very quickly by the "friendly" encounters students initially have both with the computers and Pathfinder Learning System menus.

With little additional effort, students can pursue topics in great depth simply by going beyond the work assigned in each outcome. Most book-based assignments, for example, are only a few pages in length. Pathfinder contains a small library which consists of the nearly nine hundred books required for the assignments. Curious students find themselves exploring much more of the book than assigned, and browsing through other books and materials to which no assignments have been made. Most ABE learners seen by this observer have never used CAI materials, and find some of the disks intriguing. Some students will spend an hour or more completely absorbed by a CAI program, whereas their attention spans with book-based tasks can be measured in terms of mere minutes.

III. Expansibility of resources

In addition to the variety of materials, there is an adaptability factor which has the potential to enhance Pathfinder greatly. To some extent, the Pathfinder resource materials can be expanded to suit the needs and interests of the user group. For example, the many videotapes that have been developed specifically as preparation for writing the GED could be used. These (surprisingly) are not included in the standard Pathfinder resources. Also, good commercial CAI disks are available for speed-reading, spelling, and vocabulary building, for example, and could be used to supplement the IBM disks supplied by Pathfinder. However, the extent to which these additional resources can be integrated is minimal since the Pathfinder management system cannot accommodate supplemental materials into either its reporting system or, more importantly, into its assignment and testing data base, without expensive programming changes.

IV. Expansibility of paths

Although technical assistance is required, additional paths can be entered into the learning system data base to customize Pathfinder at each site. The additional cost might be considerable, but the system is designed to accommodate extensive expansion and adaptability. Local site operators of Pathfinder could supplement the Reading and Writing Course by including, for example, more books and video cassettes with Native Indian content. Assignments and test items would then have to be programmed into the data base for the added materials.

More ambitiously, entire paths or courses could be developed to suit local needs. A site wishing to develop a path in Native Indian literature, could, for example, choose the books, develop appropriate strands, topics, objectives and outcomes, develop both the assignments for the outcomes and the related questions for the pre- and post-tests, and hire a programmer (or the Toronto Pathfinder developers) to enter the codes for these materials into the computer data base. To a considerable extent, the computer-managed system is a receptive vehicle readily modifiable to reflect local needs, a feature promoted and encouraged by the Pathfinder developers.

V. The tireless, unbiased teaching device

The teaching of basic number and language skills can be a most tedious instructional duty. One of the best uses of computers as teaching machines is their tireless capacity to provide for drill of basic skills. With good CAI, students receive drill that is individualized to their skill level, pace, and time requirements. Ideally, the CAI offers solid reinforcement and encouragement, and provides high motivation to even very reluctant learners. CAI may often be the first kind of teaching that adult basic learners encounter which they really enjoy. Moreover, for the most part, students perceive CAI to be absolutely unbiased, often entertaining, and unarguably accurate--perceptions not always extended to their human teachers.

Teachers have additional reasons to be appreciative of CAI. The tedium of preparing, administering, scoring, and recording drills and test

results is no longer a drain on instructors' (or aides') energies since CAI is usually programmed to manage these tasks. Thus freed, instructors can direct their time to more productive educational activities, yet student drilling on basic skills is not ignored, and can be a highly interesting and effective part of a remedial program.

To a great extent, many of these liberating attributes of CAI are also virtues of the Pathfinder Learning System management technology. Pre- and post-tests are generated, scored, and recorded by the computer which then can determine the prescriptive assignments, generate these, and record student progress. These would otherwise be exceedingly time-consuming tasks for instructors which would divert both large quantities of time and energy from the job of teaching and interacting with the learners.

VI. The faultless reporting device

Other labour-saving benefits include the record-keeping systems which Pathfinder has developed. A "query" system allows the instructor to generate an immense variety of reports from the numerous kinds of information stored in the data base. Virtually every activity undertaken, the date, length of time, score, and so on is recorded for each learner, group of learners, course, etc. On a moment's notice, the system can generate with impeccable accuracy class lists, attendance lists, lists of students not signed on since a specified date, lists of students on any given course, path, strand, topic or objective, individual student progress in any or all subjects by day, week, month, term, or in total.

The number and kind of reports depend largely on the instructor's creativity and familiarity with the powerful query function of the management system. Reports relating to Pathfinder materials can be generated to determine, for example, all books in the Social Studies Course with a grade six reading level, or all materials used in a given strand. The report generating system, once mastered, permits instructors to view data about students individually and as a group in useful ways not available in the non-computerized classroom. It also produces in seconds routine reports that would consume hours of instructor time and energy.

Chapter summary

The Pathfinder Learning System offers an innovative approach both to CMI and the ABE classroom. It offers many advantages for the individualization of learning programs for students, including features permitting considerable individualization of placement, pace, reading level, and scheduling. Other management features allow for additional individualization. Pathfinder is easily operated by student and instructor alike, as care has been taken by the designers to create a system of menus which provide a simple user interface. Pathfinder offers a wide variety of learning materials which allow learners to choose between different learning styles. These innovative features are motivating to many students who find the technology appealing and, for some, preferable to print-based learning. Furthermore, the extensive Pathfinder equipment permits supplementary materials (e.g., video cassettes, and CAI) to be used. The software

management system can accommodate additional, locally developed paths in order to customize use to include new subject material or for different ways of using existing Pathfinder material. The Pathfinder management system includes many advantages inherent in computer technology. It can operate continuously, storing vast amounts of data, much of which can be organized into a variety of reports which would otherwise be onerous and time consuming for instructors to create.

CHAPTER FOUR: DISADVANTAGES OF CMI AS EXEMPLIFIED BY THE PATHFINDER LEARNING SYSTEM

In Chapter Three, the advantages of CMI were considered. In this chapter, the disadvantages are examined. The critique centres primarily on conceptual questions concerned with how Pathfinder as an exemplar of CMI relates to accepted practices, principles, goals, and ideals of adult education.

The disadvantages discussed in this thesis of using comprehensive CMI systems in the ABE classroom fall into four categories. Some blurring exists among these categories since some questions are held in common, and can be examined from different perspectives in those various categories.

An introductory section examines the concept of "centrality of use" of CMI, and includes a discussion of the confusion surrounding the capabilities and limitations of comprehensive CMI systems, and the raised expectations which contribute to the confusion. This section provides context for the subsequent four sections which discuss the various disadvantages.

Some disadvantages of using comprehensive CMI systems in the ABE classroom can most clearly be seen when viewed in the context provided by established worthy practices, principles and goals of adult education. Section two examines some of the factors inherent in Pathfinder and other CMI systems which are antithetical to accepted ABE principles and goals.

The third section examines a second category of problems, those arising from the concept of predetermined learning objectives upon which the CMI curriculum is constructed. Section four discusses disadvantages arising from the Pathfinder ungraded structure. The final section examines

the fourth category of disadvantages, those relating to the role of the instructor.

I. Centrality of use and raised expectations

The major disadvantages of Pathfinder and Pathfinder-like programs arise from an over-reliance on their capabilities, in effect, confusion surrounding the centrality of their use in ABE classrooms. The term "centrality" refers to the relative degree to which the resource or method or activity (in this present case, a comprehensive CMI system) is used to deliver a program of studies. If, for example, Pathfinder were used only as a supplementary resource to traditional instruction, then it would not be considered as central to the program's delivery. On the other hand, if the ABE program consists primarily of the Pathfinder activities, Pathfinder would be considered central to the delivery of the ABE program.

Taken to the extreme, if the system were used as a "stand-alone" program with the (ascribed) capability of delivering a program of studies, it would have absolute centrality. Clearly, the question is one of emphasis, but it is a critical question since many of the disadvantages discussed in this chapter are exacerbated by the centrality of use of Pathfinder in the ABE program.

Confusion in respect of capabilities and limitations

The centrality issue seems directly related to the degree to which educators understand the capabilities and limitations of the new technology. Their understanding would be considerably increased if educators were

clearer about the answers to questions such as: What can the programs actually do? How are they to be used? What are their limitations? To what extent will they replace the instructor's role? Are the systems relatively complete learning systems? If not, what additional program components are needed? Will they have an overall positive or negative effect on learners? What is their "fit" in respect of the goals of the ABE program or of adult education principles? Can they do what they claim they can do?

CAI has been around long enough that it has established a niche in many classrooms, for the most part as a supplementary drill and practice resource for basic skill-building. Yet many questions similar to those cited still surround their use.

Comprehensive CMI systems, on the other hand, have only very recently been available in a form (linked microcomputers) and at a cost that contribute to their attractiveness as a major investment for general use in ABE. What is apparent is that many educators are convinced that comprehensive CMI programs are worthy of exploration as a major educational resource. In part, the decision to purchase the system results from high expectations of the system's capabilities to serve as a major educational resource, even as a "stand-alone" teaching/learning resource. This thesis argues that such expectations may not presently be realized, and more importantly, that the extensive use of CMI may impoverish the quality of an ABE program.

Expectations raised by CMI and technology

A potential disadvantage to the educator initially confronting CMI systems has to do with expectations. Unrealistic expectations are raised in several ways that CMI programs have capabilities well beyond their actual limitations. Three parts to this problem of expectations are explored here in regard to Pathfinder. One aspect relates to the promotional material, its language, and its omissions. A second aspect of expectation raising involves an appearance of comprehensiveness given by the extensive configuration of hardware, software and materials in the elaborate and often elegant systems. The combined effect is to create expectations that Pathfinder can serve virtually as a stand-alone vehicle for delivering a comprehensive ABE program. A third aspect of expectation-raising relates to superficial evaluations of systems presently in use.

Expectations promoted in Pathfinder brochure

The promotional brochure issued by Pathfinder makes the following claims:

> Pathfinder integrates networked computers, management software, curriculum and an educational resource library.
>
> With the flexibility of individualized learning, the learner gains:
> -the skills that make the pursuit of higher learning possible,
> -the skills that employers say they require in their employees,
> -the skills that allow each person to function and participate as a productive member of society. (Pathfinder Learning System: A new direction in lifelong learning, undated, p. 1. Henceforth, Pathfinder).

This quotation is illustrative of a problem that relates to raised expectations that Pathfinder is designed to deliver these highly desired

"skills." Since these skills are nowhere defined in the brochure, and since there is no suggestion that additional abilities might be required, by claiming that the learner will "gain" these skills, Pathfinder has set up a high degree of expectation that it can deliver them. A later section of this thesis presents the argument that other much more important abilities (which are not addressed in the Pathfinder training program) are necessary for learners to achieve the broad goals identified in the brochure. The point here is that a major disadvantage to the learner may occur if Pathfinder is treated as the central means of delivering the program in accordance with the expectations raised.

A second expectation is set up through omission. Because there is no suggestion that other courses or program components may have to be prepared to supplement the Pathfinder curriculum, or that Pathfinder should be considered only the academic skill-building component that could be included in a more encompassing ABE program, there is the expectation that Pathfinder can be used as a stand-alone ABE program. This expectation is reinforced by the statement that:

> The Pathfinder Learning System provides computer-managed, individualized instruction and offers a pragmatic alternative to traditional classroom methodology. (Pathfinder, undated, p. 3)

The limitations to the "pragmatic alternative" are neither discussed nor implied, but the message is clearly designed to raise expectations about the capabilities of the system.

Expectations raised by the comprehensiveness of Pathfinder

The expectation raised by the promotional material that Pathfinder is a stand-alone learning system is further strengthened by the comprehensive nature of its five subject offerings (which span the third through twelfth grades), and the extensive hardware, software, and materials needed to "teach" the subject offerings. The expense of the total system is itself impressive--approximately $160,000 (An evaluation of the Pathfinder Learning System, 1990, p. 29. Henceforth, An evaluation).

The curriculum is vast, and a demonstration allows the novice to experience the ease of use of its many features, and the impressive use of multi-media materials. The overall impression is that the system is a comprehensive learning resource.

No doubt, some of the expectations raised may well be the result of naive beliefs held by potential users, beliefs which relate to the mystique surrounding computer technology that endow that technology with unlimited capabilities which are unrelated to physics or fact. One can observe, however, that the promoters have taken no steps to dispel these naive beliefs.

Expectations raised by some evaluations of systems presently in operation

Because Pathfinder has only been recently introduced, very few evaluations of the system are available. While educators need objective evaluative material to help them make informed use of the technology, some evaluations will simply contribute to raising expectations of the system, as with the following:

> A thorough investigation of the Pathfinder Learning System in use at the New Brunswick Training School was conducted by the Curriculum and Evaluation Branch of the Department of Advanced Education and Training. The study concluded that the Pathfinder Learning System is an excellent tool for the delivery of individualized, self paced academic training. All those involved expressed a high degree of satisfaction with the system, with major benefits for all users....Any weaknesses in the program can be attributed to its newness, and either have been addressed or are being addressed, as a result of an excellent communication link between the users and the supplier. (An evaluation of the Pathfinder Learning System, 1990, p. 1)

Evaluations such as the one quoted raise expectations that Pathfinder can indeed deliver "individualized, self-paced academic training" and may contribute to a false sense of the true capabilities and limitations of Pathfinder.

In summary, a number of expectations are established by promotional claims which are given additional credibility by the comprehensive nature of the learning system, and by some evaluations of systems in operation. These expectations contribute to the belief that programs such as Pathfinder have the capability of playing a major, or even a central, role in moving learners to desirable ABE goals. It is this premise that provides the departure point for this critique of the major disadvantages of the use of Pathfinder as the principal vehicle for delivering a learning program in the ABE classroom.

II. A narrow view of ABE principles and goals

> The point is that education is centrally concerned with the development of a critically aware frame of mind, not with the uncritical assimilation of previously defined skills or bodies of knowledge. (Brookfield, 1986, p. 17)

As detailed in Chapter Two, the Pathfinder program of studies is composed of a hierarchy of highly fragmented, predetermined learning outcomes. While this type of program is consistent with the drill-and-practice approach to education, and while forms of drill and practice have their place in ABE, should this remediation approach dominate an ABE program? This writer believes such an approach is predicated upon an impoverished view of ABE. Education surely implies something more than drill and practice to develop trainable skills, particularly when those skills may "develop the ability only in relation to the trivial material they deal with" (Barrow, 1990, p. 149).

What *should* adult education be about? The writings of major contributors to adult education theory including Lindeman (1926), Knowles (1977, 1984), Brookfield (1985, 1986, 1987, 1988), Jarvis (1987a, 1987b, 1987c), Knox (1977), and Stubblefield (1988) establish a central concern with education as development, not remediation, and particularly development through self-directed learning[1] and group process.

Developing adults' sense of their personal power and self-worth is a fundamental underpinning of Brookfield's concept of self-directed learning. Brookfield (1985) sees adult education as facilitating adult learning of a particular kind, and distinguishes it from adult training, which itself, he realizes, may be a necessary activity. To Brookfield, adult learning results

[1] Caffarella and O'Donnell (1987) offer a particularly cogent review of the self-directed learning literature.

from adult education which has at its heart the practice of critical reflectivity. The implication for educators is that they must assist the adult learner "to reflect on the manner by which values, beliefs and behaviors previously deemed sacrosanct can be critically analyzed" (Brookfield, 1985, p. 47).

This view is also reinforced by other theorists such as Knox (1977) who believes that competent professionals should "assist adult clients to obtain understanding of adult development and learning for themselves....[and] help adults realize their potential" (pp. 553-554). Knox also stresses forms of assistance that encourage self-sufficiency and rejects forms of assistance that foster dependency.

Lindeman emphasizes process--specifically, small group discussion--as the appropriate method for adult education. The instructor's role is to be stimulative, guiding, facilitative, and adult education is to be "a co-operative venture in non-authoritarian, informal learning the chief purpose of which is to discover the meaning of experience (Lindeman, 1925:3)" (Brookfield, 1987, p. 122). For Lindeman, adult education is characterized by activities in which learners:

> discovered the meanings of life in the process of learning. In its essence, adult education was a method by which adults released their intelligence to handle the new social realities of the twentieth century....Adult education was a way of learning the relation between knowledge and living; it was not a process of acquiring the tools of education. Adult education was functional: it served the ends of individual growth. Adult education began with the situations adults faced, not with subject matter. The method of adult education was discussion. (Stubblefield, 1988, p. 147)

As early as 1949, the first UNESCO adult education conference "took it as understood" that:

> there will have to be 'special methods of teaching and of leadership training' in adult education. These special methods must reject the mode of teacher/pupil relationships prevalent within the formal school system, and accept a new mode of relationship involving 'a common seeking for truth' in the discussion group....In such a pattern the teacher will be an adviser or guide able to make adult education democratic in its aims and methods. The independence of the adult as a learner had to be fully protected. (Bholsa, 1989, p. 110)

These principles are conspicuously absent in Pathfinder activities, which have much more to do with adult training than with adult education--activities which largely foster dependency rather than independency, a concept which is explored in the third section of this chapter.

Just as Brookfield distinguishes learning from training, Rogers (1983) distinguishes between two distinct forms of learning. One type is learning which involves the mind only and does not have personal meaning for the learner--Brookfield's "uncritical assimilation of previously defined skills or bodies of knowledge." Rogers asserts that nearly every student finds that large portions of his curriculum hold no personal meaning and that education then becomes the memorization of disembodied, irrelevant facts.

Rogers contrasts this kind of learning with learning which is significant, meaningful, experiential--the kind of learning, he suggests, that happens when a child touches a warm radiator and learns for herself the meaning of the word *hot.*

> *It has a quality of personal involvement*--the whole person in both feeling and cognitive aspects being *in* the learning event. It is *self-initiated.* Even when the impetus or stimulus comes from the outside, the sense of discovery, of reaching out, of

> grasping and comprehending, comes from within. *It is pervasive.* It makes a difference in the behavior, the attitudes, perhaps even the personality of the learner. *It is evaluated by the learner.* She knows whether it is meeting her need, whether it leads toward what she *wants* to know, whether it illuminates the dark area of ignorance she is experiencing. The locus of evaluation, we might say, resides definitely in the learner. *Its essence is meaning.* When such learning takes place, the element of meaning to the learner is built into the whole experience [emphasis in the original]. (Rogers, 1983, p. 20)

Pathfinder learning is primarily of the kind which involves the uncritical mind only. It does not involve the individual's feelings or personal meanings, and by Rogers' criteria, it has little or no relevance for the whole person.

But it is Knowles who perhaps most convincingly provides the key to understanding the major disadvantages of the predetermined learning objectives approach which characterizes Pathfinder. Knowles (1984) attempts to clarify differences in assumptions about learning required for educating adult students from those assumptions underlying pedagogy (the educating of children). He uses the term "andragogy"[2] which he defines as "the art and science of helping adults learn" (Knowles & Associates, 1984, p. 6). Of those several assumptions which Knowles associates with andragogy, three illuminate major disadvantages with Pathfinder-like approaches to adult education. These are the concept of the learner, the role of the learner's experience, and the basic orientation to learning. These three assumptions are explored in more detail below:

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[2] For discussion of origins of the term "andragogy," see Brookfield (1987, p. 127), and Jarvis (1987a, p. 174).

> *1. Concept of the learner.* Teacher-directed procedures (pedagogy) generally produce a dependent personality, whereas when self-directed activities are encouraged an increasingly self-directed individual is assumed, although strategies may be required for the transition from dependency to self-direction.[3]

With Pathfinder, rather than "teacher-directed," the procedures are "system-directed," and the result is similarly disempowering for the learner. The message to the learner is that the system with its predetermined activities--training activities--holds the key to success for the learner, thus creating a state of dependency on the system. The image of the teacher as the font of knowledge is replaced with the idea of the learning system filling the "empty vessel" learners.

Freire (1970), also in reference to the concept of the learner, refers to education as being "domesticating" (as opposed to "liberating") if it treats learners as objects, prescriptively, manipulating them as passive individuals, empty vessels, who are not invited to participate creatively in their own learning. He refers to this historical approach to education as "dominating," "narration," and as "the banking concept":

> Instead of communicating, the teacher issues communiques and makes deposits which the students patiently receive, memorize, and repeat....The scope of the action allowed to the students extends only as far as receiving, filing, and storing the deposits. (p. 58)

On the other hand, education of a liberating nature, in Freire's view, treats learners as subjects of their learning, is "humanistic," invites participation, is dialogical, and promotes critical reflection leading to action. "Education for domestication is an act of *transferring* 'knowledge' whereas

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[3] This assumption and the two which follow are summaries. The original statements can be found in Knowles and Associates, 1984, pp. 9-12.

education for freedom is an *act* of knowledge and a process of transforming action that should be exercised on reality [emphasis added]" (Freire, 1985, p. 102).

The disempowerment of the learner is implicit in the design of a system such as Pathfinder because of the "domesticating" concept of the learner as object rather than subject of learning.

> 2. *Role of learner's experience.* Pedagogical practices assume the learner's experience is to be built upon, rather than be used as a resource, and that it is the *teacher's* experience that counts. Andragogical efforts consider the learner's experience as a rich resource for further learning.

Pathfinder assignments essentially parallel the pedagogical practices described here by Knowles, and by ignoring the "rich resource" of learners' experiences, reinforce the disempowering message that the learner's experience is not valued in the education process.

> 3. *Orientation to learning.* The emphasis for teacher-directed activities typically is on subject matter, whereas adult learning usually revolves around a life situation task or problem.

In adopting the pedagogical approach (which Knowles also refers to as the "content" approach), Pathfinder in effect deprives the adult learner of the richness of learning favoured by current ABE principles and practice which usually include group discussions, projects, reports and other learning activities centred on the realities of the learners' life situations.[4] Such activities build confidence and self-esteem when "[e]ffective practice is

[4] See, for example, Bholsa (1989), Brookfield (1985, 1986, 1987, 1988), Freire (1970, 1976, 1985), Jarvis (1987a, 1987b).

characterized by a respect among participants for each other's self worth" (Brookfield, 1986, p. 10).

Brookfield (1985) speaks also of the need for the development of the learner's increasing sense of personal control. Indeed, he defines adult education as:

> that activity concerned to assist adults in their quest for a sense of control in their own lives, within their interpersonal relationships, and with regard to the social forms and structures within which they live. (p. 46)

The control of which Brookfield speaks is developed through principles of critical practice designed to facilitate learning. Brookfield (1986) lists six such principles, two of which state:

> Facilitation aims to foster in adults a spirit of critical reflection....[and] The aim of facilitation is the nurturing of self-directed, empowered adults. (pp. 10-11)

Brookfield's principles are a challenge to adult educators and to learners alike to strive toward worthy ideals that go far beyond the Pathfinder emphasis on subject content and the limited view that education is mainly concerned with predetermined skill-building activities.

In addition to the assumptions of pedagogy and andragogy, three of which are cited above, Knowles and Associates (1984) suggest ways in which the ideals of self-directed learning can be achieved. The seven elements of andragogical process design are:[5]

> *1. Climate setting.* Both physical environment and psychological atmosphere must be conducive to learning. Psychological elements include mutual respect,

[5] The statements which follow are a summary of Knowles and Associates (1984, pp. 14-18).

collaborativeness, mutual trust, supportiveness, openness and authenticity, pleasure, and humanness (learning is a human activity; the more that people are treated as human beings, the more they learn).

2. *Shared planning.* People tend to feel committed to any decision in proportion to the extent to which they have participated in making it; the reverse is even more true.

3. *Involvement in diagnosis of needs.* A balanced negotiation between facilitator and learners for helping learners responsibly and realistically identify what they need to learn through a mutual assessment of needs.

4. *Involvement in formulating learning objectives.* Originally, Knowles called this fourth element "goal setting." In 1984 he asks, "What procedures can be used to help learners translate their diagnosed needs into learning objectives?" He then answers by stating, "See the following section on learning contracts" (p. 18).[6]

5. *Involvement in designing learning plans.* Knowles asks what procedures can be used to help the learners identify resources and devise strategies for using these resources to accomplish their objectives, and again refers to the section on learning contracts.

6. *Helping learners carry out learning plans.* Prior to his 1984 explication, Knowles outlines this element by stating that self-directed learning emphasizes an inquiry approach, including independent projects and capitalizing on experiential learning. In 1984, he states simply, "See the following section on learning contracts" (p. 18).

7. *Evaluation.* Knowles again treats this element in his section on learning contracts, but in 1984, says that he would be remiss in not drawing attention to the turning away from almost exclusive emphasis on quantitative evaluation toward increasing emphasis on qualitative evaluation.

It is questionable whether any of these elements exist to any meaningful degree in Pathfinder. The second to fifth elements listed are virtually eliminated as a result of Pathfinder's predetermined learning

[6] The use of learning contracts will be explored in the final chapter of this paper.

objectives, the disempowering aspects of which are discussed in the next section of this chapter. The omission of these critical elements reveals how antithetical to the principles of self-directed learning are those which direct Pathfinder.

It remains to be said that between 1970, when Knowles first published his assumptions about andragogy and pedagogy, and his final revision of those assumptions in 1984, Knowles changed his view from seeing the two approaches as being dichotomous to seeing andragogy as "a system of concepts that, in fact, incorporates pedagogy rather than opposing it" (Knowles & Associates, 1984, p. 8). He did so because over the years, practitioners at all levels of education convinced him that andragogy worked in some situations with children, and that in some situations in basic training with adults, pedagogical methods seemed to be required.

Since drill and practice are needed elements of most ABE programs, programs such as Pathfinder can provide a motivating and useful alternative to more traditional pedagogical methods. The development of desired skills through drill and practice can offer, for many, much needed routine and a measurable sense of progress towards goals-- elements which contribute to the sense of well-being of many ABE students. Furthermore, these measurable elements are often lacking in activities which exercise higher mental processes. It is easy to know when one has mastered division of fractions, but there do not appear to be solid benchmarks in the development of critical thinking.

The heart of the issue is the centrality of drill and practice and seatwork approaches in the overall ABE program. It may be much less difficult to build a program exclusively around low level skill-building than around the principles of self-directed learning. But are those really, as the Pathfinder promotional brochure claims, "the skills that make the pursuit of higher education possible, the skills that employers say they require in their employees, the skills that allow each person to function and participate as a productive member of society"?

From what can be inferred from the views of prominent adult education theorists, it is more likely that programs based on the goals and principles of self-directed learning will assist the learner to develop not only the skills, but also the attitudes and abilities that are indispensable to the kinds of success Pathfinder promises.[7]

Beyond promoting individual goals of success in higher education and the workplace and of functioning productively in society, the goals of adult education are imbedded in even higher ideals concerning improvement of the whole society. In discussing Albert Mansbridge, an English pioneer of adult education, Alfred (1987) offers the following synthesis of the development of social purpose in adult education:

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[7] Behaviourist learning theory has an entirely different view of the purposes of education, of course. This is placed in perspective by Strike (1974), however, who believes that "the most significant objection to behaviorist theory in education is not that it will directly corrupt educational practice....Rather...that by continuing to offer a panacea for instructional ills, attention and resources will be diverted away from the real problems of education which I suspect are to be located currently in the area of social policy" (p. 118).

> Mansbridge's assertion [1929?] that "adult education and the claims of democratic citizenship are inseparable" was, is and always will be valid, provided education is not, as it all too often is, desocialised and thus stripped of its inherent humaneness and political relevance (Smith 1956:58)....Raymond Williams said recently that adult education is not just determined by social change or is only about extending opportunities; it is about making "learning part of the process of social change itself" (1983:9). Cole and Freeman made the same point even more clearly in 1918 when they affirmed that adult education is about the "creation of a manhood and a womanhood capable of controlling their own destinies in a free and democratic country" (Hughes and Brown 1981:58). (Alfred, 1987, p. 33)

The concern with social change has deep roots in adult education literature. In discussing Herbert Croly's [1923?] thesis of nationalism as the instrument for individual improvement and national development, Stubblefield (1988) observes that Croly was tying individual realization to a collective purpose:

> A healthy society required that persons move beyond selfish interests, beyond individualism, and toward responsibility for the community as a whole. Croly wanted not just social reform, but a reformed society. (p. 13)

A contemporary proponent of "liberating" education for creating a better world is Paulo Freire. Freire's revolutionary ideas have been debated for twenty years, both because they have been poorly understood and misinterpreted, and because of the complex, controversial, and often paradoxical nature of his thinking. He is often emphatically clear in his concepts. In conversation with Ira Shor, for example, the topic turns to the autonomy of the individual learner as the measure of democracy and empowerment:

> *Paulo:* I don't believe in self-liberation. Liberation is a social act. Liberating education is a social process of illumination.

Ira: There is no personal self-empowerment?

Paulo: No, no, no. Even when you individually feel yourself *most* free, if this feeling is not a *social* feeling, if you are not able to use your *recent* freedom to help others to be free by transforming the totality of society, then you are exercising only an individualist attitude towards empowerment or freedom. (Shor & Freire, 1987, p. 23)

The overemphasis of individualism has been a serious criticism of the work of perhaps the best known and most influential contemporary adult education theorist, Malcolm Knowles.[8] This emphasis is his most significant point of departure from the thinking of Eduard Lindeman (Knowles' mentor, and arguably the most significant figure in American adult education theorizing). Fisher and Podeschi (1989) suggest that for Lindeman, the meaning of adult education is lost if individual freedom and individual learning is not kept within an ethical context of public ideals. They contend that this is a concept that Knowles has abandoned, since he:

> writes as the product of modern American individualism, where private and public life are fragmented, emphasis is on technical means rather than moral ends, and vocation as specialized career is filled with priorities of institutional accommodation, economic advancement, and cultivation of the self. (Fisher & Podeschi, 1989, p. 352)

Fisher and Podeschi (1989) point out that Lindeman believed in an inherent synthesis of the individual and society, seeing "the home, neighbourhood, community, trade union, co-operative society and trade association as ripe settings for adult educators to educate individuals for fruitful participation in concerns beyond themselves" (p. 347).

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[8] Fisher and Podeschi (1989) cite Griffin, Jarvis, Spear, and Tennant, all of whom have criticized Knowles on this matter.

Lindeman's concerns are echoed somewhat by Barrow (1990) who, in speaking about education generally, offers the following ideals:

> The ultimate goal is thus a community of autonomous, liberal-minded, imaginative, compassionate, rational people, wedded to the idea of pursuing a true understanding of the world and the nature of humanity, both of which they recognize, with due wonder and humility, to be exceedingly complex matters. (p. 8)

If worthy education programs can be measured by the degree to which they provide the means towards these ideals, then ABE programs developed around the centrality of remediation would appear to fall far short of what adult learners are entitled to in an enlightened education system.

III. The concept of predetermined learning objectives

The Pathfinder skill-building approach based on predetermined learning objectives can perhaps assist learners to learn to read better, improve their grammar and spelling, and learn a multiplicity of facts about science and geography. The over-all effect, however, of focusing on low level goals of skill building and learning of facts through an individualized seatwork approach not only ignores the disempowered state which is characteristic of many of the learners when they enter ABE programs, but also increases disempowerment by promoting practices which foster dependency.

A major problem with Pathfinder is that it has been designed to *direct* the learning situation rather than supplement a program which is under the learner's, or even the instructor's, direction. The hierarchy of many hundreds of learning outcomes directed by the Pathfinder management

system moves the learner through a predetermined sequence of activities and, despite the availability of several paths which allow for a degree of individualization, the learning parameters are determined overwhelmingly by the system and not the learner or instructor. In ABE programs designed to develop learner autonomy, it is the instructor who should be working with the learner to facilitate the defining of learning ends and means (Brookfield, 1986).

With Pathfinder, it is the testing system which drives the learning program. When pre- and post-testing of low level skills becomes the defining element of learning ends and means, the major processes that should be at work in an ABE model to empower the learner are pre-empted. There are at least six ways, as detailed in the following discussion, by which this disempowerment is promoted.

Lack of ownership

Pathfinder and virtually all other CMI systems are designed and constructed by people other than the users. Since there is little possibility for the end users to contribute to those processes, it is unlikely that they can gain a sense of ownership of either the content or process of the program they are to undertake. In contrast, programs which are designed to empower adults involve them in shared planning, diagnosis of needs, formulating learning objectives, and in designing learning plans, four of the seven elements of the andragogical process which Knowles suggests. This approach is consistent with the principle of assisting the learners in their quest for control in their lives. Freire's work with illiterate peasants and

Ashton-Warner's work with Maori children are examples of programs where learning occurs as a result of both process and content centering on the learners' involvement.

Ironically, with Pathfinder, the "genuine" learning which has occurred has been that of the developers. It is they who have developed the sense of ownership of the product; it is they who have been offered the opportunity to work collaboratively and to develop a sense of pride in the work they have produced, a sense of accomplishment for having produced it--feelings which contribute strongly to a sense of worth, of self-esteem.

The product of their creative, cooperative efforts, on the other hand, offers the intended learners few of the opportunities for the kind of learning that the developers have experienced.

The learners' lack of ownership of nearly every aspect of the learning program is pervasive in CMI, and it is a compelling reason why CMI should remain supplementary to other more empowering approaches to ABE.

Lack of opportunity for decision-making

Closely related to the lack of learner ownership is the diminished role of decision-making for the learners. Pathfinder developers have made the majority of decisions about the topics to be studied, books and materials to be used, and so on. In doing so, they have exercised the kinds of higher level abilities that should be fostered in learners. However, the program that they constructed passes along few or none of these kinds of opportunities to the learners; instead, it restricts the learner for the most

part to answering questions at the lower end of Bloom's (1977) taxonomy of educational objectives.

Because all of the major decisions have been taken, Pathfinder, and virtually all CMI programs, deprive those who most need to develop decision-making abilities, the ABE learners. Once placed in the learning system, the learner is directed to the book, page, and number of questions to answer. As a consequence, the process implicitly teaches compliance and docility with no opportunity to learn to work cooperatively with others. Little decision-making of consequence is required beyond deciding whether to engage oneself in the task at hand.

Depersonalization of assignments

A basic starting point for much of adult education is, according to Knowles, Brookfield, Bholsa, Freire, Ashton-Warner and others, to build lessons upon the experience of the learners, often through the use of group process and group discussion. This approach provides relevancy, promotes ownership, and permits the learners to explore and affirm who they are--their identity--in the kind of supportive group context which characterizes good adult education practice. This process of building upon student experience confirms for students--especially those of low self-esteem--that their own experiences hold value for learning, and that learning can occur through reflection on their experience. Learning to trust the usefulness of personal experience and to develop strength from it is a key precursor to developing a positive self-concept, confidence, and a sense of control of one's life. Dealing with negative attitudes is a basic concern of many ABE

programs, whose clientele have often been deprived of success and control in their lives.[9]

CMI has no effective way of personalizing a program of studies or effectively and directly dealing with attitudes. No opportunities are provided for group discussion, exchange of opinion, or examination of personal experiences. To the contrary, CMI militates against the development of interpersonal skills which are vital to achieving the goals for which Pathfinder makes claims. The message sent, therefore, is that the learner's life and experiences have no significance here. The people and events valued are found largely in the books chosen for use in the system.

This depersonalization of learning and implicit devaluing of each individual's experiences are alienating processes. Many students will not be aware of this disempowerment, since they have not developed the sophistication or "consciousness" to consider this aspect of the learning processes to which they are subjected. CMI will not change any of that. Good adult education practice, on the other hand, would have such change of consciousness at the core of its rationale. This is the "praxis" so closely associated with Freire's work that in effect *requires* the learner to reflect on the processes and feelings encountered in the learning endeavor.[10]

Good educational practice would start with student interests and construct the skill-building activities around them. It would relegate CMI to

[9] Mezirow et al., (1975) found that the ABE goal "increased ability to cope with adult life roles and problems" was ranked of first importance by more ABE teachers than any other goal. (p. 64)

[10] See Freire (1970, 1976, 1985), and Shor and Freire (1987).

its proper role of providing a resource bank of supplementary learning materials and activities to develop skills in areas of weakness which students identify while undertaking tasks relevant to their personal learning goals. How this could be accomplished is suggested in the next chapter.

Impersonalization of the system

Similar to the problem of depersonalization is that CMI cannot make personal reference to the users other than to type out the students' names on their tests and assignments. The machine cannot reinforce in other than superficial ways the major and minor successes the students are having. The CAI disks can play little tunes when a correct answer is given, but they cannot offer warmth, respect, or the kind of intimate reinforcement that some adult learners, particularly ABE students, need in large measure to shore up their fragile self-esteem. The machine cannot care, cannot assist the adult learner to see the small victories, cannot interpret, or recognize that the concepts have been learned despite the final answer being incorrect. Machines have no way of noting that students with short attention spans are steadily improving in their study skills.

Good instructors are acutely aware of the personal struggle in which many of their students are involved, and are able to offer encouragement in small and big ways--a touch on the shoulder, a questioning glance, a special celebratory lunch--in a personal way that can make a difference.

Fragmented, disembodied learning

A major problem with CMI involves the lack of curriculum integration. The hierarchy of fragmented skills may move learners towards

the designated end goals of the CMI curriculum, but it does so in Pathfinder with little or no interconnection. CMI is the antithesis of truly integrated learning. For example, if they are used at all, in good educational practice spelling lists are drawn from other subject matter and from errors individuals make in their written work. In CMI, spelling lists are arbitrary compilations. Similarly, reading comprehension lessons which could, for example, be drawn from social studies topics under study have, in Pathfinder, no relationship to other aspects of the curriculum.

The disconnection between courses can at times be frustrating to the learners. For example, students may be required to write a letter of application as part of an assignment for the Employment/Life Course weeks or months before they are introduced to letter writing in the Reading/Writing Course. Situations such as this cause students to feel manipulated, angry, and suspicious of the quality of the learning program of which they perceive themselves to be mere objects. These feelings are indicators of feelings of disempowerment.

Imposed learning objectives

One of the consequences of the way in which Pathfinder has designed the hierarchical curriculum is that the predetermined learning objectives are not so much chosen by the learners as they are imposed upon them. Eisner (1979) presents two clear images of the technological approach to the curriculum which are relevant to the Pathfinder design:

> A curriculum having these features would be very sequential. Each task would build on what preceded and would prepare for what was to come. The implicit image of the curriculum is that

> of a staircase with few landings and no hallways feeding into it. The aim of the staircase is to increase the efficiency with which one arrives at the top floor. In a technologically oriented classroom, curriculum activities would often be available in workbooks or in boxes of sequential instructional materials. Students would come to regard it as their responsibility to proceed through the workbook or curriculum materials box on their own, although when they need the teacher's assistance they could ask for and get it. More often than not, the materials would be color coded, so the students could know visually where they were in the program....Students as well as teachers would record the progress they had made by maintaining charts or records of the scores derived from their tests....The tacit image of such a classroom is the efficient and effective machine. (Eisner, 1979, pp. 69-70)

The disempowerment implicit in the stairway image and the efficient machine result not only from the removal of choices and control from the learners, but also from the "act of faith" demanded of them that they accept the end goals chosen for them and the process devised for reaching them. It is when this act of faith appears to be betrayed, as in the previous example of the fragmented letter writing assignments, that anger is a natural result.

Perhaps even greater betrayal is perceived with the students' possible realization that many of the tasks have no relationship whatsoever to providing skills they themselves want to develop. They are driven implacably onward in directions chosen by others. The machine is firmly in control of what they must learn, and students learn about personal pronouns because the curriculum requires this learning. Learners would be hard pressed to find a relationship between Pathfinder tasks and their own difficulties dealing with language, calculations, and information in the real world of landlords, charge cards and government agencies, not to mention spouses and children.

In summary, the effect is disempowering to learners if they do not have a sense of ownership of their learning because they have not been involved in any decision-making in designing their learning; if learning tasks appear to be arbitrary, fragmented, and unrelated to one another; if learning tasks are perceived as being imposed rather than chosen; and if learning tasks are perceived as being unrelated to the learners' needs and reality, even if these perceptions are held at a level that cannot be well articulated.

IV. The Pathfinder ungraded structure

In this present section, three disadvantages relating to the manner in which the Pathfinder curriculum has been structured as a continuous program are discussed. The first disadvantage concerns "articulation" with existing ABE programs. The second results from the absence of exit points in the curriculum. The effect of those two disadvantages is the difficulty of issuing a diploma which employers or other institutions will find understandable.

Many different kinds of ABE courses with varying content, goals, and program names have developed over the years in the more than thirty institutions in B.C. that offer such courses. One of those colleges offered eleven such courses with program names such as Basic Employment Skills Training, Employment Orientation for Women, Basic Vocational Skills Development, Basic Employment Readiness Training, and ABE Corrections (A provincial update on ABE articulation, 1989, pp. 11-12).

The confusion of employers and other educational institutions trying to make sense of these certificates as qualification for employment or further training has been considerable. In British Columbia, ABE curricula have recently undergone so-called "articulation" processing in order that the chaos of disparate courses offered by the many institutions be diminished through commonalities. Towards this end, common nomenclature has been developed for levels of achievement, course requirements have been set for diplomas and certificates, and some common course outlines have been developed throughout the province (A provincial update on ABE articulation, 1989).

Pathfinder enters the British Columbia ABE arena with its own courses which conform to none of the articulated standards. The Pathfinder program of studies is based on eleven provincial and territorial guidelines for grades three to twelve, yet the program has been designed primarily for adults. A considerable disadvantage exists, then, for educators to use an ABE program which conforms to none of the program standards that has been developed, and which conforms more to public school curricula than to ABE curricula.

A second and somewhat related factor complicates not only the articulation process for Pathfinder, but creates another disadvantage to its use--there are no exit levels established except at the conclusion of each course. Since the entire program is ungraded, students have no way of knowing through Pathfinder what grade level they have achieved.

Pathfinder must therefore rely on some form of standardized exams to measure student achievement within the program.

In effect, unless students use Pathfinder to prepare for and write the GED with its provincially recognized diploma, other means will have to be devised to determine levels of achievement for exiting students. Since there is no particular fit between Pathfinder and "articulated" courses, a considerable problem exists in issuing a meaningful exit diploma to Pathfinder "graduates."

This problem is further complicated by Pathfinder structure which is so highly individualized that some students may be registered in only one course, while others are registered in all five. While these disadvantages may not be as serious as others, they create additional burdens which diminish the administrative advantages that Pathfinder purports to provide.

V. The role of the instructor

A major disadvantage with the Pathfinder system is that the role of the instructor is unclear. Some assumptions can be made in respect of the operation of Pathfinder. Four of these assumptions are discussed in the first part of this section. The second part presents, in contrast, the role of the instructor as envisaged by advocates of self-directed learning, with reference to the helping process, and teaching-for-thinking models.

Assumptions about the instructor's role intended by Pathfinder

Pathfinder training sessions for instructors consist of several days of workshops which provide an orientation to Pathfinder's hardware, materials,

learning program structure, and program operation (use of the "menus" for both learners and instructors). The apparent assumption underlying this orientation is that Pathfinder conceives of itself as a stand-alone system which controls the learning program, and the instructor serves primarily as an extension whose major role is to foster the learner's ability to use Pathfinder independently. The problem here is rooted in the view that the tail should wag the dog--that the instructor should serve the resource.

A further assumption appears to be that the instructor will also serve as a tutor to assist students having difficulty with the Pathfinder assignments. The tutoring focus is one of remediation, sending the message that the student is deficient in skills and abilities, and "needs help." A more empowering approach is that of development, particularly that which sends the message that students have skills and abilities which they can learn to develop in effective ways to increase control in their lives.

A third assumption appears to be that some aspects of the instructor's role are implicit in Pathfinder's "instructor's menu"--the instructor's interface with the management system. Implied responsibilities include (a) entering data in respect of registration, reading level, and initial placement information in order that the system can operate the programs for the learners; (b) entering marks for essay questions contained on some pre- and post-tests; and (c) operating other administrative features offered by Pathfinder, such as the report generator.

A fourth assumption is either that the many hardware and software components will operate without need of attention, or that the instructor has

responsibilities for attending to problems which may arise. The use of multimedia resources imports a multitude of demands on technical knowledge, if not expertise. If technical assistance is not available on site, instructors will spend an inordinate amount of time wrestling with the technology that is designed to free them for quality time with the students. Much of the technology is new, and it cannot be assumed that instructors will have any experience with, for example, the NetWare software which links the workstations to the file server, and in so doing, overrides the DOS commands familiar to instructors with knowledge of "PC's." Also, it is unrealistic to expect that printers will not jam, or that other equipment malfunctions will not occur. The results of such breakdowns are disruptive because they usually require immediate attention, often hours instead of minutes, during which time instruction or student-teacher interaction is not possible.

With the exception of the tutoring activities, the assumptions about the instructor roles imply involvement with low-level tasks that could be undertaken competently by a trained aide. The volume of low-level tasks necessitates the services of a full-time worker, particularly during the first several weeks when students are learning to use the system. Since few of the maintenance tasks have any direct bearing on instruction but are essential to the operation of the system, unless an aide is available, the instructor must spend a great deal of time and energy on non-teaching tasks.

The tutoring role itself is problem-ridden. Occasionally the instructor may want to teach a small group of students experiencing the same kind of problem, but this is difficult since Pathfinder encourages such a high degree of individualization that learners are rarely (if ever) working on the same outcome, and even more rarely at the same time, since timetables are also highly individualized. Finding times for several students to work together even in the same subject becomes disruptive, particularly because each learning problem may involve a different group of students. Consequently, the instructor may be required to tutor on a one-on-one basis exclusively, and thus repeat the same tutoring tasks over and over with different students.

The inefficiency is evident. Resourceful instructors will doubtless find means of mediating these problems, but the point is that the source of these problems lies in Pathfinder's highly structured individualized learning program that is so intricately tied to the management system. Pathfinder provides for numerous adjustments, but in the end, these adjustments do not significantly diminish the system's control over the nature and sequence of the learning tasks. Clearly, considerations relating to the instructor's role are incidental to the primacy of control residing in the complex management system.

If that is not what is intended by Pathfinder, the omission of other intended roles of the instructor is a very serious oversight in the instructor orientation workshops, the promotional materials, and the system design.

A curious anomaly exists, however, in the following statement in the Pathfinder promotional material:

> Complete lesson preparation: The instructor doesn't have to plan the content to achieve a learning objective: curriculum specialists have done that within Pathfinder. The instructor is free to teach. (Pathfinder, undated, p. 5)

This statement raises the expectation that lessons are prepared for instructors to teach. "Lessons" are prepared in the sense that individualized task assignments are made which are to be carried out by the learners. Assignments typically consist of reading passages explaining the nature of skills to be learned followed by "seatwork" exercises. There are no lessons prepared for instructors to "teach," however. Instead, instructors will find themselves tutoring learners or teaching lessons they must design in order to help the learners understand the tasks required to complete assignments. Having available pre-selected objectives and learning materials does not constitute "complete lesson preparation," as any classroom teacher would surely agree. The statement provides additional evidence, however, of the narrow perception Pathfinder takes of the processes involved in teaching and learning. What is additionally confusing about this Pathfinder claim concerns the statement "The instructor is free to teach." Teach what? When? To whom? This isolated statement simply heightens the confusion surrounding the instructor's intended role.

The role of the instructor in the self-directed learning approach

The role of the instructor in self-directed learning is primarily seen as that of a facilitator of learning (Brookfield, 1986). They are wise instructors

who keep their eyes unwaveringly on the goals and principles of self-direction so that they are helpful, but do not create dependency. The instructor as facilitator may often be called upon to clarify decisions to be taken, but respectfully leaves decision-making to the learner.

Instructors have the responsibility for establishing a climate conducive to learning, the first of the seven andragogical elements listed by Knowles. Further, it is as facilitators that instructors involve learners in the other six elements of andragogy (i.e., shared planning, diagnosis of needs, formulating learning objectives, designing learning plans, helping learners carry out learning plans, and evaluation). The goal is to facilitate the self-directedness of each learner; that is, to encourage the development of what Brookfield refers to as "a critically aware frame of mind," and so to empower learners increasingly to assert control over their learning and over their lives.

It is important that instructors as facilitators have a clear conception of learning as distinct from training. The writings of Brookfield, Knowles, and Rogers, among others already cited, clarify that concept as understood by proponents of self-directed learning.

The helping process at the heart of facilitation has been widely addressed by others, notably by Carkhuff (1983), and Gazda et al. (1984). Their work centres on the importance of interpersonal communication skills, and therefore the active role of the facilitator.

Furthermore, advocates of "teaching for thinking" stress the need to increase the learners' confidence in themselves and:

> to strengthen their ability to do their *own* thinking. As a consequence of their experience with thinking-related materials, pupils become strengthened in their sense of personal power and more capable of handling challenge. In such a program, the kinds of teacher-student interactions used in the classroom play a critical role. (Wassermann, 1986, p. xviii)

In summary, the instructor's role appears limited to tutoring students who are having difficulty with Pathfinder assigned tasks (remediation rather than development), entering necessary data in order for the system to recognize learners, and orienting the learners to the overall system. For the most part, these are low-level tasks more suitable for a trained aide than for a teacher. It would appear that the primary concern in Pathfinder is the operation of the learning system, and that the instructor's role is deemed to be subservient to and facilitative of that concern.

This view of the instructor's role stands in sharp contrast to the view in the self-directed learning model that the instructor's role centres on the primary goal of empowering learners through facilitation of learning which promotes thinking and strengthens personal control.

Chapter summary

Expectations raised by promotional material, the impressive comprehensiveness of the system configuration, and early evaluations of the system contribute to a perception of a central educational role for Pathfinder in ABE programs. However, as has been argued, this perceived central role exacerbates the disempowering aspects of the predetermined learning programs.

Established principles of adult education suggest that the major concern should be with the development of the self-directing abilities of the learner, including autonomy resulting from increasing personal control, and the development of a critical frame of mind, casting the learner as subject rather than object of learning. Indeed, the predetermined learning outcomes which constitute the Pathfinder learning program seem to promote dependency, and pre-empt both learner ownership and decision-making.

These predetermined learning outcomes indicate the Pathfinder system is guided by a narrow view of adult education, more concerned with remediation than with human development. Although some drill and practice exercises are useful in ABE programs, a major concern arises when they become the central activities of the ABE program.

In British Columbia, many institutions offering ABE have developed a system of "articulating" their courses and programs in order to promote greater commonality, thereby promoting greater understanding of course content and certification. Pathfinder courses do not conform to what has been articulated. Further, the ungraded Pathfinder learning spiral, having no exit points except final course completion, makes certification difficult.

Additional disadvantages are found in the assumptions surrounding the role of the instructor. A legitimate assumption about the Pathfinder view is that the instructor's role is subservient to that of the CMI learning system, which appears, in effect, to downplay the importance of the educator. In contrast, proponents of self-directed learning view the instructor's role to be one that facilitates learning and the development of a

critical frame of mind which increases the learner's control over his or her world.

CHAPTER FIVE: EDUCATIONAL IMPLICATIONS

In this chapter, three major educational implications are examined which emerge from the critique of CMI as exemplified by the Pathfinder Learning System. These implications relate to informed critical review, locus of control, and possible supplementary instructional strategies which can be used with CMI to provide more educationally defensible ABE programs. A rationale is offered for each of these implications, and ways are suggested to implement the strategies.

I. Informed critical review

A major implication of this critique is that because CMI's impact can be both beneficial and disempowering to the adult learner, strong leadership and vision are needed if the resource is to be used in an educationally effective manner. This leadership would ideally be concerned with ensuring that CMI programs are nested within ABE programs that are guided by sound educational goals.

CMI programs have features which appear to allow the systems to operate with "stand-alone" capabilities. The relevance and suitability of such programs and their capabilities and limitations in assisting adult learners achieve program goals must be carefully evaluated. An attempt has been made to show that CMI systems provide training rather than education, skill-building rather than the development of self-directed behaviour. There is a place for skill-building in ABE. The danger is that ABE programs using CMI will place undue emphasis on the technology, and

by default, on the narrow principles of training which dominate CMI. The consequences are likely to be that programs of superficial appeal and limited worth will be offered to learners whose best interests will then be poorly served.

Questions need to be raised about the appropriate use of CMI, and these in turn may provoke healthy questions about the field of ABE itself. Are CMI programs, on their own, promotive of the end goals desired for ABE? Should those end goals be job training, narrowly conceived? Low level skill-building? The development of increased learner autonomy? How can these end goals best be met? Where, within an ABE program, does CMI provide the best "fit"? What are the advantages and disadvantages of CMI approaches to reading, writing, and other component subjects? These are pivotal issues which relate to the effective use of CMI.

A second level of questions about how to improve the resource can be raised after experience has been gained with CMI. How can CMI be modified so that the resource can be used more compatibly within ABE principles? What additional preparation do instructors need in order to make most effective use of CMI? Are there characteristics of learners which would identify those who might benefit most from CMI, and those for whom CMI might prove less beneficial?

Careful evaluation of CMI uses in actual ABE programs may be a crucial step in determining answers to these questions. Educators have a responsibility to provide feedback to developers if future versions of CMI programs are to reflect the values that are consistent with sound ABE

programs. Several methods are available to educators to assess CMI programs. Pilot projects with clear goals are appropriate ways of developing experience with and understanding of CMI systems. Formal and informal evaluations and comparative studies, user group meetings, workshop presentations at ABE conferences, surveys, demonstrations and in-depth coordinated evaluations and comparisons of systems in operation could be productive ways of gathering and disseminating information.

It has been indicated that educational leadership is required to prevent over-reliance on CMI and to develop greater understanding of the technology and its effective use. Additional considerations for the development of defensible ABE programs which utilize CMI are discussed in the remaining two sections of this chapter.

II. Locus of control

A second implication of the examination of CMI is that the locus of program control should rest with the educator rather than with the resource. At issue is the process by which educational decisions are made in the classroom.

Because Pathfinder automates learners' progress through the learning program, the system, in effect, assumes control of the learning situation by relentlessly presenting the sequenced assignments throughout the course. In the preceding chapter, it has been shown how this automated, predetermined approach to learning deprives learners of opportunities for ownership and decision making. Since learners in the system have

minimum control over their learning, the intervention of the instructor is crucial for empowering students. This requires, in effect, wresting control from the CMI system.

It is a generally recognized role of the facilitator/instructor to mediate the learning process and, in order to do so, the locus of program control must remain primarily with the educator, and not with the resources nor with the learner. Many believe it is primarily the educator who is responsible for the education provided to the learner.

If the locus of control is left with the CMI system, the educational program is likely to remain disempowering and of questionable value to the "higher" goals of adult education. On the other hand, if the locus of control remains with the learners to determine appropriate curricula for their learning, an equally troublesome problem occurs. The issue is addressed by Brookfield (1985) who claims that viewing adult education as the design and management of effective learning as defined by the student "denudes the field of any philosophical rationale, future orientation, or purposeful mission" (p. 45). In contrast to Knowles contention,[1] Brookfield is not prepared to accept uncritically the assumption that adults are naturally self-directed learners; indeed, Brookfield maintains that there are "good grounds" for maintaining that self-directedness is "an empirical rarity" (Brookfield, 1986, p. 94). Nor will he accept the premise of andragogy "that the educational task becomes one of assisting adults realize their already

[1] See Knowles (1984, p. 8) for his assertion that adults are, by "psychological definition," self-directing.

half-perceived self-directedness....[or that] our task as educators is to facilitate a non-directive release of latent learning potential so that adults can realize learning goals they have set for themselves" (Brookfield, 1985, p. 44).[2] Brookfield (1986) summarizes his position in respect of the "ownership" of learning goals, learner needs, and the facilitator's role in establishing goals and curricula by describing the facilitation of learning as "a transactional encounter in which learner desires and educator priorities will inevitably interact and influence each other" (pp. 97-98). What is needed is balance between the learners' concerns and expressed needs, and the facilitators' contributions in curricular and methodological spheres, in order to prevent the program from becoming what Brookfield describes as "an educational supermarket" catering to the curricular whims of the students, or an elitist program catering to learners whose preferences and prejudices match those of the programmer (Brookfield, 1986, pp. 97-98). Still, Brookfield believes strongly in self-directed learning once the "orthodoxies" have been jettisoned.[3]

Perhaps it is an educational paradox that the locus of control of the educational program must remain with the educator in order to facilitate the individual's gaining control over his or her world. What appears certain is

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[2] See also Knox (1977, p. 362) for further discussion about the extent to which adults vary in self-directedness.

[3] Brookfield (1986), a major contribution to the field of adult education, is devoted to a full discussion of the literature, problems, and merits of self-directed learning, and how it can best be facilitated.

that the control should not rest with the lock-step CMI resource at this point in its development.

Some of the most promising avenues for maintaining the balance of the various elements which combine to form an educational program for adults--establishment of an appropriate locus of control, emphasis of key ABE goals and principles, and judicious use of learning resources--are explored in the following section.

III. Instructional strategies for use with CMI

This section outlines three potentially promising strategies (congruent with the goals and principles of adult education) for addressing the disempowering characteristics of CMI as evidenced by the Pathfinder Learning System. The three strategies are learning projects, group process, and journal-keeping. These strategies address one or more of the problems indicated in the previous chapter, including lack of ownership, lack of opportunity for decision-making, depersonalization of assignments, impersonalization of the system, fragmentation, imposed predetermined learning objectives, and issues surrounding the centrality of use of the CMI system.

Learning projects

One strategy central to Knowles' approach to andragogy is what he refers to as learning contracts.

> Learning contracts provide a vehicle for making the planning of learning experiences a mutual undertaking between a learner and his or her helper, mentor, teacher, and, often, peers. By participating in the process of diagnosing needs, formulating

> objectives, identifying resources, choosing strategies, and evaluating accomplishments, the learner develops a sense of ownership of (and commitment to) the plan. (Knowles, 1986, p. 27)

The term learning project is preferred here to learning contract since the legalistic overtones and chill of the word contract are absent from the more tantalizing connotation of project. The literature, however, for the most part refers to contracts. This section outlines some general concepts and suggests how learning projects can be implemented to offset some of the disempowering aspects of CMI.

The literature is extensive, and it is not the intention to summarize it here.[4] However, there are some important points to be made about the benefits and use of learning projects. First, the use of learning projects allows the locus of control to remain with the educator who facilitates the development of learner self-direction as a major goal of the activity.

Second, the activities involved in designing and evaluating learning projects encompass many elements useful for developing critical reflection. These activities therefore are consistent with the basic goals of adult education programs as described in the preceding chapter.

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[4] See primarily Knowles (1986), Knowles (1984), Knowles (1975), Knowles and Associates (1984), Brookfield (1986), Berte (1975). Tough (1979) provides an analysis of learning project components in the form of several lists which contain clusters of steps or questions useful to the learner or facilitator in planning a learning project or for making decisions about various aspects of the project. Such lists include initial planning and preparation, seeking help, process clusters of planning, attractive characteristics of learning groups, negative characteristics of learning groups, and so on. Additional guidance is provided on such topics as increasing the student's choice of how he learns, of what he learns, helping the learner choose learning materials, experimenting with group help, and the relationship between helper and learner.

Third, many adult learners may find learning projects difficult and demanding. Brookfield (1986, pp. 81-84) cautions that considerable additional time is demanded of the instructor for this approach to learning--time for planning with the students, monitoring the projects, and facilitating the solution of the many problems that can arise. Clearly, there is wisdom in beginning with short-term, rather easy projects. From the first day, cooperative tasks could be assigned which the instructor has devised which would both give orientation to the many Pathfinder resources and initiate students into elemental forms of structured learning projects. Other structured tasks and assessments can assist learners to come to a better understanding of their own needs, of what resources are available to them through Pathfinder (as well as through other sources) for determining their learning program, and to increase their understanding of the learning project techniques.

Fourth, what is important in respect of CMI in this approach is that learning projects allow learners (perhaps collaboratively with the instructor) to determine which skill or ability they want to improve, rather than submissively accepting Pathfinder's next objective in an automated chain of objectives. With the learning project approach, the learners engage in decision-making, analysis, reflection, and risk taking; *then* they use Pathfinder as a resource to improve the desired skills. The difference between the two approaches is the difference between being an object of someone else's idea of learning or the subject of one's own, to paraphrase Freire.

Fifth, learning projects can also be used to promote peer-learning with Pathfinder. There is no reason why two or three students should not work together on mathematics problems, a science unit, or a career exploration project. Learning projects work well for cooperative learning, where even the drawing up of the project parameters can be an enjoyable exercise in group decision-making, leadership, genuine problem solving, and shared responsibility. It would be unrealistic to think that the group would always agree, always get along, or always be successful. The reality of the situation promotes learning. Facilitators who are clearly focused on the overarching goals of the program would welcome opportunities requiring learners to reflect, for example, on what went wrong, on how the problems could have been avoided, on what they might do to address the problems, and on what they had learned from their experience. Adopting a reflective approach to virtually all aspects of any learning project promotes self-direction, autonomy, increased confidence, and a sense of accomplishment.

The number of learning projects that can utilize the many resources of a comprehensive resource such as Pathfinder are virtually limitless.

The need for the instructor/facilitator to monitor projects at every stage is essential, since much can go wrong. Still, the potential of learning projects for achieving the goals of the ABE program may be unrivalled by other strategies, "despite the initial frustration, ambiguity, and resentment felt by some learners who are asked to depart from their normal teacher-dependence mode" (Brookfield, 1986, p. 84).

The two additional strategies which are discussed next can usefully be tied to the learning project approach.

Group process

One of the major disadvantages of the Pathfinder Learning System is the fact that it eschews group process. As is clear from the literature, however, group involvement is a pivotal adult education methodology. As one writer suggests, the basic orientation of ABE:

> seems to be rooted in the assumptions of group learning. The group provides the opportunity for inter-learning (mutual learning from each other) but, more importantly, teaches group processes for leadership as well as followership in the conduct of democratic action, both within the learner group and outside in the communities. (Bholsa, 1989, p. 113)

There are many good reasons for including group process in the ABE classroom since group strategies often serve several objectives at once. Again, the locus of control rests with the instructor/facilitator who must assume initial responsibility for establishing a supportive climate, and explain the purpose of group discussion. A small, supportive group can offer an informal setting for oral expression, team building, cooperative learning, critical thinking, decision making, and the development of self-respect, trust, responsibility, confidence, feelings of accomplishment, initiative, and poise.

The use of learning groups "is of potential value for fostering attitude change" (Mezirow et al., 1975, p. 151). Long-held negative attitudes of students who have experienced educational and personal failure may improve dramatically as a result of the support learners find in their new group membership. Given sufficient time, many students are able to

redefine themselves in positive ways, and attempt more successful ways of behaving as a result of a growing self-respect.

Group process appears to be particularly appropriate for providing a desired balance to CMI's emphasis on individualization which can lead to isolationism.

Many opportunities present themselves in the ABE classroom that invite group discussion: planning outings, planning the weekly timetable, discussing (evaluating) aspects of the program, planning a potluck for visitors, deciding how to make the classroom more appealing, determining out-of-school recreational activities, brainstorming ideas for group identity such as designing a T-shirt for the group, raising money for a project (or as an emergency slush fund), providing a service in their community, arranging an open house to let others know about their program.

The instructor/facilitator will want to structure some discussions to promote learners' abilities in analysis, synthesis, and evaluation. Group discussion centred on the evaluation of a recent activity or a problem that has arisen provides an opportunity for all students to reflect on their own feelings and experiences. Students can be encouraged to reflect on all aspects of their learning program, including the CMI resource. Inviting students to share their thoughts and feelings about using the computer and the many other Pathfinder resources, about the pre- and post-testing, the assignments, and the like can do much to promote feelings of well-being about their overall program. The information students provide will also

assist the instructor to evaluate perceptions and use of the CMI resource, and subsequently to improve effectiveness of that use.

The role of the facilitator/instructor in group process is a critical one, particularly in the early stages. However, the purpose is not to maintain tight control of the group, but rather to encourage shared leadership:

> As the acceptant classroom climate becomes established, the facilitator is able increasingly to become a participant learner, a member of the group, expressing his views as those of one individual only. (Rogers, 1969, p. 165)

It is through the conscious efforts of the facilitator/instructor that all elements of the ABE program are woven together so that they form an integrated whole which makes sense to the learners. In this way, balance is achieved between group and individual efforts, skill building and less technical aspects of learning. And consistent with earlier comments regarding locus of control, instructors ensure through their efforts that Pathfinder is not at the centre of the program, but is simply one element of a much varied, humanistic, balanced, student-centred program. Group discussion is a major vehicle for maintaining program balance.

Journal-keeping

Excessive individualization of learning where human contact and communication is minimal has already been cited as a potential problem with CMI programs. It is possible, but hardly thinkable, that learners could sign on in the morning in a computer cubicle and sign off in the afternoon without having spoken to anyone all day, and carry on in a similar fashion for days on end.

Journals can be exceptionally effective devices for overcoming some of the communications problems involved in highly individualized ABE programs. Tied to the writing program, and formally scheduled as a daily activity (which, for example, might occupy the last twenty minutes of each day), the journal provides a vehicle for reflection on the day's activities, both those that need to be complained about and those that need to be celebrated. Indeed, students who are reluctant to express their thoughts in a group setting may freely confide opinions through the journal.

Some students will take their journals home and write to the instructor at length. Trust may develop that would not happen without this kind of device. Students often need to express very deeply personal matters, and journals foster a healthy and even healing bond between instructor and student.

If the device is to be a worthy exercise, the instructor must be actively involved in the process by offering thoughtful, sensitive, non-judgmental responses. Strackbein and Tillman (1987, p. 30) suggest: "Never red ink errors in spelling, grammar, or mechanics. Over the year you will see many of these disappear through increased experience and pride." If the student is prepared to go public with his or her writing, journal extracts can later be polished and written into a class newsletter or program evaluation. Confidentiality is essential. Most often, journals are written to the instructor. They are often written daily, perhaps handed in weekly, although some writers suggest they be collected daily.

Instructors may occasionally want to be directive and ask for feedback on some elements of the program (for example, how students are feeling about the computer component; what problems they may be encountering with their present timetable; their reactions to a group activity that didn't go well; how an awkward situation in the group should be handled). For the journal to serve its best role, however, the topic should be initiated by the learner.

Journals provide instructors with the opportunity to elicit free-flowing opinions and observations from learners who may never have been asked for an opinion before, and the journal may well increase feelings of confidence in not only students' writing abilities, but also in their self-worth. Journal-writing offers a major strategy for gauging many of the feelings, stresses and adjustments that re-entry students experience, and is one possible foil to the isolation of individualized computer-managed education.

In short, the journal is a useful way for the instructor and student to establish communication of a deeply significant nature, for the instructor to get "feedback," and to promote many of the goals that ABE is intended to foster.

Chapter summary

Since the advantages of highly individualized learning offered by CMI may be offset by the disempowerment inherent in some of its elements, additional informed critical review is needed. While remaining open to innovations which can improve ABE programs for learners, educators can

ensure that innovative programs are congruent with the ideals, goals and principles of adult education. Educators can also offer leadership in the evaluation and dissemination of information about such programs with a view to promoting both understanding and improvement of the systems for use in the ABE classroom.

Further, substantial reasons exist for educators to maintain the locus of control of ABE programs rather than ceding that control to the learners, or in the case of CMI, to the learning resource. The facilitator/instructor's role includes the mediation of learning through a well-balanced use of resources and strategies designed to develop the critical frame of mind and the autonomy of the learner. Promising strategies which offset the disempowering aspects of CMI include learning projects, group discussion, and journal-keeping. It is preferable that the CMI resource is not at the centre of the program, but rather that it is accessed as a skill-building tool to meet needs identified by learners, and that the resource is but one element of a varied, humanistic, balanced, student-centred program grounded in the sound goals and principles of adult education.

CMI may have significant potential in ABE, but for the reasons suggested in Chapter Four, it must be used in appropriate ways. In this chapter, several strategies for achieving these ends have been suggested. No doubt there are many other promising suggestions. The objective in offering this critique of CMI will have been achieved if it stimulates others to think about the quality of education we offer our ABE students through CMI.

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