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EDITORIAL

This issue of DEOSNEWS presents an article by Dale Howard and Charles van Duren that looks at computer literacy from an expanded and more theoretical perspective than is common. The authors present this broader interpretation of computer literacy and apply it to a discussion of designing comuputer curricula based on audience needs and expectations.

COMPUTER LITERACY AT A DISTANCE

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INTRODUCTION

Computer technology pervades North American culture and is prevalent in many other parts of the world. Nations with computer "know how" have a product that affords them international political and economic strength. The computer sits at the center of a growing world economy in which efficiency and expediency of production are deemed essential to compete in a market that demands more, faster. Information, itself, has been given commodity status, creating an unprecedented demand for information technology (Dertouzos 1988; Johnston and Packer 1987; Naisbitt and Aburdene 1990).

In response to a growing dependency on computer technology, learning how to use the computer has become part of many public educational curricula. However, not all people receive their computer training in public schools. In recent years there has been increasing emphasis on adult computer training, often through community education programs or in-service training (Carter and Honeywell 1991a; Carter and Honeywell 1991b). Other adults receive their initial computer experience as part of their post- secondary education. In many instances it is mandatory. Such is the case for students registered in the Information Systems Certificate, Bachelor of Arts in Information Systems, Bachelor of Administration, Bachelor

of Commerce, University Certificate in Accounting, and University Certificate in Administration programs at Athabasca University. In other programs such as Nursing and Bachelor of General Studies, computer literacy courses are electives. For some students, those without a program of study, an introductory computer course is taken for general interest or for upgrading.skills.

COMPUTER LITERACY

Shortly after the introduction of the microcomputer in the late seventies, the general public's interest in computers skyrocketed. Concerns were expressed over what some perceived as a national computer literacy "crisis" (Luehrmann 1980; Molnar 1978).

According to the National Computer Literacy Goals for 1985 Conference, as expressed by Deringer and Molnar (1982) of the National Science Foundation (USA), the ability to use and understand computing is becoming as important as our ability to understand and handle the written word. A computer-literate populace is as necessary to an information society as raw materials and energy are to an industrial society.

It appears that computer literacy has been given at least some of the status appropriated to language. It is not uncommon for institutions of higher learning to require a computer language as part of their general entrance requirements, or to substitute a computer language for a foreign language requirement (Peterson's Guides 1989). Also, there have been calls from industry requesting that future employees be skilled in the use of the computer (Levin and Rumberger 1986).

Today in North America, some kind of computer experience by young adults is nearly universal. As many as 50% have taken some formal training on the computer (Collis and Martinez 1989). Statistics Canada says that 9.6 million Canadians report being able to use a computer. That's just under half (47%) the adult population. The figure is much higher for teenagers (82%) (Lowe 1991). However, as widespread as this experience may appear, computer literacy still remains, in many respects, only computer awareness (Adams 1989).

In response to a growing concern that computer literacy has not fulfilled its mandate, attempts are being made to include computers in a broader context, referred to as technology education. The International Technology Education Association defines technology education as "A comprehensive, action-based educational program concerned with technical means, their evolution, utilization, and significance; with industry, its organization, personnel, systems, techniques, resources, and products; and their social/cultural impact" (Lauda 1989, 2).

Computer literacy may be only the beginning of a broader more general technological literacy associated with the continued perception that a technological society will have to be competent in both the use and language of technology.

Knowing a language is arguably the most important

component of any culture. To learn the language of technology means to become acquainted with technological jargon. In the case of the computer, it means learning to communicate with a machine. Communication, in this sense, refers primarily to knowing how to use computers, knowing the right inputs, recognizing the significance of the outputs. Literacy, however, means to understand the cultural significance of the communication. Technological literacy, then, means to understand, appreciate and critique technology. To be technologically literate is to be better able to participate in a technological culture, to share rights and privileges, and to shoulder the responsibility for a technological society.

THE ADULT COMPUTER EXPERIENCE

For many adults, using the computer for the first time is memorable, often paradoxical, where eager anticipation is accompanied by frustration and disillusionment (Howard 1992). Making sense of technology is inextricably tied to making it work. Yet, using technology changes one's perspective (Ihde 1990). During the transformation from procedure to application,technology becomes less extrinsic and more part of the way one does something. The initial awkwardness experienced subsides and the learner is no longer confronted or challenged by an array of procedures and cryptic commands. The usefulness of the technology is no longer questioned. The learner accepts this as a "better" way to do things. Doing it the "old way" no longer makes sense. The old experience is devalued.

However, transformation of the user by the technology is often subtle, and analysis of the psychological and sociological impact of technology on users is not a common consideration during the introduction of computers to adult students. Both instructors and students often view such diversions as irrelevant to how the technology "really" works. Such perceptions and experiences of technology make it difficult to introduce a broader sense of computer literacy to adult students.

PEDAGOGICAL RESPONSIBILITY

For teachers, particularly those who teach adults computer technology, the technological experience should be approached with a great deal of pedagogical responsibility. It is important that educators involved in using computers for instruction or as a subject of instruction be cognizant of the computer as more than "just a tool." It is a cultural artifact with meaning, a meaning deeper and richer than the computer's mere physical presence. Teachers of technology should go beyond the usual "text" of instruction manuals and online help menus, and explore and explicate a fuller meaning and understanding of computer literacy.

The responsibility of educators is to educate, but often education means training. Education refers to the transformation of a person's outlook as a result of what he or she knows (Peters 1980) . More specifically, being educated in computer information technology is more than an instrumental understanding of how a computer works or is used; it is the

development of a broader conceptual framework from which a person is able to understand the issues and implications of the technology. Educators provide students with opportunities for "genuine learning," where the learner experiences something more existentially relevant than the mere gathering of information (Colaizzi 1978; Osborne 1987). Teachers, as educators, are obligated to provide learning experiences that challenge the student to explore new understandings, new meanings.

LEARNING TECHNOLOGY AT A DISTANCE

Dealing with the adult first-time computer experience and developing a broader sense of literacy is especially challenging when learners are receiving their computer literacy at a distance. It is more difficult to have group discussion or impromptu meetings to address the issues and implications of technology at a distance. At AU the situation is even more restrictive, since a continuous registration policy allows students to start their courses at any time during the year. In many instances, this translates into a certain isolation of the student from his or her peers and almost eliminates group activities.

The AU distance education delivery model is primarily a self-paced, home study, telephone tutorial model. COMP 200, Introduction to Information Systems and Technology, is a course about computer information systems: what they are, and how they are designed, developed and used by organizations to operate more efficiently, and to help them make better informed decisions. Table 1 illustrates the course demographics. Essentially, COMP 200 is a revised computer literacy course with a mandate altered to suit the needs of an increasing variety of students and programs. It tries cater to all possible interests, ranging from an introductory course for Information Technology Program students to those programs where computer literacy serves as an elective.

Students registered in COMP 200 receive a course package consisting of a text book, study manual, study guide, and four or five software packages. Students are assessed on a number of activities. Three telephone quizzes provide contact points with the telephone tutor. Five written assignments deal with information system topics ranging from number systems to systems analysis and design. A sixth exercise involves tutorials using software packages supplied as part of the course materials. In addition, there are a number of suggested activities aimed at promoting a better understanding of computing technology's place in society.

Table 1. Demographics of COMP 200 (452 students - Feb. 1992)

DEMOGRAPHICS	NUMBER of STUDENTS	PERCENT
GENDER		
Female	241	53.3%
Male	211	46.7%
PROGRAM		

No Program	179	39.6%
Nursing Transfer	8	1.8%
Certificates	59	13.1%
B.A.	94	20.8%
B.G.S.	75	16.6%
B. Admin.	28	6.2%
B.N.	9	2.0%
LOCATION		
Alberta	385	85.2%
Other Provinces	67	14.8%

ADULT LEARNERS

Another, more general, consideration focuses on the characteristics of adult learners. Most AU students are working adults between the ages of 25 and 44 who study part time. According to Cross (1988), adults are highly pragmatic learners. They are usually self-directed, experienced, and motivated by extrinsic factors such as job promotion or salary (Knowles 1984). To present psychological and sociological materil in a course, perceived by most adult students as a hands-on, "how to use a computer" course would appear to many of them incongruous with their purpose for enrolling. Even when the social impact of technology is addressed in the first chapter of almost every introductory text on the subject of computer applications, it is viewed as material to be glossed over during initial introductions to the course.

At AU we want to provide adult students with a broader sense of computer literacy, yet respond to the primary characteristics of adult learners: a desire for practicality and personal relevance of the material being learned. A partial solution to the problem is to embed concepts that explore a broader sense of computer literacy in the course assignments.

CUSTOMIZED COURSE DESIGN

A general purpose introductory course in computing systems will attract students with a wide range of expectations. These expectations are generally derived from three roles that students take on with respect to computing, based on categories of the nature and extent of end user interaction with information technology (Panko 1988).

1. Providers. Providers are designers, producers, managers, operators of computer or information systems, or those taking courses to qualify them for these positions. For this group, the introductory course is a foundation course for further study. Providers require an expertise appropriate to the individual's area of interest and/or activity. As well, they need a notion of the impact of information technology on society in general, and on their particular profession.

2. Users. Users interact directly with computer and/or information systems, providing input and using output. For this group, the introductory course is likely a combination of general interest and foundation. It is probable that "users" will be utilizing computers for specific purposes in an occupational area.

They need to be technically competent in the technology that they are required to use in their professional context. Users may require skills in software development, but are more likely to use existing applications. This group needs a sense of the types of problems for which computer solutions are appropriate, and the range of software applications available.

3. Clients. Clients have no direct interaction with computer systems, but may use computers and derive benefits from them. The computer is not perceived as an integral part of the job. For this group, the introductory course is a general interest course, with an emphasis on how to be an intelligent consumer of computer-related products and services.

For all three groups computer literacy includes an appreciation of how computers are changing society, and an understanding of the social, political and ethical issues relating to information technology.

Students are not easily identified as belonging to one of these three groups, except as they register in specific academic programs that give varying degrees of emphasis to computing and information technology in their curriculum. Therefore, designing assignments to serve the needs of all three groups requires flexibility in at least two dimensions.

Dimension One. The first consideration is the technology or skill content of the exercise. Providers and users both need practical skills, and thus can be expected to perform reasonably complex hands-on problem solving exercises. For clients, the issue is not quite as clear, because this group is likely to display a range of attitudes toward computers, from the enthusiasm of the hobbyist to the fearful curiosity of the technophobe. It is not unreasonable to expect clients to interact confidently with computer applications and to use applications as part of their professional practice or personal activities. It is unrealistic, however, to expect clients to acquire more than the elementary skills necessary to access and minimally apply application software.

Dimension Two. The second dimension involves the assignment content. If we can accept that the different groups will identify themselves by their program and course choices, then the content of the various assignments can be oriented towards the student's discipline. The provider group may be expected to solve a systems problem using software and hardware. The user group could be asked to program a software tool or use an application program to perform some specified actions. The client group may be best served by a task involving the evaluation of software packages, leading to a generic knowledge about classes of software. Tables 2-4 illustrate the customization of assignments to reflect the three computing roles students acquire via their programs.

Table 2. Providers: Assignments for Students Registered in Information Technology Diploma

COURSE COMPONENT	ASSIGNMENT

Operating System Provided is a diskette with a collection of numbered text files.The files contain descriptions of computer applications in defined areas (science, medicine, education, etc.). The task is to print the files, name them appropriately, and to set up a directory tree structure to organize the files in a meaningful way, according to content. Skill: Using an operating system as an organizational tool. Literacy: Acquiring an understanding of the diverse applications of computer technology.

Word Processing Produce a report outlining, describing and explaining the "functional view of computing" (Vinsonhaler, Wagner, and Gentry 1989). Give examples of each layer. Incorporate the following word processing features: formatting, font changes, tables, headers and footers. Skill: Acquiring both elementary and advanced commands for document preparation. Literacy: Developing a user context in which to examine information systems.

Data Management Design a small data base to store information on computing jobs found in the career sections of various newspapers. The data base should include the following attributes: 1) employer name; 2) job title; 3) job qualifications; and 4) salary. Query the data base and produce a brief report on jobs sorted according to qualifications and expected salary. Skill: Acquiring elementary commands to program and use a data base manager. Literacy: Broaden awareness of the professions associated with information system technology.

Expert System Shell Provided with a basic inventory of microcomputer equipment, prices, and other specifications, design a system that allows queries on types of components to be considered when given an intended need/use and intended budget. Also describe some scenarios representing a range of uses for the system. Skill: Acquiring elementary commands to program and use an expert system shell. Literacy: Becoming familiar with equipment categories and relative costs as well as appropriate inventories for specific applications and budgets.

Communications Given a communications package, program the package to connect with the student mainframe computer. Use three CMC facilities in the following ways: 1) send electronic mail to the tutor to confirm access;2) sign on to the conferencing system and join the discussion on ways to use computers for communication (summarize the discussion so far); 3) use the file transfer utility to transfer your summary file between the micro and the mainframe. Skill: Using the commands to program a communications package and utilizing various forms of CMC on line. Literacy: Becoming aware of a broad base of CMC applications.

Table 3. Users: Assignments for Students Registered in Business Administration

COURSE COMPONENT	ASSIGNMENT
Operating System	Having received several files concerning office computer ethics, organize the files into meaningful categories and copy them to your hard drive. Skill: Using elementary commands to handle files and to develop a directory structure. Literacy: Developing an awareness of ethics issues in computing and information technology.
Word Processing	Write an essay (approx. 5 pages) discussing office ergonomics. Include the following formatting features in your paper: right justification, bolding and underlining, tab, footnote, and page numbering. Skill: Using elementary commands for document preparation. Literacy: Understanding the relationship of health, safety, and productivity issues and information technology.
Data Management	Conduct a media watch (newspaper, TV, radio, etc.) concerning information technology. Construct a data base of the articles and reports using the following attributes: 1) title; 2) source; 3) key words; and 4) brief abstract. Produce a report on business related topics, indicating a retrieval using key words. Skill: Using elementary commands to program and use a data base management tool. Literacy: Developing an awareness of the issues most commonly reported concerning information technology.
Expert System Shell	Given the structure and content of a knowledge base, develop an expert system for marketing computer products. Query the system for suggested marketing strategies for a range of products. Skill: Using programming commands to develop and query an expert system. Literacy: Developing an awareness of computer products and their uses.
Communications	Given a communications package, explore its possibilities by: 1) signing on to the student mainframe to send electronic mail messages to the tutor to acknowledge access to the system. Send another message to introduce yourself to a fellow student; 2) sign on to the local bulletin board and submit a report describe the resources available; and 3) perform a literature search on an online university library catalogue system. Skill: Using a variety of online systems and user interfaces. Literacy: Becoming aware of the variety of ways computers can be used as communications tools.

Table 4. Clients: Assignments for Students Registered in Nursing Program

COURSE COMPONENT	ASSIGNMENT
Operating System	Evaluate a text-based user interface such as DOS and a Graphic User Interface such as windows. Compare and contrast these systems according to intuitiveness, level of knowledge required to perform simple tasks, and documentation available for assistance. Skill: Using elementary commands to handle files and to develop a directory structure. Literacy: Developing an awareness of "user friendliness" in computing and information technology.
Word Processing	Develop an opinion essay on "Why Members of the Nursing Profession Should be Computer Literate". Include the following formatting features: right justification, bolding and underlining, tab, footnote, and page numbering. Skill: Using elementary commands for document preparation. Literacy: Developing a personal and professional rationale for acquiring computer literacy.
Data Management	Given a predefined data base system, with data entry screens, build a data base of health care resource material dealing with information technology in health care (create a bibliography). Provide the following attributes for each entry: 1) title; 2) author; 3) publisher; 4) date; 5) subject; and 6) brief annotation. Produce a report by sorting the data base according to a particular health-related subject. Skill: Using elementary commands of a data base management tool. Literacy: Acquiring a broader knowledge of the applications of information technology in the health care profession.
Expert System Shell	Given a demo version of a relevant expert system, work through several search strategies. Research the use of expert systems in the health care profession. Attempt to evaluate their use, citing expert opinion as well as your own. Skill: Using query commands to retrieve data from an expert system. Literacy: Developing an awareness of expert systems in the health care profession.
Communications	Use a communications package to access the library database for information related to health hazards and computer use. Submit your query strategy as well as the results. Skill: Using elementary commands to connect to an online data base. Literacy: Becoming aware of the association of computer use to health risks.

SUMMARY

The introduction of the personal computer a little over a decade ago prompted a flurry of interest in computer technology. What was only available to scientists, big business, and government become readily available to the average person with a few thousand dollars to spend on a desktop computer.

Availability of the technology fueled a national perception that knowing how to use a computer meant increased opportunity and prosperity. The "computer literacy crisis" was born and computer classes became increasingly common in public and post secondary educational institutions.

Computer literacy, in the narrowest sense, is knowing how to operate a computer and to efficiently and expediently use a number of computer application programs. In a broader sense, computer literacy is also a knowledge of how computers affect the individual and social context of culture. It is an awareness of the responsibility each user of technology shares in the appropriate application of technology. Although both views of computer literacy are present in many texts on the subject, computer literacy as part of a broader technological literacy still comprises only a relatively small portion of most computer literacy courses.

The adult computer experience suggests that many, if not most, adults view computer literacy as getting to know the operations of a computer and the application of computer software. This is also supported by research examining the characteristics of adult learners. However, pedagogic responsibility urges some teachers to introduce the broader sense of computer literacy as part of the mandate of post secondary education. These individuals view education from a process orientation rather than a position emphasizing results.

The Athabasca University mandate of openness, the demographics of AU's student population, and the characteristics of adult learners pose some difficulties in delivering a broader sense of computer literacy to the approximately 450 students registered annually in COMP 200. An attempt has been made to design assignments that both reflect the inherent issues of technology and serve to teach students the mechanical operation of the technology and application of various software packages.

CONCLUSIONS

As computer technology becomes more "transparent", less obviously a physical presence in our environment, the issue of technological literacy becomes.more critical. Paradoxically, however, the more likely technological literacy is to be taken for granted and become a "non issue". In our eagerness to embrace the benefits of computer technology we may overlook the impact and change unquestioned acceptance of this technology means.

Although Athabasca University must maintain a delivery model suited to its particular mandate of openness and accessibility, it is also cognizant of changing technology, changing student demographics, and the increasing need for more emphasis in a "whole" education. While the course coordinators and tutors of COMP 200 are embedding the issues of technology in the course assignments, attempts are being made to encourage more interactivity between students and teachers. Computer conferences will soon be established to allow students taking COMP 200 to examine and debate the issues of technology. However, open registration times will

continue to cause problems; therefore, customizing course design to meet the needs of individual user groups will likely continue to be a viable pedagogic approach.

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