IMPLEMENTATION OF COMPUTER NETWORKING

IN HIGHER EDUCATION

by

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INTRODUCTION

Our intention is to present work in progress in Canada and the United States. Perhaps we can best convey what we are doing by describing our projects in terms of four major aspects: type of institution, educational model, Computer Based Education model, and user experience and behavior. First we want to give you an overview of our projects, and then focus our remaining comments on some aspects of distance education.

Institutions

Our research is being conducted at two types of institutions, the small town community college and the large city graduate school. Cariboo College is a small community college of 2,500 students. Saybrook Institute is a graduate school with an enrollment of 170 students. Cariboo is located in Kamloops, British Columbia, a community of 60,000 residents, whereas Saybrook is situated in the middle of San Francisico, a metropolitan area of more than 3 million people. Cariboo College is a non-degree granting undergraduate and vocational institution which serves mostly students ranging in age from 18 - 24 years from the local area (Cariboo College Calendar, 1984-1985). Saybrook is a degree granting graduate institution for mid-career professionals who reside all over North America and in selected countries of Europe (Saybrook Institute Catalog, 1984-1985).

Educational Model

Our research projects involve two educational models: Residential and External. At Cariboo College, the university transfer students work in the traditional residential program attending lectures and seminars over an academic year which consists of two semesters of fifteen weeks duration. At Saybrook Institute the educational model follows the external format consisting of two half-year periods of home study as well as twice yearly intensive week long meetings with faculty members and other students (Powers, 1984; Peel, 1985). Cariboo students study and work on their courses with the use of the college library, whereas Saybrook students draw upon university and public libraries within their own community. At Cariboo College assignments are completed and submitted directly to instructors according to course schedules, whereas at Saybrook students work at their own pace and mail assignments to instructors. Cariboo students write midterm and final objective tests in addition to their assignments. Saybrook students are evaluated through a procedure of critique, feedback and requested revisions of papers until acceptable standards are reached.

Computer Based Education Model

   We are working with two forms of Computer Based Education
(Montgomerie, 1982). The form of Computer Based Education (CBE) at
Cariboo involves several campus based work stations in the same
room that are linked to a host minicomputer in the same building.
We refer to this CBE Model as Computer Integrated Campus Education
or CICE. At Saybrook each student works in his own home and is
linked to a host mainframe in another location. We call this CBE
model Computer Integrated Distance Education or CIDE.

   At both Cariboo and Saybrook major developments have been
completed to integrate the computer with learning activities.
Although the computer can be thought of as a computational device,
in our models we see the computer as an tool to assist in the
thinking and learning processes. We prefer to think of students
doing their course work at stations rather than at computers. Such
a work station enables the student to use several tools such as
word processing, electronic mailing, conferencing, computer
managed learning, computer assisted instruction and any other
computer based activities that become available (Daniel, 1982).

User Experience and Behavior

   Our research interests not only focus on CBE models but also
they center on how students and faculty adapt to and work with
computer integrated learning activities. The general topics we are
investigating include community networking, learning styles, and
attitudes.

Summary

   Let us summarize the distinguishing characteristics of each
project (Table 1). One can readily see two contrasting
institutions, educational models, living conditions, computer based
education models, and populations of students. Taken together, we
believe that our research will lead us a more generalized base of
practical knowledge for implementing computer networking in higher
education, and already some benefits of our work are becoming
evident (Peel, Collen and Maydan, 1986).

Table 1. Descriptors characterizing two projects in CBE.

Descriptor	Cariboo College	Saybrook Institute
Location	Kamloops	San Francisco
Level	Undergraduate	Graduate
Format	Residential	External
Program	Non Degree	Degree
Age	18-24	25-65
CBE	CICE	CIDE

PURPOSE

We have just reviewed the basics of the two CBE models we are using. For the remainder of our paper we will focus on distance education, and we will direct our comments to phases of implementing a computer network, characteristics of the participants, user training, student-faculty relationships, and impact of CBE upon the participants and the institutions involved. First, we will report the current status of this implementation at Saybrook Institute, and second at Cariboo College. We will emphasize those aspects of the CICE model implemented at Cariboo which serve as a prototype for the CIDE model now being implemented at Saybrook.

CIDE AT SAYBROOK INSTITUTE

Implementation of CIDE at Saybrook consists of four phases.

Phase I: Feasibility involves a study of costs and benefits, hardware and software requirements.

Phase II: Initiation aims at getting participants to log-on and to be familiarized with software capabilities. It also includes the development of a user manual tailored to the needs of the network. Word processing and conferencing literacy among participants are essential requirements of this phase. A small group of students and a faculty member are needed to begin the network and refine the use of the system. Finally, one work station in the network needs to be established at the institution to begin communicating administrative policies and procedures among staff, faculty and students.

Phase III: Conferencing entails active use of the network to complete courses and degree program requirements. At this point, many more students and faculty members join the initial group. Completion of the educational programs now becomes possible through the electronic medium for a substantial portion of the student body. Further, the administrative staff uses the network to communicate many routine procedures.

Phase IV: Institute-wide Usage means that all students, faculty and staff members can be on-line. This phase represents full implementation of the network. It assumes ongoing evaluation and improvement of the network.

Currently, Saybrook is in Phase II of implementation. Fourteen students, one faculty member, the institute, and the host organization comprise the workstations of the Saybrook Electronic Network (SEN). However, only six students, one faculty member and the host organization are actively on-line. In the next academic

year, we anticipate a major expansion of the network to include
many more students, three faculty members and the institute. At
that point, Saybrook will be ready to proceed from Phase II into
Phase III.

Characteristics of participants

     The students in SEN are mid-career professionals representative
of the Saybrook student body. Their workstations are located in
British Columbia, California, Hawaii, Texas, and Washington, D.C.
These students are pursuing graduate degrees in Psychology and the
Human Sciences. Most of them are employed as mental health
professionals, have several years work experience, and education to
the Masters level. Contrary to our initial expectation, the
students vary widely in their knowledge of and experience with
computer technology. On the one hand, some have owned a personal
computer with a modem for a few years and on the other hand,
joining SEN has marked their introduction to word processing,
electronic mail and conferencing. The first author of the paper,
and Director of the network, is the faculty member working with
these students.

User Training

     All participants in SEN have had to rely on their own resources
to purchase hardware and software, and to acquire the skills
necessary to network. But the host organization, has provided a
user manual to assist students with learning the log-on procedure
and the basic command options. At this time, Saybrook has yet to
develop its own user manual for SEN, and to provide workshops and
trainings for participants to become word processing and con-
ferencing literate. These activities will fulfill important needs
in order to move Saybrook out of the Initiation phase and into the
full Conferencing phase of CIDE implementation.

Student-Faculty Relationships

     In general, the faculty member and students involved have
exchanged much more information than would have been the case
without the electronic medium. Their communications have fostered
a more personable relationship and greater committment to complete
their degree programs at the institute. SEN has made it possible
for students to ask a variety of questions about taking courses
and graduate study at a distance. There is less delay using SEN,
than when the students depend upon the postal system and waiting
for the week long, face-to-face meetings held twice a year with
faculty members. Ironically, although students can telephone
faculty at any time, typically they do not do so. The network, as

a new option for communication, has prompted students to become more active in initiating communications.

Impact on Individuals and the Organization

It is too early to assess much of the impact of CIDE on individuals, faculty members, graduate instruction, and the institution. Nevertheless, it is clear that many students and some faculty members are purchasing hardware and software in anticipation of joining the network at some time in the near future. Realizing that SEN is becoming a reality and an educational choice, students are planning that time in their studies at which they intend to become part of the network. There is much discussion on other fronts as well. Faculty members are looking to the administration for more budgetary support so that they can become active participants. More time is being directed towards funding of research related to the project. In general, SEN is looked upon as a benefit which will enhance the educational process and the educational model used at the Institute.

CICE AT CARIBOO COLLEGE

The Computer Integrated Campus Education (CICE) project started at Cariboo in December of 1985. Although the project is being used in a residential setting, it has all the elements for easy CIDE implementation. The four phases of the present project are as follows:

Phase I: Planning involves the design of the project, securing administrative support and funding and preparating curriculum materials for university transfer psychology courses at the first and second year level. At this phase, assistants are hired to design curriculum and enter test bank information.

Phase II: Initiation includes training of students in the use of word processing, electronic filing, electronic mail, and conferencing. This phase of the program involves several classrooms (over 200 students), one faculty member, and assistance from computer services personnel.

Phase III: Implementation entails computer managed learning (CML) and conferencing. The computer managed learning includes both pre-testing and supervised exams, all of which are issued and marked by the computer. Conferencing includes all the assigned written work for the course and is evaluated by the instructor. The instructor monitors both the computer managed learning and conferencing part of the course using a modem and computer located in his own home. Therefore, the project, as used in this

residential setting, contains all the elements for CIDE
implementation: A course with all learning activities and
evaluation accessed by a computer with a modem.

Phase IV Evaluation is carried out through the design,
distribution and completion of a research questionnnaire by the
participating students.

At present, Cariboo College has completed all four phases of
implementation. By next fall, we anticipate an expanded use of
CICE at the college with possible planning for CIDE. Now, we will
present a summary of our findings.

Characteristics of Participants

The more than 200 particapating students in the Cariboo
introductory psychology courses were typically young adults
between ages 18 and 22 years old. The students were enrolled in
social science programs, business administration, and nursing.
Many of these students were working toward a standing which will
allow them to enter into universities. Few of the students had
more than a fleeting introduction to the skills associated with the
computer, although a small number had previously completed
computer science courses. There was a wide range of reactions to
the implementation of CICE. The instructor, who implemented the
CICE project, was the second author of this paper.

User Training

Five hours of training were provided in both class and seminar
periods. The class training involved a presentation and
demonstration of the features of the computer workstation, whereas
the seminars consisted of hands-on experience. During the
seminars, each of which had 20 students, there were two persons
present to assist the student's learning at the workstation.
On-line help was available, although not always easy for the novice
user to understand. Subsequent to the initial five hours of
training, there continued to be two people available during the
seminar time for assistance. Small groups of students received
short lectures as needed.

Student-Faculty Relationships

The research questionnaire revealed a wide variance of impact
upon the student-faculty relationship as affected by the
introduction of CICE. Since the use of the computer was a
mandatory part of the course, we expected major adjustments on the
part of both student and faculty. Several students were ready to

drop out of the course upon hearing of the use of computers was mandatory. Some of those students did indeed drop the course, but most remained in the program. Other students were resistant initially due to their lack of confidence about their own ability to operate the workstation. Upon gaining at the skills associated with computer use in the course, these students became the most frequent workstation users.

The Electronic Mail (EMAIL) features attracted the students. Upon learning that they could send individual messages to the instructor for personalized assistance, many students became regular users, and the faculty member had scores of messages to answer daily. Some students never did use the EMAIL facility to communicate with either the faculty member or other students. EMAIL communication varied from being informal and friendly to formal and matter of fact. For the faculty member, there were several adjustments to being able to make optimal use of the features of the computer.

Since the seminars consisted of students at workstations, with minimal face-to-face contact, the impact upon both faculty-student and student-student communication were expected to be minmal; however, many students reported having more personal contact with the faculty member and with each other than in traditional courses. With the self-paced aspect of the seminars, the faculty member was able to give an high degree of individual attention especially through the use of electronic mail and conferencing facilities.

Impact on Individuals and the Organization

One of the most immediate findings was that individuals used their newly learned skills to complete assignments for other courses. Another use by students was to communicate with each other using EMAIL. The total effect for the organization was that the use of the host computer was significantly higher for the college due to the increased load on the computer system. On several occasions the host computer was used to its maximum capabilities, and other users, including college administrators, had to be asked at times to log off.

Since other faculty are also planning to use CICE model in their own programs, computer facilities must be enhanced through additional funding. Proposals to train more faculty, to increase the power of the computer, and to add many more workstations are presently being considered at Cariboo College.

CONCLUSION

We have found that it is possible to implement a computer based

educational system very rapidly with a large group of students, given mandatory involvement and available workstations with access to the computer which was the case at Cariboo College. Where implementation is more voluntary, training is minimal, and program requirements are more self-paced, it appears implementation is much more gradual as seems to be the case at Saybrook Institute.

Our work at Cariboo involves a CICE model. It has served as a prototype and one CBE model among several considered for the CIDE model now being implemented at Saybrook. Our collaborative efforts have been very helpful in drawing upon the work at Cariboo for the purpose of establishing the SEN at Saybrook. It has become increasingly apparent to us that many of the characteristics, problems and issues involved in implementing a CICE model are applicable to implementing a CIDE model.

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